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Historical intersections of climatic change and power transitions: Ecological pressure, differential adaptability, and the US–China power transition in the Anthropocene

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Abstract

How is the ongoing climatic change shaping the trajectory of the US–China power shift? How does rapid climatic change intersect with great power transitions? Challenging the sociocentric bias of power transition theory, we argue that climatic shifts act as contingent but pervasive amplifiers of geopolitical instability by intensifying revisionist motivations and reshaping relative capabilities through differential sociopolitical adaptability. Through comparative historical analysis of three cases—the Mongol–Song transition during the Medieval Warming, the Spanish–Dutch transition, and the Ming–Qing transition during the Little

Ice Age—we show that ecological pressures heightened revisionist motivations, conditioned differential adaptability, and introduced nonlinear dynamics into power shifts. Applying these insights to the US–China competition, we argue that Anthropocene climate change is rendering the transition more unstable and less amenable to prudent management. Lastly, we propose a reformed concept of prudence and institutional restraint under conditions of the climate-amplified power rivalry and their implications for US–China relations.

Keywords: US–China relations; power transition; Anthropocene; climate change; adaptability

1. Introduction

What are the concrete pathways by which ongoing climate change intersects the US–China power transition (Colgan and Miller 2022; The White House 2022; Pepe, Grinschgl, and Westphal 2023)? Surprisingly, few works have probed concrete ways the two transitions intersect (Colgan and Miller 2022; Toal 2024). Power transitions remain a main topic in security studies and the dominant framework for analyzing the US–China rivalry (Organski and Kugler 1980; Gilpin 1981; Modelski 1987; Modelski and Thompson 1988). A substantial literature has examined anticipated consequences of the closing US–China power gap (Ross and Tunsjø 2017; MacDonald and Parent 2018; Zhang and Lebow 2020). However, existing theories tend to explain a power transition process through other social processes, excluding nonhuman planetary processes such as climate shifts, largely due to sociocentric biases and planetary gradualism (Connolly 2019). As historical climatic shifts have variably affected the course of power transitions (Fagan 2008; Degroot 2018; Che and Lan 2021; Brook 2023), this paper focuses on three cases where planetary-scale climatic shifts cut across major power redistributions: the Mongol–Song transition during the Medieval Warming, the Spanish–Dutch maritime power transition during the Little Ice Age, and the Ming–Qing transition in the same period. Our framework also connects these to power transitions scholarship by considering revisionism of both a rising challenger and the established power at regional and international levels. Relatedly, a few works have drawn lessons for contemporary security through deep historical analyses. Building on them, we analyze historical intersections between climatic

shift and power transitions and their implication for the current US–China power shift (Diamond 2011; Hsiang, Burke, and Miguel 2013).

In a nutshell, we argue that major climatic shifts make power transitions highly volatile by deepening political actors' dissatisfaction within the two powers, producing different revisionisms, and making transitions contingent on ecological pressures and differing sociopolitical adaptability. First, as existing studies show, rapid climatic pressures often undermine sociopolitical stability, leading contending powers to remedy instabilities through various revisionisms (Wang 2022). Second, disruptive ecological stress can suddenly alter capability distribution given competing powers' differential sociopolitical adaptability, precipitating one's relative decline. Rapid climatic shifts produced ecological shocks that disrupted mobilization capacities, but their disruptive effect varied with contending powers' differential adaptability.

2. Sociocentrism and planetary gradualism in power transition theories

A few theoretical investigations of power transitions touch on potential intersections between power shifts and nonhuman planetary processes such as climate change. Yet they fall short of addressing them head on. Admittedly, recent theoretical works analyze more nuanced motivational and emotional dynamics between established and rising powers. Nonetheless, they rarely address how climate disruptions might intervene in power transition dynamics, let alone the prudent management of great power competition under such conditions (Chan 2008; Pu 2019). Another common theoretical focus is the rates and trajectories of the redistribution of material power in the international system (Gilpin 1981; Beckley 2012; MacDonald and Parent 2018; Lind 2024). But such discussion also dismisses how rapid shifts in planetary processes such as climate may affect power redistribution.

Drawing on Davidson's account of revisionism's domestic roots and Schweller's dissent phase account of the long cycle, our framework fills this gap by extending power transition scholarship's analytical tools to incorporate ecological planetary processes that condition their operation. These moves still remain grounded in power transition theories. Some may argue that power transition theories are intentionally blind to domestic politics in general or largely concern power transitions at the global level. However, given satisfaction and dissatisfaction's centrality as a linking

mechanism between power transitions and their outcomes, one must integrate domestic political dynamics shaping the degree of dissatisfaction (Modelski 1978; Kugler and Lemke 1996; Tammen *et al*. 2000; Ward 2017; Mukherjee 2022; Schweller 2026).

Moreover, as Tammen, Kugler, Lemke, and Organski put it, "the motivation driving decisions for war and peace is relative satisfaction with the rules of the global *or regional hierarchy*." Unlike the conventional notion that the power transition framework only concerns dynamics between the global hegemon and the second strongest challenger, it has already been applied to many regional power transitions in Europe, Asia, Latin America, and the Middle East (Kugler and Lemke 1996: 10–22; Tammen *et al*. 2000: 63–81; Streich and Levy 2016; Greve and Levy 2018). Following Davidson, we define revisionism as a political entity's tendency to pursue "values not presently enjoyed" and status-quo orientation as its tendency to maintain those presently enjoyed in the regional or international system. These values may include physical, biological, material, and ideational goods, such as status, in the respective system (Tammen *et al*. 2000: 11; Davidson 2006).

Specifically, rising powers are likely to adopt revisionist goals if the dominant group becomes increasingly dissatisfied with either the regional or global distribution of such values and generates substantial political pressure within them. Davidson treats such domestic pressure for revisionism as mediated by policymakers' calculus about which politically relevant groups possess resources the regime requires to survive. Likewise, his framework of revisionism's origins connects domestic pressures to state-level dissatisfaction and revisionist orientations. Building on his framework, *ceteris paribus*, our analysis treats climate-induced political pressures as a condition that may heighten a rising state's dissatisfaction and revisionism during a power transition, manifesting through domestic political struggle (Davidson 2006: 19–35; Davidson 2002).

Additionally, although Organski and Kugler initially assumed that "the dominant power was satisfied and the challenger was dissatisfied" (Kugler and Lemke 1996: 20), our framework accommodates a declining power's dissatisfaction and subsequent revisionism, especially when it perceives that the costs of maintaining the existing order outweigh its benefits. Similarly, Schweller recently articulates "the dissent phase" of the long cycle, where challengers undermine the regional or international order and declining established powers simultaneously destabilize existing orders that

no longer serve their interests. Thus, the declining power may also exhibit dissatisfaction with the existing order, and thereby revisionism (Schweller 2026: 49–51, 95–6).

Despite the power transition literature's inattention to planetary processes, interactions between power shifts and significant planetary changes have occurred multiple times during rapid climatic shifts such as the Medieval Warming and the Little Ice Age (Fagan 2000; Fagan 2008: 46–65; Brook 2020). Above all, the current cycle of the US–China power shift coincides with the increasing awareness of the Anthropocene and the urgency to deal with its disruptive challenges. For example, the 2050 zero-carbon target proposed in the 2018 IPCC special report coincides with China's goal of matching US military power and realizing the Chinese dream by 2050 (Xi 2017; IPCC 2018; Goldstein 2020). An extensive climate-security scholarship has investigated the links between environmental change and conflict, including Homer-Dixon's pioneering work that identified environmental scarcity as a contributor to violent conflict, especially in developing societies subject to resource depletion and demographic stress. Quantitative cross-national work, such as Hsiang, Burke, and Miguel's meta-analysis, found significant correlations between climatic anomalies and diverse conflict forms, while critics including Buhaug questioned their findings' robustness. More recent work has converged on the "threat multiplier" framing (Homer-Dixon 1991, 1994; Hsiang, Burke, and Miguel 2013; for the principal challenge, see Buhaug 2010; for exceptions, see Busby 2008; Crawford 2022).

Nonetheless, Uexkull, Buhaug, and Busby recently take stock of the field's progress and find a notable structural bias. Uexkull and Buhaug note a critical underexamination of the security implications of long-term climate change, distinct from short-term variability and extreme weather, leaving multidecadal climatic shifts unaddressed. On climate stress and territorial resource-driven conflict, the most consistent empirical finding concerns intrastate communal violence over land and grazing rights, not competition between great powers or empires (von Uexkull and Buhaug 2021; McGuirk and Nunn 2025). Our framework addresses this gap: how sustained climatic shifts may reshape the key variables of power transition theory—the dissatisfaction of political actors, the revisionist orientation of states, and the differential rates of adaptability between competing powers—at the level of great power competition and over multidecade time horizons.

3. Climate–power transition nexus in history

3.1 Revisionist motivations and differential adaptability

Existing studies indicate a significant correlation between climate anomaly and conflict, but we need to elaborate more specifically how and where climatic shifts intersect with power transitions (beyond Hsiang, Burke, and Miguel 2013, see Burke, Hsiang, and Miguel 2015; von Uexkull *et al*. 2016; for skeptical perspectives, see Buhaug 2015). In line with the key variables in power transition literature, we focus on how climatic pressure can shape revisionist motivations and capabilities of the competing powers. First, climatic shifts such as the Anthropocene tend to exacerbate domestic instabilities, increasing dissatisfaction among political actors and intensifying revisionist motivation (Bradsher and Dong 2022; Kopits *et al*. 2025). Organski and Kugler initially posit that a rising challenger "is most likely to be the aggressor" because of its dissatisfaction with the international system. Subsequent scholarship, however, recognizes that levels of dissatisfaction or satisfaction can vary for both rising and dominant powers (Organski and Kugler 1980: 19–20; Kugler and Lemke 1996: 20–2; Tammen *et al*. 2000: 10–13). As elaborated above, the link between domestic ecological stress and polity level revisionism does not translate mass discontent directly into state policy; rather it operates through leaders' calculations about which constituencies hold the resources—legitimacy, fiscal capacity, and coercive force—that the regime requires to survive. Climate-driven domestic stress may shift the relative political resources of constituencies that prefer or oppose revisionist external posture, tilting elite incentives during a power transition.

As Gilpin, Schweller, Johnston, and Mukherjee argue, revisionism may be expressed through territorial expansion, challenges to hierarchical status arrangements, demands for a greater share of economic or material goods, or resistance to the normative and institutional foundations of the previous order (Gilpin 1981: 106–15; Johnston 2019; Mukherjee 2022). Climate-driven ecological disruptions do not create these revisionist motivations *ex nihilo*, but systematically amplify pre-existing dissatisfaction with the prevailing order by deepening resource scarcity, exacerbating perceived inequities in the allocation of goods, and narrowing the scope for diplomatic accommodation. While revisionism's specific manifestation differed across the three cases—territorial conquest, rebellion against an imperial

fiscal regime, or challenges to a tributary trade system—ecological pressures generated by rapid climatic shifts served as a recurring intensifying force. We underscore ecological pressure's motivational effect but do not impute psychological attributes to the state actor. Rather, it refers to strategic orientation driven by ecological structural incentives, following power transition literature. We stress climate's effect on political actors' general dissatisfaction, including the public, which may fuel states' revisionist motivation by altering leaders' calculus concerning politically salient constituencies, because such distress is ultimately mediated by policymakers' political reasoning.

Second, climatic shifts may shape competing powers' relative capacity because their disruptive effects vary with each state's differential adaptability. Here, adaptability is defined as "the dynamic capacity to effect and unfold multiple evolutionary trajectories" through proper "couplings between social actors in place that enhance the overall responsiveness" to unforeseen climatic challenges (Folke *et al*. 2010; Pike, Dawley, and Tomaney 2010: 59–70, at 62). Power transition theories' basic premise is that power shifts are driven by differential economic growth rates, through which a rising power translates increasing resources into military power (Organski and Kugler 1980: 13–63; Gilpin 1981: 156–85). Climatic change may affect these rates not only by conditioning each state's basic habitability and productivity but also because states develop different adaptive capacities to cope with climatic shifts. Homer-Dixon and others have extensively documented how varying degrees of resilience and adaptability shape societal responses to environmental disruptions (Adger and Kelly 1999; Homer-Dixon 2006).

For case selection, three cases—the Mongol–Song transition, the Spanish–Dutch maritime power transition, and the Ming–Qing transition—are historical instances where a sustained, multidecade to multicentury climatic shift intersected with a major redistribution of great power level political authority in Europe, Asia, or Eurasia (Modelski and Thompson 1988: 115–29). As observed by Uexkull and Buhaug, "the empirical climate-conflict literature almost exclusively studies effects of climate variability or extreme weather events, not climate change," with multi decadal shifts in average climatic conditions receiving scant empirical attention. Conversely, studies examining longer time horizons typically remain within the field's characteristic subnational, civil conflict-focused frame, leaving comparative analyses of long lived climate shifts at great power scale rare

(von Uexkull and Buhaug 2021: 3–17, at 7; see also Hendrix 2018: 190–1; Busby 2022).

The Medieval Warming, Grindelwald Fluctuation, and broader Little Ice Age offer unique empirical windows onto how sustained climatic shifts—comparable in temporal scope to the unfolding Anthropocene—interact with power transitions at continental or international scale. We therefore treat these cases as historical laboratories for examining our framework's two mechanisms: how sustained ecological pressure shapes the conditions under which revisionist motivations arise, and how differential adaptability reshapes relative capacity. Although revisionism's substantive expression varies across the three cases—territorial conquest (Mongol), rebellion against an imperial fiscal regime (Dutch), challenge to a tributary trade and tribute order (Manchu)—our framework is consistent with the international security literature's broader conceptualization of revisionism.

3.2 Mongol continental expansion

The first historical precedent is the 13th century rise of the Mongol empire relative to the Song dynasty during the Medieval Warming period. Within several decades, the Mongol war machine wiped out multitudes of several dynastic formations, including the richest and most advanced state of the 13th-century world, the Southern Song China, and integrated most of the Eurasian landmass into its imperial network (Zarakol 2022: 47–88). In his account of hegemonic transition, Gilpin also attributes Mongol progress to cavalry and the low cost of steppe transportation (Gilpin 1981: 58–9). As McGuirk and Nunn demonstrate, drought in transhumant pastoralist territories systematically increases conflict in adjacent sedentary agricultural areas by dislocating long established seasonal migration. The Mongol expansion is one historical antecedent in the climate-driven pastoral sedentary conflicts of medieval Eurasia, which McGuirk and Nunn themselves note (McGuirk and Nunn 2025: 407).

Likewise, the Mongol empire's expansion intersected with one of the momentous global climate changes, the Medieval Warming. From the 9th to the 13th century, the Medieval Warming had generated a dry climate in the Eurasian steppe region. Combined with the North Atlantic Oscillation's atmospheric pressure shift, this warming period produced frequent and intense droughts. Such droughts devastated the steppe pastures on which nomads and their horses depended, triggering a subsistence crisis. The arid

desert and steppe in Inner Asia pulled and pushed animals and people with rainfall fluctuations. With sufficient rainfall, these regions became rich pastureland that drew in nomadic people. Conversely, Medieval Warming-driven ecological stress and droughts pushed people and animals to seek other pasturelands and food sources. The push often meant conflict with sedentary polities in the South, such as the Song dynasty. Yuhua Wang observes that while more than a third of external war battles occurred in the exceptionally warm period of the Medieval Warming (951–1320), the majority of such battles were between Han Chinese regimes such as Song and nomadic regimes such as the Mongol Empire (Wang 2022: 35). Similarly, Brian Fagan argues this ecological outward push drove much of the Mongols' 13th-century expansion (Fagan 2008: 56–63). Recent quantitative work has shown systematic climate-driven conflict between pastoralist and sedentary groups across the long sweep of Chinese history. For example, Bai and Kung show that drier conditions in pastoralist territories increased nomadic incursions into sedentary agrarian regions over two millennia, while Ko, Koyama, and Sng reveal that climate-driven nomadic pressure was a major structural force in the political and territorial organization of premodern East Asia (Bai and Kung 2011; Ko, Koyama, and Sng 2018).

Climate contributed to the Mongol empire's advance in two major ways. First, as droughts degraded steppe pastures on which Mongol subsistence depended, the territorial distribution—confining Mongols to arid zones, while sedentary empires enjoyed fertile regions—became not merely unfavorable but existentially threatening (Fagan 2008: 56–63). This stress intensified Mongols' dissatisfaction with the territorial and economic foundations of the status-quo order centered on the bipolar structure of Song and Jin states, leaving Mongol subsistence dependent on these more productive states' willingness to trade with and appease them, and compelling territorial revisionist expansion (Barfield 1989). Across the very decades that paleoclimate reconstructions register as "extremely dry"—the 1115–39 and 1180–91 droughts bracketing Temüjin's pre-imperial career, including an unbroken sixteen-year drought from 1175 (Pederson *et al*. 2014; Hessl *et al*. 2018)—the Jin court was running a sustained program of extraction and coercion against the steppe, including the "thin-the-ranks" punitive expeditions of the Shizong era and many others. As a result, the political grievance Jin policy provoked overlapped with the contemporaneous drought stress, the two amplifying each other and resulting in the

"resentment to the marrow of the bones" (Ratchnevsky 1991: 10–13, 21–2, 109, 152; de Rachewiltz 2004: sections 53, 66–8).[1] The amplifying effects of the climate were temporally uneven. For example, the 1211–25 Pluvial—fifteen consecutive wet years, the lowest moisture variance in Pederson *et al*.'s 1,112-year reconstruction—was a positive shock that supplied capacity rather than distress to the Mongols (Pederson *et al*. 2014; Di Cosmo 2024: 32–50, at 41). Yet the Pluvial is a fifteen-year anomaly nested inside a century-long arid Medieval Warming regime, and it closed with "a 4-y drought beginning in 1226 CE, followed by a return to high moisture variability characteristic of much of the last millennium" (Pederson *et al*. 2014: 4376). After it conquered the Jin in 1234, the Mongols engaged in an extended warfare with the Song for half a century after the end of the Pluvial, and during this period the revisionist attitude of the Mongols toward the Song again coincided with the various ecological stress caused by the dry warm weather, which likely heightened their dissatisfaction toward the Song. For example, *Yuanshi* records under 1248 a catastrophic drought with 80%–90% of cattle and horses dead.[2] Such recurrent ecological stress was now refracted through a fresh grievance of Möngke and Kublai against the Song as the latter breached previous agreements and imprisoned the Mongol envoys.[3]

To say the warming climate drove Mongol expansion is not to say it determined the attempt to overthrow the Song. Rivalry between nomadic polities and Han sedentary empires had formed a pattern much earlier (Di Cosmo 2002). Other ideational factors played a role, such as the Mongol legitimacy conception rooted in perpetual world conquest (Zarakol 2022: 1–44). Mongol power's rise itself resulted from heterogeneous elements interacting, including the warming climate (Fagan 2008: 46–63). The rapidly warming climate was one driver, providing an ecologically driven revisionist push toward sedentary regions. In this context of climate-compounded dissatisfaction, Chinggis Khan's centralizing initiative found its material impetus and political legitimacy.

1 Zhao Gong, *Mengda beilu* (1221), https://zh.wikisource.org/zh-hant/%E8%92%99%E9%9F%83%E5%82%99%E9%8C%84, accessed 21 June 2026.

2 *History of Yuan Dynasty*, juan 2, the Basic Annals of Emperor Dingzong, the third year.

3 *History of Song Dynasty*, juan 474, biography of Jia Sidao; *History of Yuan Dynasty*, juan 3, the Basic Annals of Emperor Xianzong, the sixth month of the sixth year; *History of Yuan Dynasty*, juan 4, the Basic Annals of Emperor Shizu, the seventh month of the third year, on the *jichou* day.

Second, ecological stress and destabilization of Mongol steppe societies ultimately enabled large-scale centralization of power under the emergent Chinggis Khan. In other words, the Mongols quickly adapted to the ecological disruptions. By weakening pre-existing social systems, climate-driven destabilization opened room for a new centralizing leader, and the charismatic Chinggis Khan seized this moment to unify Mongol tribes and build a war machine that conquered Eurasia (for the role of crisis in steppe state-making, see Di Cosmo 1999). By Chinggis Khan's time, steppe people had acquired administrative capacities through Khitan and Jin experience and ideologies amenable to large political organization (Di Cosmo 1999; Munkh-Erdene 2011). Using preexisting institutional and ideological innovations, centralizing Mongol leaders quickly adapted to the changing climate by amassing military and political power in unprecedented central nomadic institutions. Comparing adaptive capacities directly is difficult, since the Medieval Warming unevenly affected the regions Mongols conquered (Fagan 2008: 1–21; Lee 2017). Yet within their own environmental context, the Mongols were mobile and adaptive enough to turn preexisting clan disruption and the Medieval Warming's harsh dry climate into an opportunity for unprecedented accumulation of political and military power by the central ruling clan.

In sum, while the climatic shift would not have produced a world-conquering empire without the nomad state-making tradition, Chinggis Khan's charismatic leadership, and archery and cavalry technology, the Medieval period's rapid warming played a crucial role in enabling a continental power transition. It supplied the major motivational push for Mongol expansion while initiating political centralization. Without the push of climate—however contingent—the Mongol war machine might not have operated with the same intensity.

3.3 The Spanish–Dutch maritime power transition

The Spanish–Dutch naval power transition's deep origins lie in the fiscal architecture of Philip II's composite monarchy from 1556 to 1598. Habsburg Spain was the most powerful state in sixteenth century western Europe, but the very scale of its commitments—simultaneous confrontation with France, England, and the Ottoman empire—outran even its resources, forcing a perpetual triage of imperial priorities. Throughout the 1560s and 1570s, the defense of the Mediterranean against the Ottoman fleet

repeatedly took precedence over the Low Countries: when the king's advisers had to choose between allocating resources to the Mediterranean or the Netherlands, they almost always chose the former (Parker 1970: 72–95). The Netherlands problem was a problem of money, but the Crown's inability to disengage from either front meant chronic underfunding of its northern administration. The result was a mounting debt—the Netherlands state debt rose from a manageable 500,000 florins in 1550 to a peak of 10,000,000 by 1565, with peacetime deficits alone running half a million florins a year—and an intensifying fiscal demand on the Low Countries themselves. Treated as the empire's most productive tax base, the provinces were pressed ever harder, a heavy-handed extraction that fused with confessional and constitutional grievance to ignite the revolt. The five years of war on two fronts between 1572 and 1576—during which Philip II spent roughly double his revenues—accelerated the Spanish State Bankruptcy of 1575 and the military collapse in the Netherlands that followed in 1576 (Parker 1976: 53–72, esp. 57–9; Parker 1970: 72–95, esp. 79–85). Climatic pressure, examined below, did not create this extractive dynamic but intensified it. As the Little Ice Age depressed agrarian yields and revenues across the monarchy, the fiscal squeeze on the Low Countries grew more onerous.

Correspondingly, the Spanish–Dutch naval power transition occurred from the late 16th to the mid-17th century. Portugal led at sea from the 16th century, but Spain absorbed its naval capabilities by the late 16th century. Meanwhile, the Dutch rose during the first half of the war of independence and retained naval lead into the mid-17th century. Modelski and Thompson observe, "it was only toward the end of the transitional struggle that the ascending Dutch position surpassed that of the weakening Spanish" (Modelski and Thompson 1988: 105–8, 115–29). By their modified warship count, the Spanish–Dutch crossover is unmistakable. Spanish capital warships peaked at 70 in 1588 (the Armada year) and reached a secondary plateau of 84 in 1597, before contracting to 30 by 1605 and 14 by 1610. Over the same span Dutch capital ships grew from roughly 18 in 1570 to 53 in 1610 and 84 in 1620. By 1639, on the eve of the Battle of the Downs, the Dutch fleet (141) outnumbered the Spanish (70) two-to-one; the next year, after Tromp's victory at the Downs, Spain's total collapsed to 12 against 141—a roughly 12-fold disparity that did not reverse before the Treaty of Münster (1648) (Modelski and Thompson 1988: 62–5). Although Spain remained a European and extra-regional actor afterward, this case

exemplifies a power transition—a redistribution of maritime, fiscal, and commercial primacy within the Atlantic-European zone. Dutch revisionism was partly a quest for territorial independence, but more so a rebellion against an imperial fiscal-administrative regime the Dutch perceived as illegitimate and extractive. Our framework, consistent with the regional hierarchy strand of power transition theory, conceives transition as a redistribution of the specific values that constitute primacy within a given functional domain—maritime, fiscal, and commercial leadership in the Atlantic-European zone. On that measure the transition is conspicuous and the crossover in naval capability documented above was matched by a divergence in fiscal and commercial capacity, not to mention the relative GDP per-capita comparison. Spain did not vanish as an influential European actor, but the United Provinces became the leading sea power of the seventeenth century world economy.

Meanwhile, the Dutch maritime ascent occurred amid the cold climate of the Little Ice Age. A study of global temperature proxies identified this as an extended anomalously cold period from roughly 1400 to 1700, with a mean drop of about 0.5°C relative to the late 20th century (Mann *et al.* 2009). Most notably, it widened growth differentials between the rising Dutch power and the Spanish empire. The Little Ice Age often brought exceptional cold and extreme weather, causing droughts, major harvest failures, and eventually famine in 16th and 17th century Europe (Fagan 2000: 101–12; Parker 2013: 3–25; Degroot 2018: 31–41).

In this context, Dutch revisionism was defined by resistance to the Spanish Empire's fiscal and political order. The Low Countries bore a disproportionate share of the empire's fiscal burden, and the Little Ice Age compounded their dissatisfaction by undermining the agricultural productivity they relied on (Parker 1985: 56–7, 128–9; van Gelderen 1992: 263; Prak 2005: 15–21; 't Hart 2014: 12–5). The Grindelwald Fluctuation (1560–1628), the Little Ice Age's second cold phase, coincided with religious tensions, economic crises, and oppressive Spanish policies, culminating in the Dutch armed revolt against Spanish rule over the Low Countries. Spring and summer frost shortened planting seasons and ruined harvests, causing food shortages and high prices. The mechanism ran through the fiscal system as much as through the fields. Climatic stress reduced harvests and revenues empire-wide, which deepened the Crown's structural deficit and sharpened its demands on its richest tax base precisely when those provinces were least able to bear them. The Little Ice

Age thus did tighten the extractive vice that Dutch elites already experienced as illegitimate.

Elite calculation mediated the translation of climate-amplified popular hardship into Dutch revisionist policy. Dutch urban elites, whose political resources depended on commercial and agricultural networks taxed by the Spanish regime and depressed by the Little Ice Age, found continued cooperation with the Habsburgs increasingly costly and politically irrelevant. The William of Orange-led coalition coalesced around these constituencies—Calvinist merchants, urban regents, and dispossessed nobility—and reframed the Spanish fiscal regime as illegitimate. Dutch grievances over fiscal extraction and political subordination clearly preceded the climatic shift, and ecological pressure did not generate Dutch revisionism from scratch. Nonetheless, the Little Ice Age deepened Dutch dissatisfaction with the dominant power, accelerating discontent into a revisionist move—armed rebellion against the Spanish empire (Parker 1985: 128–9; Degroot 2018: 160–4).

Although drought and cold spread indiscriminately across European countries, their political and economic impacts varied widely with each country's distinctive political, economic, and social contexts. The Spanish empire and the emerging Dutch republic, at the turn of the 17th century, responded divergently to the challenges of the Little Ice Age. Even as Dutch agriculture suffered from cold and drought, its diversified and commercialized regime made the economy more resilient, leaving farmers enough surplus to cope with recurring harvest failures (Fagan 2000: 101–12; White 2013: 327–52). In contrast, other parts of Europe, including Spain, did not follow Dutch farmers' agricultural innovations and remained mostly in subsistence farming. Consequently, their agricultural economy collapsed more easily under multiple closely spaced years of crop failure. European officials worried about desperate vagrants and impoverished people suffering from harvest shortfalls (Parker 2018). The Spanish Habsburg was likewise hit hard. At Philip II's 1598 memorial service, one Spaniard exclaimed that "Our Catholic King died after a drought that lasted almost nine months without a break, revealing that the earth had declared itself bankrupt" (Parker 2018). One estimate puts the toll of the subsistence crisis and plague at roughly 10% of Castile's population—600,000 people (Parker 2018).

As a result, the anomalous cold tilted economic growth rates toward the Dutch while Spain failed to develop competent adaptability. Per-capita

prosperity diverged sharply. According to the Maddison Project Database 2023 (in 2011 prices), per-capita GDP in the Northern Netherlands stood at roughly 4,270 around 1600 and peaked above 4,300 in the 1640s–1650s—the most acute decades of the Little Ice Age—before retreating to 3,377 by 1700. Spanish per capita GDP fell from 1,484 in 1570 to a trough of just over 1,000 in the 1640s–1650s, recovering only partially to 1,280 by 1700. The Dutch lead thus widened from roughly 1.5 to 1 in 1570 to over 4 to 1 by the 1650s before narrowing modestly. The disparity was not new—Dutch per capita output had exceeded Spain's even before the Little Ice Age intensified—but climatic disruption widened it dramatically, in the decades when Dutch maritime dominance crystallized (Maddison Project Database 2023).

Reduced economic capacity from ecological stress and subsistence crisis soon hampered Spanish mobilization for various wars, including those with the Dutch. Many close advisors urged the Spanish monarch to halt foreign wars, citing the difficulties of population decline and harvest failures. Some magistrates directly refused the monarch's mobilization order "because of the dreadful weather, the great dearth" (Parker 2018: 134). Economic collapse also triggered more frequent military mutinies, peasant rebellions, and general social disorder, further limiting Spanish war mobilization (Parker 2013: 254–90; Carnegy-Arbuthnott 2020). In contrast, during the 80-year War of Independence, the Dutch benefited from better adaptation to the cold and coped far better with social and political instability from the war and extreme climates, gaining a favorable position against their Spanish rival (Degroot 2018: 165–95). The Dutch advantage in mobilization capacity appears in troop numbers deployed and army financing. The effective strength of the Dutch army increased from 25,000 in 1587, to 31,000 in 1602, to 49,000 in 1608, and to 60,000 in the 1630s and 1640s. France, with about 18–20 million people—roughly ten to twelve times the Dutch Republic's 1.5–1.9 million—fielded an army of about 80,000. This striking comparison underscores how disproportionately the Dutch republic mobilized military force relative to its demographic base. Despite the war's mounting financial burden, the Dutch sustained this sharp increase with manageable delays in soldier payments, preventing mutinies (van Nimwegen and Prud'homme van Reine 2019: 372–3, 399; Maddison Project Database 2023). By contrast, Spain's Army of Flanders periodically suffered fund shortages from the crown, resulting in demobilization and mutinies of unpaid soldiers (Parker 1972: 145–57). Combined

with differential economic adaptations to the cold, this discrepancy in managing wartime domestic stress and population mobilization eventually drove Spain's relative decline and the Dutch ascendance.

3.4 The Ming–Qing transition

The last case of climatic shift intersecting with another power transition is the Ming–Qing transition, contemporaneous with the Spanish–Dutch case. The Ming was the dominant regional power and the apex of the East Asian tributary order, while the Manchu state was the rising challenger. Multiple studies have examined the link between the Little Ice Age and Ming–Qing political–military conflict (Xiao *et al*. 2015; Yin 2020; Brook 2023). First, the Little Ice Age ecological pressure on the Manchu, intersecting an already restricted Ming tributary trade regime, intensified their dissatisfaction with the Ming-centered hegemonic order and ultimately drove them to resolve subsistence shortfalls through conquest. From the late 16th century, the Ming progressively narrowed the Liaodong border market lever, exemplified by the 1608 Kaiyuan ginseng market restriction—with roughly 16.65 metric tons of silver annually at stake—and the 1614 "five advantages" memorial that proposed to use the grain market as the coercive leverage "so that in famine the Manchus come knocking at the pass to beg" (Di Cosmo 2009: 43–60).[4] Onto this engineered scarcity the Little Ice Age loaded an acute subsistence shock. While the Manchu had a better fortune in facing milder climate disruptions than those on the Ming land, the Little Ice Age still inflicted substantial damage on the Manchu's subsistence economy (Cui *et al*. 2019: 405–23; Sun *et al*. 2025). For example, in 1617, a Korean Provincial Military Commander reported that "last year's flood was especially severe in Manchu's territory; hunger and cold reached their extremity, and the old and weak filled the ditches." The report also indicated that the Ming had closed the border markets and that Nurhaci had sent over forty hostages in exchange to have them reopened, showing how the climatic stress likely amplified the Manchu grievance toward the Ming's trade restriction.[5]

Cornered by both the ecological stress and Ming's curtailment of trade, the Manchu first sought relief through negotiation. Hong Taiji proposed

4 *Veritable Records of the Ming Wanli Emperor*, juan 444, 10 March 1608; *Veritable Records of the Ming Wanli Emperor*, juan 519, 15 April 1614.

5 *Veritable Records of the Chosŏn Dynasty*, Kwanghaegun, 13 February 1617.

"mutual trade" and peace to Beijing—claiming six unanswered letters by 1630—and in late 1627 asked Chosŏn to "open the grain-market for just one year" to relieve refugee-driven shortfalls, only to be refused on both fronts.[6] The casus belli had already been articulated in Nurhaci's 1618 Seven Grievances—naming the Ming's denial of harvest on borderland farms as the fifth grievance—and the 1633 war council resolution to "feed the army off the enemy" confirmed extraction-by-conquest as the residual path out of a climate-amplified subsistence crisis under foreclosed Ming hegemony.[7]

In other words, while the climate-induced food shortages did not translate into expansion automatically, the cold climate's amplifying effects on the Manchu grievance gave its regime greater incentives to revise the territorial status quo and the existing tribute and trade distribution order. Manchu state builders, whose legitimacy rested on delivering subsistence to the banner-organized population, found that the viable path to grain ran through coerced extraction from neighboring agrarian societies rather than trade concessions the enfeebled Ming would not grant. Climate stress lowered the relative political costs of revisionist external action for the Manchu elite. Such a tendency is also corroborated by Weiwen Yin's quantitative study that shows a close correlation between early 17th century lower temperatures and increased Manchu invasions of the Ming (Yin 2020).

A second, perhaps more pronounced, consequence was differential growth rates. The climate anomaly favored the Manchu over the Ming domain, which suffered multiple mega droughts that hit its agrarian economy hard (Sun *et al*. 2025). This variation complicates direct comparison of the two powers' adaptabilities. However, the Ming's mostly agrarian subsistence economy suffered enormous losses from recurring harvest failures, producing a widespread subsistence crisis and social disorder that hindered its mobilization against the Manchus. Given the Ming's large-scale agrarian economy and the Manchus' mixed subsistence economy, such a crisis level shock was likely distinctive to the Ming, giving the Manchus the upper hand in relative adaptability. Timothy Brook documented harvest failures from extraordinarily low temperatures by identifying six sloughs in which severe temperature anomalies and droughts devastated the Ming.

6 *Veritable Records of Qing Taizong*, juan 6, 9 February 1630, juan 3, 9 December 1627.

7 *Veritable Records of Qing Taizu*, juan 5, 13 April 1618; *Veritable Records of Qing Taizong*, juan 14, 18 June 1633 "We should raise troops and march deep into their territory, burn their houses, seize their goods, and feed the army off the enemy–this is the strategy for securing victory."

These sloughs caused grain and food shortages, forcing prices to soar. Consequently, many Ming households near minimum subsistence could not survive, producing massive starvation and displacement (Brook 2023: 60).

During the last Chongzhen slough (1638–44), coinciding with the onset of the particularly cold Maunder Minimum, temperatures remained extremely low (Brook 2023: 127). The 1641 famine grain price reached 17 times a household's subsistence income.[8] Famine stress is also indirectly reflected in Ming population and GDP estimates. Population size dropped from a peak of 99.9 million in 1626 to a trough of 88.5 million in 1646 (Lee and Zhang 2013). The estimated GDP also declined substantially. Using the 1840 Ming GDP as a baseline of 100, estimates fell from approximately 55.7 in 1600 to 52.3 by 1620—a notable contraction during climatic deterioration. By contrast, the consolidating Qing economy in the same northeastern region expanded, supported by state-organized agriculture and tributary trade reorganization, though precise comparable GDP figures for the preconquest Manchu state remain difficult to establish (Broadberry, Guan, and Li 2018). These numbers indicate the late Ming's overall economic and ecological stress. In contrast, the contemporaneous Manchu state benefited from a wet and mild climate that helped it consolidate power and shift to a state-run agricultural economy with steadier revenue (Sun *et al*. 2025).

Resulting social disorder eroded the Ming's military mobilization and defense. First, it made military financing much harder. While commoners suffered subsistence crises, military costs skyrocketed from competition with the Manchus. Squeezed commoners and officials resorted to evasion and corruption, making tax collection inefficient. Insufficient funds meant many soldiers went unpaid for months and eventually mutinied (Swope 2014). The cycle of famine, deficient taxation, and popular and military unrest greatly damaged the Ming's ability to mobilize defenses against the Manchus. Fiscal stress paradoxically appears in the rapid expansion of Ming revenues. Between 1600 and 1643, the central silver treasury revenue soared 5-fold from about 4 million taels to 21 million. The rise resulted from emergency fiscal measures such as extraordinary levies and temporary military surcharges to meet military expenditure. Unpaid soldiers show that, even with desperate measures, Ming revenue could not keep up with rising military costs (Quan and Li 1972). In contrast, Qing military

8 The calculation combines various measures suggested by Brook (2023: 55, 57, 135, 171).

power continued to grow. The Manchu Eight Banners' basic units (niru) grew from 200 around 1615 to 230 in 1621, 288 in 1632, and 330 around 1636 (Zhang and Guo 1988). Moreover, the famine provoked numerous bandit groups who sacked the Ming social order. During the Chongzhen slough, popular uprisings and banditry spread, and one rebel group, the Li Zicheng rebels, finally overthrew the Ming court, opening a wide path for the Manchu army to enter the capital (Xiao *et al*. 2015; Wang 2022: 35–6; Brook 2023: 133–4). The Qing's rise resulted as much from the Ming's climate-driven internal collapse as from the Manchus' ability to develop new political and military capacities and seize the moment of Ming decline.

4. The US–China power shift during the Anthropocene

Across the three cases, ecological stress shaped the timing and intensity of revisionist ambitions, while differential adaptability—agrarian Ming and Spain disadvantaged, the diversified Dutch and less-agrarian Manchu favored—reshaped relative mobilization capacity. The Ming and Spanish empires, dependent on agrarian economies, suffered disproportionately from climate-induced disruptions, while the Dutch Republic's diversified economy and the Manchu regime's less agrarian-dependent structure positioned them more favorably. In the Mongol case, ecological disruption paradoxically facilitated political centralization by weakening preexisting tribal structures. Across the cases, the form that revisionism took varied with structural circumstances—territorial conquest by the Mongols, fiscal-administrative rebellion by the Dutch, tributary-order revision by the Manchus—but in each ecological pressure recurrently intensified dissatisfaction with the prevailing distribution of goods, in the broad sense developed in our framework. This analysis suggests not that climate determined outcomes, but that climatic variability introduced nonlinearity and unpredictability into already contested power transitions. Climate-driven fluctuations in relative capacities for adaptation and resource-mobilization added further volatility to transitions whose conflictual conditions were also intensified by climate-driven revisionist motivations.

The current US–China power rivalry intersects with another major climatic shift of the Anthropocene. Average global temperature has already risen roughly 1°C above preindustrial levels—comparable to past upheavals—and is poised to increase further even under the best case scenarios (Fagan 2008: 16–8; Degroot 2018: 2; IPCC 2018). The planetary

intersection's consequences depend on preexisting social and political conditions, and one cannot extrapolate a deterministic causal pattern from the historical accounts. Wang similarly qualifies, "a climate shock is neither a necessary nor sufficient condition to trigger conflict" (Wang 2022: 36). As Joshua Busby notes, modern industrial societies and their geopolitical competition differ vastly from the largely agrarian societies of past power transitions, making direct inferences difficult (Busby 2024). Large countries like the US and China possess industrial and technological prowess that helps them avoid subsistence crises from ecological disruption. The modern strategic environment differs vastly, too. Contemporary great powers possess nuclear weapons and recognize the catastrophic costs of direct confrontation, creating fundamentally different strategic incentives.

More fundamentally, the political pathway through which climate stress operates has itself shifted. While the agrarian transitions examined above translated ecological shock into revisionism by way of subsistence crisis, the industrialized economies of the US and China encounter the same climatic shift principally as both critical disruption to and structural constraint ontheir economies, preconditioning the aforementioned effects on their motivations and relative resource-extraction capacities. Technologically mediated, densely populated urban environments can paradoxically render modern societies even more susceptible to ecological disruptions. The United States alone endured three major droughts in the 20th century—1934–40, 1950–56, and 1987–89—one inflicting losses estimated at roughly $39 billion (Fagan 2008: 235–9). In addition to ecological disruptions, the pressure of the climate also manifests in structural economic constraints caused by the warming planet such as emissions regulations, decarbonization costs, supply chain vulnerability, and the asymmetric distribution of mitigation burdens across producers and states. Given that such costs will certainly intensify in the Anthropocene, anticipating how historical patterns of ecological–political interaction may unfold in contemporary US–China competition is both possible and necessary.

First, the Anthropocene's ecological pressure can worsen existing social and political instabilities in both China and the US, which may in turn intensify each state's revisionist orientations in distinct but mutually reinforcing ways. Modern industrial economies and global supply chains seem to insulate both powers from past subsistence crises. However, as the Dutch and Manchu cases illustrate, ecological stress's politically salient effect is altering elite incentives to translate public discontents into revisionism:

ecological disruption shifts the relative political resources of constituencies whose support incumbents need to retain power, and tilts the calculus of which foreign policy postures are politically feasible to sustain. The dense modern media environment, marked by constant news exposure and amplified partisan information within in-groups, reinforces rather than dampens this dynamic by making climate-related disruptions' political salience more readily available for nationalist mobilization.

Since the 2008 financial crisis, nationalist–populist movements within the Republican coalition, climate-skeptical industrial and rural constituencies, and the political coalitions of the first and second Trump administrations have gained substantial political resources—electoral, organizational, and discursive. The political worldview that holds these constituencies together combines climate skepticism with adversarial postures toward China. This consolidation is best understood as a defensive political mobilization against the perceived distributive costs of decarbonization in fossil-fuel-producing regions, energy intensive manufacturing belts, and rural extractive economies (Stokes 2016; Aklin and Mildenberger 2020; Mildenberger 2020). That material cost-defense is amplified by an ideological cleavage in which climate policy symbolizes cosmopolitan elite governance, fusing climate skepticism with the broader right-populist repertoire—and, in the US case, with adversarial China framing that recodes decarbonization as a geopolitical concession to a strategic rival (Hochschild 2016; Lockwood 2018). This coalition's revisionism specifically links their opposition to the global climate regime with the distributional anxiety over the rise of Chinese power. The conviction, represented by Trump, reframes the entire UN-led climate regime not as a collective response to a shared planetary threat but as an asymmetric constraint that handicaps American producers relative to Chinese competitors (The White House 2017; Trump 2025). On this view, emissions commitments raise the cost of US manufacturing while a still industrializing China continues to emit, so the regime itself becomes an instrument of relative decline—a mechanism transferring competitiveness from the US to China.

In a similar vein, repudiating the climate regime is construed as defending American primacy against a rival believed to benefit from the rules. The perception of climate change (or its denial), the dissatisfaction of the order built around it, and the uneasiness of transition to China here form a mutually reinforcing chain. Consequently, the Anthropocene climate stress, like the previous historical climate stresses, raises the political costs of

order-preserving policies but this time even in the domestic politics of the declining dominant power. It creates the amplifying association between the opposition to the existing climate regime and the opposition to the status quo of the US–China economic and political alignment, lowering the political price of withdrawal from both. Under deepening climate-driven disruption, this coalitional dynamic may strengthen rather than weaken.

In China, the same elite-mediation mechanism operates within a different institutional environment, producing a parallel dynamic. Nationalism has been an increasingly central legitimizing pillar in Chinese domestic politics since the late 19th century, and after the collapse of the socialist bloc, antiforeign nationalist ideology became the most important legitimating script of the Chinese Communist Party (CCP) (Carrai 2019; Pu 2019: 51–69). The CCP's political survival depends on its capacity to sustain legitimacy across an increasingly mobilized population—and as Davidson's framework anticipates, the regime both responds to and actively cultivates the nationalist constituency, on which its legitimacy depends, through patriotic education, the active management of online nationalist discourse, and the tight control over civil society. Anthropocene ecological pressure enters this dynamic as an additional means to cultivate nationalist constituency. As Chinese citizens face environmental uncertainties and distress, the regime can channel that distress into faith in state capacity—presenting authoritarian environmental governance as the protective shield for the Chinese nation against the dangers of the warming planet (Pan *et al.* 2023). Augmented by the climate stress, this nationalist rally for the People's Republic of China (PRC) regime lowers the relative political costs to the CCP of revisionist external posture and raises the political costs of accommodation with the US. The post-Tiananmen Chinese nationalism has been constitutively framed against US "containment." Once mobilized, this constituency imposes audience costs on accommodation: Weiss's study of state-managed nationalist protest documents how cultivated mobilization signals resolve and forecloses concessions to foreign rivals, and survey evidence shows that mass Chinese support for assertive foreign policy tracks a similar nationalist register (Zhao 2004; Weiss 2014; Tang 2016).

The various strains from the warming climate sustain this dynamic between climate stress and Chinese nationalism. As a massive agricultural economy, China has always been susceptible to ecological disruption, and both the Medieval Warming and Little Ice Age saw devastating droughts (Huang 1985: 62; Fagan 2008: 213–27; Brook 2023). The Anthropocene

today likewise stresses Chinese socioeconomic systems. The North China Plain faces intense droughtand flood risk (Zhang *et al.* 2021). Unsurprisingly, the summer of 2022 saw the most extreme heatwaves "in six decades" and possibly the worst drought in decades, adversely affecting food production and power supplies (Bradsher and Dong 2022; Wong and Huang 2022). Accompanying deforestation and soil erosion reduce arable land in a country with very low per-capita arable land. Ecological pressures of the climate gave further opportunities and incentives for the PRC regime to cultivate its already intensified nationalist constituency, leading to a more rigid and hostile popular tendency toward foreign powers, especially the US. The widely acknowledged assertive turn in Chinese foreign policy after Xi consolidated power tracks a similar elite-mediated mechanism augmented by the climate distress (Goldstein 2020).

The distinctive Chinese fusion of environmental governance with nationalism makes Chinese revisionism toward the global climate regime different from its American counterpart—best understood not as defection from the regime but as a cautious hierarchy revisionism that preserves the rules while seeking to relocate the regime's leadership center. Domestically, the Party-state articulates climate stewardship through the constitutionalized "ecological civilization" project, embedding planetary care within Party legitimacy rather than treating mitigation as cost imposed from without (Goron 2018; Hansen, Li, and Svarverud 2018). This domestic ideational frame translates externally into a posture that supports the surface architecture of the UN climate regime—Paris Agreement ratification, successive NDCs, the "dual-carbon" 30/60 pledge—while simultaneously seeking to reposition the regime's normative center, folding climate governance into the "community of common destiny" discourse and a broader multipolar institutional vision in which Chinese leadership in global governance is constitutive rather than peripheral (Kopra 2019; Xi 2020; State Council Information Office of the PRC 2023).

Within this configuration, Beijing's dissatisfaction with the existing climate order emerges as a reactive grievance against American climate-burden-shedding. China declines to absorb the costs of maintaining the climate regime centered on a hegemon that no longer honors its own design. Thus, China attempts to reconstitute climate governance around UN-centered multilateralism under its own leadership—a within-rule revisionism oriented to hierarchy reordering rather than rule destruction. The result is a dual but asymmetric revisionism characteristic of the dissent

phase, namely American rule revisionism, undermining the climate order to defend its own position that it believes the order has eroded, and Chinese hierarchy revisionism, preserving the order while undercutting its center, which propels power transition through contestation over normative leadership within global governance.

Unlike the historical cases, both powers today actively articulate a desire to keep competition within peaceful bounds—yet climate-amplified revisionist tendencies, channeled through the elite-mediated mechanisms outlined above, may undermine this objective. In our framework's terms, the status-quo position is occupied not by either state but by the existing order itself, which both contest from different directions—China by revising hierarchies within it while seeking to preserve its core economic rules and benefit from its institutional architecture, the US by dismantling its multilateral architecture and free trade system even at the cost of an order it once championed. This dual revisionism characterizes the dissent phase, where rising challengers undermine the status quo from one direction while declining established powers destabilize it from another. Climate stress in both states may amplify the elite-coalitional dynamics that propel them along these divergent revisionist trajectories.

Given our framework's second dimension, the Anthropocene is also affecting US and Chinese relative capacities, albeit differently than in premodern times. With industrialized economies, neither will asymmetrically suffer the subsistence crises that dismantled agrarian empires. Yet modern societies' complex infrastructure creates new vulnerabilities—wildfire contagion in densely populated areas, electricity disruption from extreme weather, and reengineering urban infrastructure for a changing climate. Given their continental size, both the US and China have already suffered significant loss and damage from the climatic shift's impacts on their habitability and infrastructure. According to its National Centers for Environmental Information, weather and climate disasters alone have caused $2.57 trillion in damage to the US economy since 1980 (National Centers for Environmental Information 2023). While not all disasters can be attributed to Anthropocene climatic shifts, rising temperatures have greatly increased climate disasters (IPCC 2018). The figure will rise more dramatically once climate change's economic and social cost includes diffuse effects on US health, productivity, and infrastructure (Davenport 2023). China, too, faces serious climate-driven threats to its power resources and national security. Changing physical landscapes pose direct risks to its

military and critical infrastructure—coastal shipyards, South China Sea islands, railways and energy infrastructure on permafrost, and densely populated southern river deltas. As with past societies, ecological stress has compounded risks to internal political stability, as climate change threatens food and water security across the country (Sikorsky 2022).

Given the worsening climate-driven consequences they already face, the two countries will likely undergo endemic fluctuations in their relative capacities. With no clear winner and constant and unpredictable fluctuations in relative adaptability, there are two possibilities. If the two powers develop symmetric adaptive capacities, both sides will likely grow more concerned about their relative position. However, if one power fails to forge adaptability competent relative to the other's, asymmetric adaptability may increasingly facilitate the inferior power's relative decline by undercutting its resource-extraction capacity. This need not entail state collapse given the robust baseline infrastructural power of the US and China, but a winner of the adaptability competition may emerge better positioned to widen the power gap in the 21st century.

While both countries' advanced technological capacity and continental size tend to anticipate symmetric adaptability, the recent divergence in Chinese and American climate approaches also suggests possible asymmetric adaptability. While the US under the second Trump administration has systematically dismantled its climate preparedness infrastructure—canceling Pentagon climate studies, withdrawing from multilateral climate frameworks, and proposing to rescind the regulatory basis for greenhouse gas regulation—China has pursued the opposite trajectory, investing over $625 billion in clean energy in 2024 and meeting its 2030 renewable capacity targets six years early (Climate Action Tracker 2025; Ember-Energy 2025; International Energy Agency 2025; Simon and Kuhn 2025). This divergence extends beyond energy policy: China continues to integrate climate adaptation into its national security planning and has submitted new NDC targets for 2035, while the US has eliminated institutional capacity for such integration and abandoned the Bonn climate negotiations for the first time in three decades (Moore 2025; CSIS 2026). Former senior defense officials warn that this self-imposed blindness amounts to a strategic gift to China, as adversaries and competitors continue to assess climate risks the US now willfully overlooks (Council on Strategic Risks 2025). To be sure, China's climate adaptation record is far from unambiguous given its continued coal-fired expansion and acute structural vulnerabilities like water

scarcity, but the overall strategic direction, for now, hints at Chinese advantage. Whether this asymmetry proves transient—reversible with a future administration change—or structurally consequential remains to be seen, but the pattern illustrates exactly the differential adaptability our historical analysis identifies as a critical variable in power transition volatility.

5. Conclusion: Peaceful change in the Anthropocene

This paper probed how the intersection of climatic and power shifts has influenced the latter's process historically and how far such interactions apply to the current US–China competition. First, the ecological pressure and the consequent social and political instabilities tend to strengthen revisionist motivations by raising dissatisfaction mediated by leaders' calculation. Second, the differential adaptability of the emerging and established powers in the face of ecological pressure may influence resource-extraction capacity of competing powers, possibly leading to unexpected changes in relative power, such as accelerating the decline of the power with less favorable adaptability as with the Ming, or uneasiness over constant fluctuation of relative power under continued symmetric adaptability. Overall, climatic shift renders power-shift processes highly unstable and contingent. Thus, probable outcomes could diverge more from those anticipated by conventional sociocentric power transition theories.

This conclusion has critical implications for managing the US–China rivalry. Some realists have advocated a more restrained US grand strategy or the recognition of China's legitimate geopolitical interests. However, the higher volatility of the Anthropocene power shift will likely push the competition beyond whatever guardrails and prudent management the two powers seek to establish. Historically, the diverse forms of revisionist motivation in great powers, or empires—territorial conquest by the Mongols, fiscal-administrative rebellion by the Dutch, tributary-order revision by the Manchus—combined with differential adaptability to ecological distress to produce intensified geopolitical conflicts or the sudden collapse of one competing power. In the modern Anthropocene, climate-driven mutual aggressiveness and endemic fluctuation of relative adaptive capacities again likely render the power transition process more unruly despite best efforts to manage it. As Rathbun argues, prudence amid intense geopolitical rivalry has always been a rare feat in modern great power relations, requiring a combination of leaders' distinct psychological dispositions (Rathbun

2018). One must now add the diffused destabilizing effects of the Anthropocene climatic shift on domestic political dissatisfaction and social adaptability. Under the Anthropocene power shift, the odds of successfully and prudently managing the US–China rivalry seem too slim to trust sociocentric prudence alone.

The realist call for restraint is worthwhile in redressing past US foreign policy deficits and formulating a better alternative, but remains predicated on sociocentrism (Gholz, Press, and Sapolsky 1997; Posen 2014). Hence, truly prudent management of the Anthropocene power shift should combine prudent diplomatic accommodations with robust institution building that ensures some stability amid Anthropocene volatility. The very severity of Anthropocene volatility may paradoxically furnish incentives for such institutional development. As our analysis reveals, competing powers that failed to recognize how ecological forces reshaped their geopolitical fortunes suffered catastrophic consequences. Today, escalating costs of climate-driven disruption may compel both powers to seek institutional safeguards because the stakes of failing to do so are becoming intolerably high. Modelski's long cycle theory suggests that states can learn evolutionarily, and imminent existential threats such as the climate crisis might enable contending powers to develop more institutionalized competition (Modelski 2012). Beyond prudence, US and Chinese policymakers should cultivate a reformed prudence generating institutional restraints that reflect Anthropocene power shift volatility. Notably, climate change cuts both ways. It affects the revisionist pressures and differential adaptability that destabilize power transitions, yet its destructiveness simultaneously reinforces structural incentives for institutional cooperation. How these countervailing pressures interact remains a vital question for future research.

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