

Book Chapter

Evaluating Climate Change Governance Using the “Polity–Policy–Politics” Framework: A Comparative Study of China and the United States

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Abstract

Climate change governance has attracted increasing academic interest. However, holistic reviews on the dynamic complexity and stability of climate change governance have received little attention. This study addresses this research gap by conducting a structurally comparative analysis between China and the United States based on the “polity–policy–politics” framework. Three analytical facets are identified for each dimension of the framework, including institutional settings, the nature of policy mechanisms used in climate change practices, and the degree of multi-actors’ involvement under two governance scenarios. Results show that climate change governance in the two countries differs substantially. The process of climate governance in China is driven by strong leadership at the national level alongside policy continuity, whereas well-functioning market mechanisms and robust regulatory systems are still lacking. A more meaningful involvement of social forces is also critically needed when addressing increasingly complex and uncertain climate change. By contrast, the US federal climate policies are considered inadequate compared with sub-national actions and persistent efforts of non-state actors, to which the success of climate practices is largely attributed. This study systematically uncovers the divergence of climate mitigation under different political–institutional contexts, and

evaluates the effectiveness of governance arrangement in the two countries, which helps policymakers to understand the potential of improving the performance of climate change governance.

Keywords

Climate Change Governance; Multi-Level Governance; Policy Instruments Mixes; Non-State Actors

Introduction

As the climate change problem becomes increasingly complicated and its essence as a global public good is highlighted, climate change governance has aroused unprecedented worldwide attention in recent years. The Paris Agreement proposed an overarching climate goal of keeping the global temperature well below 2 degrees Celsius (°C) and pursuing efforts to reach 1.5 °C. It is widely recognized that greenhouse gas (GHG) emissions contribute significantly to global warming, whereas no consensus on solutions for climate change mitigation has been drawn on a global level [1]. Climate change governance varies substantially within countries due to a variety of factors, such as political–institutional contexts and political priorities determined by governments, as well as forms and levels of governance with multi-players involved [2–4].

Previous analyses of climate change governance focus on one specific research aspect or on one particular country. For instance, many studies analyze and evaluate the multi-level governance of climate change, such as how power dispersion varies at national and sub-national governance levels [5], and the efforts taken at the sub-national level in reducing GHG emissions [6,7]. Other scholars compare a mix of policy instruments on climate change mitigation [8] and assess the influence of cities on urban climate action at horizontal and vertical levels [9]. Meanwhile, faced with the increasing challenges of climate change in developing countries, such as China, South Africa, and India, climate change policies—especially the process of policymaking and implementation—

have attracted more academic attention (e.g., [10–12]). However, governance is characterized by a complex interdependency of dimensions, such as institutional settings, policy steering mechanisms, and the involvement of non-state actors. Thus, studies focusing only on one dimension prevent us from having a systematic and holistic view of climate change governance. Meanwhile, we argue that a comparative perspective is especially critical in analyzing climate change mitigation actions. Without a structural comparison across various political–institutional contexts, any study will be confined to only one governance context [13–15].

We address this research gap through a structurally comparative analysis between China and the US, drawing on the previously identified meta-framework of governance modes developed by [16]. The meta-framework is well suited for the aim of our research, as it systematically summarizes three key dimensions based on the conceptualization of the governance modes, which allows us to analyze the notion of governance with a holistic approach. With this multi-dimensional framework, this paper uncovers the dynamic complexity and stability of climate practices within the two countries, along with their own opportunities and obstacles in addressing climate change concerns, and based upon that, evaluates the effectiveness of governance in the two countries in meeting the temperature targets set in the Paris Agreement.

Focusing on mitigation practices, with particular attention paid to energy efficiency and conservation (there are usually three types of resource strategies for reducing GHG emissions, including efficiency, consistency, and conservation (or frugality/sufficiency) [17]. Efficiency/consistency refers to improving technology in energy use while the degree of energy consumption remains the same; conservation means consuming less. Consistency (e.g., recycling) is not included in this study), this study contributes to the literature of climate change governance in three ways. First, it contributes to an understanding of complexity and governance divergence within distinct contexts by closely examining mitigation practices in China and the US, which will shed light on other comparative

works under various political–institutional contexts. Second, this comparative analysis further extends previous research on addressing climate change challenges by incorporating a robust analytical framework, and, in turn, enriches the application of the meta-framework in governance scenarios. Third, the comparison of mitigation patterns in the two countries are useful for policymakers and practitioners in comprehending their capacities with respect to climate change response and how governance could be improved, which further draws implications for other countries.

The paper proceeds as follows. Section 2 reviews the background of the meta-framework used in the comparative analysis. Section 3 describes the methodology used in this study, with key analytical facets identified and case studies selected. We then examine the divergence of climate change governance in China and the US in Section 4. Section 5 discusses the main findings, coupled with the theoretical and practical implications of climate change governance. Conclusions are provided in Section 6.

Background of the Meta-Framework

With the burgeoning awareness that governments are no longer the only actors when it comes to addressing common issues, the perception of “governance” has emerged, with a number of scholars have identified multiple typologies of governance modes using diverse approaches. Combining a range of attributes pertaining to “governance”—in particular, Rhodes’ (1997) focus on politics [18], Rosenau (1995) on polity [19], and Heritier (2002) on the policy dimension of governance [20]—Treib et al. (2007) introduced an extensive categorization of governance modes consisting of polity (institution), politics (actors and political process), and policy (instruments) [21]. Aiming at better capturing the shift from “government” to “governance,” Lange et al. established a normative context of governance by using a meta-framework: the triad of “polity–policy–politics,” which is differentiated from the intention of Treib et al. to provide an analytical framework [22,23]. With critical dimensions drawn from the literature on the governance modes included, the meta-

framework provides an intriguing explanatory lens through which complicated governance practices can be reviewed in a structured way.

The meta-framework is composed of three dimensions: polity, politics, and policy (Figure 1). On the top of the triad, the polity dimension serves as the institutional setting, where politics and policy dimension take place. It denotes the structural side of governance, or the “institutional ‘rules of the game’ that shape the interaction of actors and policy instruments” [16]. Here, the “rule of the game” refers to both formal and informal regulations or rules established over time [24]. The politics dimension refers to “the actors and interaction processes inherent in a mode of governance” [16]: that is, the actors involved and their influence on the process of policymaking. The policy dimension is identified as the political steering tools shaped by the actors. For instance, the forms of policy instruments and approaches adopted in the process of policy formulation and implementation [16,25].

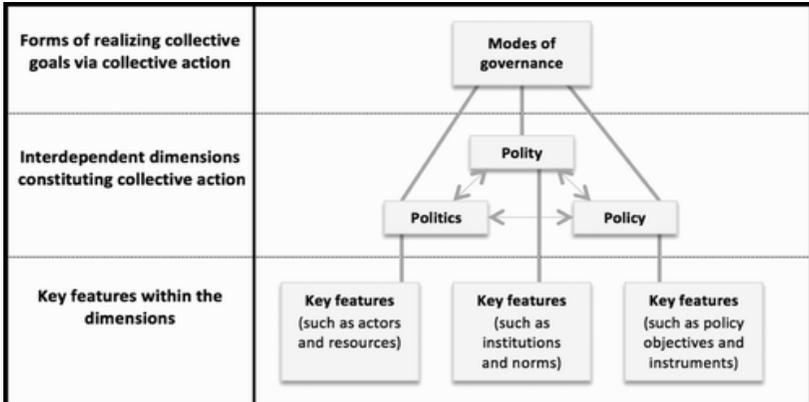


Figure 1: Meta-framework for conceptualizing governance modes.
Source: [16] (p. 412).

Methodology

Selection of China and the US for Comparison

China and the US were selected for analyzing the divergence of climate change governance for two main reasons. According to Anderson (2008), the distinction between a federal and unitary political system differentiates the national political system, allowing us to understand the influence of political authority across levels of governance [26]. Based on this, we compared two political systems: a centralized unitary state with low local autonomy as in China, and a decentralized federal state with high local autonomy as in the US.

The two countries share similarities in terms of significance and urgency in addressing climate change. Statistics show that China and the US are the two countries with the largest CO₂ emissions in the world, accounting for 30% and 15%, respectively, of the global CO₂ emissions [27]. Confronted with a pressing climate change challenge, both China and the US submitted the ambitious Intended Nationally Determined Contribution (INDC) for GHG emission to UNFCCC in 2015, with the commitment to reducing carbon intensity by 60%–65% by 2030 and reducing emissions 26%–28% by 2025 from the 2005 level, respectively. Although the two countries signed the Paris Agreement in 2016, the US withdrew from it right after President Trump's inauguration.

Additionally, the Climate Risk Index from 1998 to 2017 was used to analyze countries and regions that have been exposed to extreme weather events over the past 20-year period. The rankings of 31st and 27th for China and the US, respectively, reveal that both of them are two of the most vulnerable countries to climate change [28].

Data Collection and Methods

This study was based on and conceptualized from the 2014–2016 Asian Development Bank (ADB) technical assistance research project ([29]), and complemented by desk research with both scoping methods and a documentary analysis adopted.

The preliminary data were compiled from semi-structured interviews and focus groups performed in both countries during field studies in 2015 and 2016, respectively. In both countries, we interviewed key practitioners with extensive knowledge involved in different governance approaches. This included public officials working at the National Development and Reform Commission (NDRC), Ministry of Environmental Protection (MEP, renamed as Ministry of Ecology and Environment in 2018), government agencies at sub-national levels, such as the Guangdong Provincial Development and Reform Commission, Sichuan Provincial Environmental Protection Bureau (EPB) alongside United States Environmental Protection Agency (US EPA), EPA Region 5 office in Chicago, and the Missouri Department of Natural Resources, etc. The interviews with informants from academia, non-governmental organization (NGO) sectors, and private sectors gave us a balanced view of climate actions. In total, 25 interviews were conducted in China and 14 interviews in the US. The interviews were recorded, transcribed, and coded manually.

In terms of the scoping review, an exploratory search of peer-reviewed articles covering central concepts and definitions of each dimension within the meta-framework was performed in Scopus [30]. This step provided an initial understanding of the literature, allowing us to narrow down the search area in accordance with snowball logic and trial-and-error. Sets of different combinations of key search words were formulated accordingly. For example, key search words were combined with “China” as “climate change mitigation” AND “institution” AND “China,” “climate change mitigation” AND “policy” AND “China,” and “climate change mitigation” AND “nonstate” AND “China.” Substitutions of synonyms were used to avoid missing semantic keywords. For instance, the search keyword “institution” was replaced with “institutional structure,” “political system,” and “multi-level.” Similarly, “policy” was substituted with “policy instruments” and “policy-making,” while “nonstate” was substituted with “non-governmental organizations.” Then, the search was switched to the US, with “China” in the search word combinations replaced with “the United States.” Following that, a query in Scopus for the period

2005 to 2019 was carried out to extract publications, including keywords identified. The search was confined to peer-reviewed academic articles in English, with unrelated disciplines (such as earth and planetary, computer science, engineering) excluded to reduce the number of articles to a manageable amount and to ensure that the literature was consistent with our study. A total of 263 articles were found at this stage. Based on the in-depth analysis of the keywords, abstract, and full text of the remaining articles, we identified papers with high relevance to the aim of our study. The key analytical facets for climate change governance were determined within each dimension (Table 1).

In addition to the academic articles gathered from Scopus, desktop research was also performed to review climate change governance-related policies and government documents, laws, plans, reports, and national statistics of the two countries. Data were collected from multiple sources for triangulation, including government portals, national census bureau, and digital newspaper archives. We followed an integrated method to review and analyze the literature and documents gathered [31]. The various streams of research were grouped for synthesis according to the targeted facets identified using the scoping method. To deal with both the quantitative and qualitative findings, we qualitized the quantitative data and, specifically, converted the quantitatively produced correlations (including tables, charts, or statistics, etc.) into the three domains determined (see Table 1). As such, the quantitative data were subjected to a qualitative analysis. The materials were reviewed by the entire team for checks and balances, with the unexpected findings highlighted and discussed.

Table 1: Identified analytical facets and academic studies.

Dimensions	Analytical Facets Relating to Climate Change Governance	Key Academic Studies	
		China	The US
Polity	Institutional setting (for this study, we focus on formal institution) in which level (national or sub-national) the locus of climate change mitigation lies in.	[11,32,33]	[6,7,34,35]

Policy	The selection of policy mechanisms and governing instruments used in climate practices.	[15,36-38]	[6,39-41]
Politics	Constellation of actors, especially the role and influence of non-state actors, along with the degree of their involvement in climate change governance.	[42-46]	[34,47-51]

Note: there is a growing acknowledgement of non-state actors’ capacity and potential in mitigating climate challenges, in addition to the persistent importance of “traditional” actors (national governments and international organizations).

Comparison of Climate Change Governance in China and the US

To allow an in-depth analysis of the divergent climate change governance logic across China and the US, in this section, we explore the identified analytical facets per dimension within the meta-framework.

The Polity Dimension

The Polity Dimension in China

China’s political structure is a “unitary hierarchy,” with a central government with discretionary authority guiding and regulating governance from the top to the lowest levels of administration [52]. In China, the central government constitutes a dominant role in climate governance, establishing the Climate Change Leadership Group and National Leading Group on Climate Change (NLGCC) as initial responses to climate change. Climate mitigation has been put on the national agenda as a policy priority since the national 12th Five-Year Plans (FYPs) (2011–2016) [53], and clearly required in the 13th FYP (2016–2020), which demanded a 16% reduction in energy intensity and 15% of non-fossil energy in total energy consumption by 2020 [54]. Following the issue of nationwide FYPs, individual ministries at the central level work on more focused FYPs for different sectors [4], such as the 13th FYP for Ecological Environmental

Protection issued by MEP [55] and the 13th FYP for Energy Development issued by NDRC [56].

In addition, provinces and municipalities at sub-national tiers incorporate the general targets on carbon intensity reduction set forth in the national FYPs in both the *Regional Economic and Social Development Plans* and the *Annual Government Work Reports*, and devise feasible measures and implementation strategies to address specific problems. As environmental and energy-saving goals were incorporated into the local officials' promotion evaluation, more stringent emission targets were mandated by provincial governments [57]. For instance, following the 13th FYP, in which a 20% reduction in carbon emissions was set out as a national target, Hebei, China's largest energy-consuming province, issued a provincial plan with a target of 20.5%, which is 0.5% higher than the national directive. Each province then allocated the target articulated in the provincial level FYPs in the municipalities within its jurisdiction. Such political processes, through which each sub-national administrative tier was assigned energy intensity targets, are termed as a target responsibility system [11].

The Polity Dimension in the US

In the US, climate change governance at the federal level is established through congressional legislation or through regulations and enforcement by administrative agencies. The US Congress is responsible for authorizing laws and overseeing the implementation of energy acts, while the implementation of legislations is handed over to specialized agencies, with EPA and Department of Energy (DoE) undertaking the main tasks. In addition to regulating carbon dioxide and other GHG as air pollutants under the Clean Air Act [58], the EPA also issues a mix of programs and policies on pollution control and energy efficiency, such as Clean Processing and Energy [34,59]. Similarly, the DoE confronts the challenges in the energy domain by supporting renewable energy research and innovation. It is worth noting that each of the ten regional offices of EPA is in charge of the execution of EPA programs and coordinates the efforts in GHG emission within states. The EPA Region 5 office

practitioners in Chicago reveal that “EPA regional offices are more familiar with regional reality and maintain closer partnerships with states, and ensure the accomplishment of EPA programs primarily through developing regulations and providing grants.”

As set by the US Constitution, the federal government shares certain authority with states [60], which leaves governments at sub-national levels with more leeway in shaping “the rule of the game” within its jurisdiction and more latitude in addressing social issues. In response to the lack of federal legislations on climate concerns, state governments step in and take proactive action [35]. They either set up the specialized institutions for climate change governance (e.g., California Air Resources Board), pass legislations, or coordinate mitigation practices by cultivating multi-government alliances or networks at the regional level.

The most remarkable network is the Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade system dedicated to limiting carbon dioxide emissions from regional power plants. Across the nine states that adopted RGGI in 2005, the proportion of electricity generated by carbon-rich and high-carbon energy sources decreased from 33% to 8% compared to the 2005 level. It is projected that by 2020, the RGGI CO₂ cap will contribute to a 45% reduction in the region’s annual power sector CO₂ emissions [61]. Table 2 provides a summary of the major regional climate change initiatives in the US.

Besides inter-governmental cooperation, states introduce climate change legislations or enact sector-specific policies. Considered as the pioneer of combatting GHG emissions and advancing the most ambitious climate change policy [7,39], California issued the Global Warming Solution Act (AB32) as early as 2006, which is the nation-first state law, and the low-carbon fuel standard to reduce GHG emissions by means of market mechanisms and energy efficiency standards.

Table 2: A summary of major regional climate change initiatives in the US.

Climate Change Action	Description of Climate Change Action	Regions Covered	Since	% of 2019 US Population
The Regional Greenhouse Gas Initiative (RGGI) (https://www.rggi.org)	A cap-and-trade system dedicated to reducing GHG emission from power sector	9 Northeastern and Mid-Atlantic states: CT, DE, ME, MD, MA, NH, NY, RI, VT	2005	13%
The Western Governors’ Association (WGA) (http://westgov.org/images/editor/FINAL_2018_WGA_Annual_Report.pdf)	Promote the sustainable development in the Western region through combined efforts in a variety of fields	19 States: AK, AZ, CA, CO, HI, ID, KS, MT, NE, NV, NM, ND, OK, OR, SD, TX, UT, WA, WY	-	35%
Western Climate Initiative (WCI) (http://www.wci-inc.org)	Provide administrative and technical assistance to support GHG emission trading programs: e.g., establish tracking system, market monitoring	7 Western states: AZ, CA, NM, OR, WA, UT, and MT	2007	20%
Midwest Greenhouse Gas Reduction Accord (https://climatechange.lta.org/midwestern-accord/)	Set out GHG emission reduction targets and develop regional cap-and-trade program; commit to reducing GHG emission by 80% below 2005 level by 2050	IL, IA, KS, MI, MN, WI	2007	12%
New England Governors and Eastern Canadian Premiers (NEG/ECP) (https://www.coneg.org/who-we-are/about-neg-ecp/)	Address common border affairs collectively with 5 Canadian provinces	6 US States: CT, ME, MA, NH, RI, and VT	1973	4%
US Mayors’ Climate Protection Agreement (US MCPA) (https://www.usmayors.org/mayors-climate-protection-center/)	Reduce carbon emission in the cities below 1990 level; achieve Kyoto Protocol targets	1060 US cities.	2005	0.3%
WE ARE STILL IN (https://www.wearestillin.com)	A bottom-up network, with collective efforts on climate actions from states and non-state actors across the US	135 cities	2017	0.5%
The US Climate Alliance (https://www.usclimatealliance.org)	Take active actions to address climate change, commit to reducing GHG emission 26%–28% from the 2005 levels by 2025	21 US States	2017	47%

Note: the table builds on Lutsey and Sperling’s (2008) summary of multi-government climate coordination [7], adds the latest statistics and current climate initiatives, especially those launched after President Trump’s withdrawal from the Paris Agreement, and scratches out the ones that no longer operate.

Planning-Based Governance and “Bottom-Up” Governance

China and the US have significantly different governance arrangements (Figure 2). In China, with a unitary political system, climate change governance features a planning-based process and only the central government is authorized to change the “rules of the game.” The locus of governance lies mainly in the hands of the central government, while the sub-national levels ranging from provincial to lower local levels are limited to the implementation process, with specific implementation tasks being designated through the target responsibility system. China’s enduring and stable political system—alongside the FYPs—secure policy continuity in the sustained process of climate change mitigation. By contrast, the locus of climate change governance in the US lies primarily at the regional and state level, to which the reduction of carbon emissions can be largely attributed.

The political regime in China is referred to as “fragmented authoritarianism,” a hierarchical structure filled with a substantially fragmented and complicated governance process at both horizontal and vertical levels [62]. The process of formulation and implementation of climate change policies involves entangled game and competition among and across different bureaucratic levels that also makes joint efforts hard to achieve. Although green development has been incorporated into the evaluation system of local government officials, local governments’ attempts to maintain economic development, which rely on carbon consumption, are still in conflict with the central government’s emission reduction goals [63].

In the US, scholars use the term “institutional gridlock” to explain the US policymaking process at the federal level, in which draft bills pass through a complex procedure before coming into effect [6]. Over the past decades, either the executive branch or the legislative branch have hindered climate change legislation at the federal level due to pressure from diverse interest groups, resulting in the national inaction on climate policy. Compared with national inaction, decentralized climate change mitigation activities in the US produce special

benefits, which are well discussed by Lutsey and Sperling (2008) [7]. These initiatives aptly meet local preference and the needs of stakeholders, as well as encourage diversified actions and voluntary efforts from multi-actors. It is widely acknowledged that the valuable policy experiences brought by state and local initiatives actually lead to the success of climate change mitigation, particularly in terms of carbon emission reduction and the use of new energy technology [64].

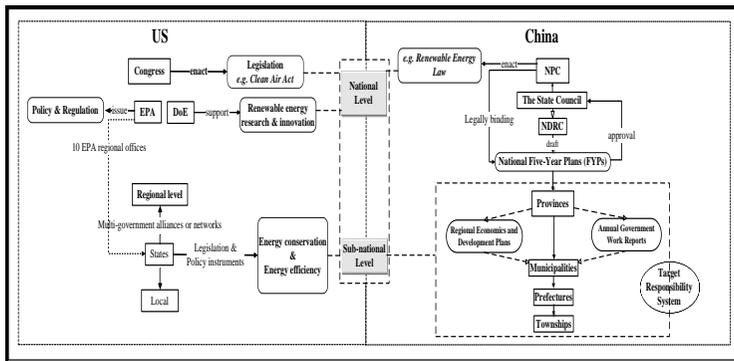


Figure 2: Comparison of governance arrangements across multi-levels in China and the US. Note: EPA: Environmental Protection Agency; DoE: Department of Energy; NPC: National People’s Congress; NDRC: National Development and Reform Commission.

The Policy Dimension

The Policy Dimension in China

Laws are recognized as the most binding form under policy dimension [65], while energy laws play an essential role in climate change governance. The National People’s Congress have passed a myriad of legislations and initiatives to encourage the use of renewable energy and to improve energy efficiency, with the main ones being the Renewable Energy Law (2005), the Energy Conservation Law, and the Circular Economy Promotion Law. Other policy documents are of the same importance, such as *China’s National Strategies to Address Climate Change* and the first strategic planning on *National Strategies for Climate Change Adaptation*. The three main energy laws, together with policies relevant to energy conservation and renewable energy,

compose a comprehensive renewable energy system in China [66].

Besides the strict carbon emission standards, the Chinese central government adopts a command-and-control policy by setting up emission reduction targets for large energy-intensive plants for iron, steel, and other metal industries [67], or exempting serious polluting enterprises from obtaining state bank loans. Furthermore, with the “Energy Revolution” initiative by President Xi Jinping in 2014, more market-based policies are being adopted by the top leadership. For instance, the central government of China offers financial incentives and favorable policies to enterprises for their energy-saving activities or for research and development on superior technology [36,37].

One striking market-based instrument deployed in the policy dimension centers on the Emissions Trading System (ETS). In 2011, seven ETS pilots were officially established in China. The pilots have achieved pronounced accomplishments in meeting carbon emission targets and controlling GHG emissions, and have accumulated valuable experience in setting standards, legal enforcement, and market supervision [37,38], all of which have significantly contributed to the establishment of a national ETS in 2017.

The Policy Dimension in the US

Except for the EPA’s regulation of GHGs under the Clean Air Act, the US has no comprehensive climate change legislation. Mitigation measures are mainly reflected from energy policy acts, with the most prominent being the Energy Policy Act of 1992, the Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007. All these acts assist the US in energy transition by increasing the use of all types of renewable energy technologies, and to move towards greater energy independence. Nevertheless, there have been some unsuccessful attempts, such as America’s Climate Security Act of 2007 (also known as the Lieberman–Warner bill) and the American Clean Energy and Security Act of 2009. Since these failed attempts, no national legislation with respect to climate

change mitigation has been made at the federal level [39,40]. Correspondingly, more US states and localities have begun to conceive innovative and ambitious schemes to address climate change, most notably by enacting GHG emission regulations and encouraging the transition towards the use of clean energy [6,7]. As it is in China, both command-and-control and market-based policy are deployed at regional and state levels in the US. For instance, the renewable portfolio standard (RPS) that is currently in operation in 29 states requires a certain share of energy to be from renewable energy sources. As a milestone of climate change governance via the market-based mechanism for carbon emission reduction, the cap-and-trade system sets a limit (cap) on the level or quantity of GHG emissions, issues a permit equaling that cap, and allows trading of the permits among enterprises that emit GHG excessively [68]. However, the fluctuation of permit prices is a major concern, which causes unpredictable prices. Moreover, allocating permits and operating a cap-and-trade scheme are associated with the extra administrative costs: for instance, substantial oversight costs are required to track emissions and ensure permit obedience [69].

Parallel to Chinese pilot programs, the US has a “policy laboratory” that works differently with respect to operational processes (Figure 3). The “policy laboratory” involves proactive approaches and initiatives adopted by pioneering US states or localities. The successful operation of a carbon trading system in California is actively emulated by other US states and even adopted by national policies [4,41].

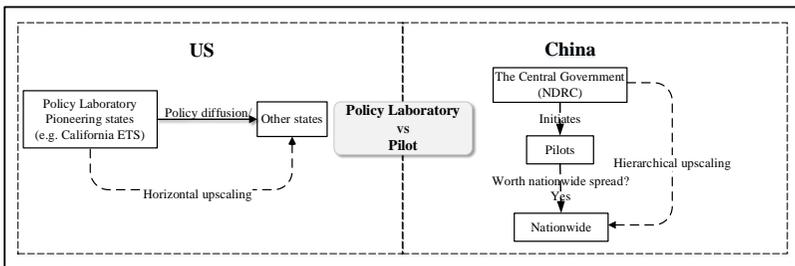


Figure 3: Comparison of “policy laboratory” (in the US) and “pilot programs” (in China).

Policy Instruments Portfolios

A closer examination of the policy dimension reveals that in China, the central government plays a key role in deciding on the forms of political steering and the selection of policy instruments. The pilot programs, such as ETS and low-carbon city pilots, serve as typical cases of “hierarchical upscaling” [41], by which the operation of pilot programs is under the steady control of the central government, including designating the location and launching the pilots by conferring preferential policies and subsidies. Once the pilots are proved to be effective, they can be either scaled up nationwide or used for drawing up new national policies. In the US, however, the “policy laboratory” is a process of policy diffusion or “horizontal upscaling” [41], in which the state and local governments decide voluntarily on the adoption of initiatives that have already been taken by others.

The boundary between market mechanisms and command-and-control steering in China is opaque [52], which, to some extent, is attributed to excessive government intervention. In China, the central government takes the leading role in the carbon trading market, setting up market prices and monitoring market operation, while private enterprises function as the implementer and are primarily responsible for creating tradeable carbon credits. A comparison with the policy steering mechanism deployed in the US reveals that well-functioning market mechanisms are crucial in reaching emission reduction targets.

The Politics Dimension

The Politics Dimension in China

As climate change becomes increasingly complex as both a scientific and policy issue, the Chinese government has realized that the traditional “top-down” policy mechanism is not capable of achieving emission reduction targets articulated in the national plan. As several interviewees from MEP instructed, “climate change is a long-standing issue, and it is important to be taken from the perspective of social governance. Only by collaborating with the third sector, the private sector alongside other social

resources, will effective governance be achieved.” The interaction between state and non-state actors in the realm of climate change governance has intensified as joint projects have proliferated over time, such as the establishment of 18 EcoPartnerships programs under the US–China Ten Year Framework for Cooperation on Energy and Environment. Another example involves the collaboration between Anheuser-Busch InBev and the China Food Fermentation Industry Research Institute on a “carbon footprint” management system to track down the process of carbon emissions comprehensively.

Among the actions taken by NGOs on climate change, the most critical include conducting research and providing national policymakers with solid political suggestions coupled with facilitating dialogues between governments [42,43]. Prominent research institutes, such as the Innovation Center for Energy and Transportation and the Greenovation Hub, are dedicated to offering policy justifications on energy mitigation and climate crisis to foster a positive transition to a low carbon economy. Some scholarly research is even adopted by the government when formulating national policies. For instance, the official Guideline of the Greenhouse Gas Emission Accounting and Reporting for the Petrochemical Production Enterprise published by China Business Council for Sustainable Development (CBCSD) was later used by NDRC as a national standard [44]. Recently, Chinese NGOs have started to take advocacy activities to raise public awareness on energy saving and the low-carbon lifestyle.

As the pivotal operators of mitigation practices, private enterprises strive to improve the efficiency of energy utilization and drive technological advances. Their efforts and achievements in renewable energy have strengthened the interaction with the Chinese government in the process of policy formulation. The immature nature of China’s renewable energy industry and the uncertainty toward the impacts of national policies together with information asymmetry urge the Chinese government to consult with the private sectors for market data and market prediction as the bases for policy setting [45,70]. It is, therefore, acknowledged that the private sector contributes a

great deal to the renewable energy scenario and affects the national policy agenda accordingly.

The Politics Dimension in the US

Over the past decades, the US has witnessed a dwindling of state power in the national climate practices, which is partially ascribed to the strengthening of civil society [47]. The climate governance activities by non-state actors in the US have been augmented dramatically, especially right after President Trump's announcement of climate policy rollbacks and withdrawal from the Paris Agreement. For instance, over 3500 organizations in conjunction with representatives of the US Society launched the "WE ARE STILL IN" program to declare that they will comply with the Paris Agreement and are dedicated to meeting the goals. Alongside efforts taken at the sub-national level, non-state actors play an indispensable role in climate change governance, especially in terms of bridging the gaps involving GHG emissions in the committed NRCs, which cannot be achieved if only the federal government is engaged [48].

Despite the fact that more NGOs—which were originally poverty or social service-oriented—have started to participate in climate change mitigation, most activities are still tackled by environmental NGOs (ENGOS). In addition to providing knowledge and technical assistance to justify potential policy options, ENGOS prioritize the climate issue, leading the way in catalyzing the legislative process and influencing the national agenda [34]. For instance, the Environmental Defense Fund (EDF) helped California with legislation on GHG economy-wide caps, ushering in a clean energy era nationwide. ENGOS implement specific climate actions as well, such as assisting power plants to reduce reliance on fossil fuels, helping vulnerable communities adapt to the impacts of climate change, and raising climate change awareness. Some aggressive ENGOS, such as Earth Justice and 350.Org, use public protests and media to pressure politicians on certain climate policies, filing cases to secure national and global rules on limiting industry carbon emissions.

American private enterprises have worked on fighting climate change even earlier than their counterparts in China. In an effort to reduce GHG emissions and transform the retail sector towards environmental and social sustainability, the world's largest retailer, Walmart, collaborates with EDF on lifecycle assessment and reconstruction via the "green supply chain" program. Besides the formal cap-and-trade system and national emission standards, corporations internalize their GHG emission footprints by purchasing voluntary carbon offsets (VCOs) and complying with private standards and rules on carbon emissions that are much more stringent than the national standard for corporate social responsibility [49,50]. Although the voluntary carbon market is still small, the demand for voluntary offsets has been growing rapidly over time. As of the first quarter of 2018, a total of 2008 projects have issued over 435.4 MtCO₂e of voluntary offsets since 2005, with the US accounting for 351 projects [71].

Rising Non-state Sectors and Strong Societal Forces

The comparative analysis between China and the US elucidates the multi-faceted nature of non-state actors in climate change mitigation practices. The civil engagement of ENGOs in climate practices are indeed embedded in the political contexts of their home countries. Comparatively speaking, due to the conducive political environment from which non-state actors benefit, non-state actors in the US are engaged in the national policymaking process to create more favorable conditions for their activities and play a more profound role in climate change governance than their counterparts in China. However, no consensus has been achieved in terms of non-state actors' contribution to climate change mitigation practices so far, which is largely due to the lack of consistent measurement and reporting platforms to capture their efforts and the difficulty of accounting for the overlap between emissions of national governments and non-state actors [51,72]. To better evaluate the impact of non-state actors, they are urgently expected to provide public and timely information of emissions.

The state and non-state relationships in China are quite delicate and complicated. Chinese ENGOs are given fairly less scope to maneuver and are under strict institutional restraint, with the government monitoring the registration of NGOs to ensure they do not disturb the political stability [46]. Meanwhile, previous research has confirmed the importance of building relationships (*guanxi*) with government officials for the operation of NGOs [73]. The fact that most of the cooperative partnerships with foreign NGOs are closely selected by the Chinese government also shows that Chinese civil ENGOs are playing a limited role as collaborators rather than promoters or initiators of policy initiatives.

Discussion and Implications

From the findings discussed above, China and the US differ substantially in climate governance arrangements, with each presenting both stability and dynamic complexity. The stability of governance arrangement can be captured from the main governance process in the two systems. China has a typical state-led political structure, in which the state planning (e.g., nationwide FYPs) plays a dominant role in the entire process of climate governance. The US, by contrast, features a law-oriented governance arrangement, with relevant regulations and policies issued or implemented by specialized agencies. Meanwhile, climate governance arrangement in both countries reflect an increasingly complex and dynamic nature, which not only manifests from the three dimensions as discussed above, but the interplay between them. For instance, in the US, the fragmented political power at the federal level coupled with influential lobby groups lead to national climate policy discontinuity, and the involvement and activities initiated by sub-national and non-state actors shift correspondingly. Moreover, with the introduction of the perception of “social governance” in China, the participation and efforts from non-state actors, such as social forces, private sectors, and the public, are greatly emphasized, while the adoption of market mechanisms as policy instruments are emerging rapidly. In a nutshell, each governance system has its own opportunities and obstacles, and neither is necessarily superior in climate change governance over the other. We

identify the key opportunities and obstacles (see Table 3) and seek to draw the main implications arising from our comparative analysis that are useful for policymakers and practitioners in both countries, as well as for other countries, in response to the challenge of climate change mitigation.

Table 3: Opportunities and obstacles arising from the governance setting in China and the US.

..	China	The US
Opportunities	Be able to secure a national policy continuity and planning on climate change governance.	The success in addressing climate governance mainly lies in the active actions taken at the sub-national level, coupled with the persistent efforts of non-state actors. A portfolio of policy instruments is deployed.
Obstacles	The transition from policy formulation to implementation cannot be promised. Lacks well-functioning market mechanisms and a robust regulatory system. Meaningful involvement of societal actors is needed in dealing with increasingly uncertain climate issues.	Lack of consistent national climate policy: political acceptability for climate science and the concerted commitment by both the legislative and the executive branches at federal level are crucially required.

First, given the increasingly uncertain and complex nature of climate change, only with a concretely integrated institutional framework can effective climate change governance be achieved [74,75]. While decentralization is adapting well to the local circumstances and allowing for diversified and innovative policy experiments and the local experience of both success or failures [76,77], relying on a decentralized governance is inefficient in terms of externalization and free-riding and market leakage [78]. Similarly, although the directives from the central government in China are crucial in urging energy conservation at local levels, a centralized mode of governing is problematic, as it fails to take differentiated provincial and municipal situations into account and cannot promise a transition from policy formulation to

implementation, both of which weaken the effectiveness of mitigating efforts.

Thus, a well-functioning regulatory regime and strong policy structure serve as an optimized strategy in reducing GHG emissions, which resonate with existing international findings as well (e.g., [79]). An integrated regulatory framework under which clear goals that are expected to be achieved are incorporated and prioritized in the political agenda promises climate policy running through the national to sub-national levels and allows the nesting of various climate change governance activities [80]. It is widely acknowledged that governments play an indispensable role in coordinating and supervising climate activities across multi-levels for which no other actors could substitute [81]. The US is one of the first countries to recognize the relationship between climate change and human activities, and tackles climate change by initiating programs to advance climate change technology. However, climate change is more than a technical issue: it is, foremost, a political issue that needs to be addressed [82,83]. In dealing with climate change, which is inseparable with consistent policies at the national level, a political consensus on climate change and the concerted commitment by both legislative and executive branches are crucially required. In addition, a consistent and sustained government monitoring and appraisal system alongside the effective allocation of regulatory responsibilities across diverse administrative levels should be secured in the regulatory framework. As for China, the role of the six regional inspection bureaus (*ducha ju*) of MEP in their respective regions is expected to be fully facilitated. With a comprehensive evaluation of the regional factors, such as the degree of industrial agglomeration, economic growth, and the cost of carbon emission, each inspection bureau takes a differentiated approach in coordinating with local municipalities with regard to GHG emission, through which, the overall performance of GHG emission in China would be improved substantially.

Second, the policy instruments used by the government in dealing with climate change governance can be quite complex, and the adoption of policy instrument mixes has become the

trend of emission reduction while achieving sustainable development in both countries. The portfolio of policy instruments takes effect differently, as each policy tool has its particular attribute and has varying advantages in the governance goals that are expected to be attained. For instance, the command-and-control policy has proven effective, as it mandates how much and whom to abate by setting emission reduction standards and, thus, tends to be easier to operate compared to market-based policy; however, an over-reliance on the command-and-control policy might instead weaken enterprises' incentive for emission reduction in the long run. By contrast, a market-based policy is more flexible and encourages enterprises to reduce carbon emission with more independence, whereas it does rely on a relatively robust market mechanism and tends to cause additional administrative costs, such as oversight costs. More fundamentally, we note that the policy instrument choices present a nested relationship within the governance framework and governance logics, in which policy implementation preferences, multiple actors, and multiple policy goals vary [84]. In tackling complex and multi-faceted issues, such as climate change governance, an innovative and effective policy instruments portfolio is required by all countries. Comprehending the overall government capacity, the trade-offs between policy instruments, and policy goals in both the short-term and long-term are conducive to maximize the complementary effects of varied policy instruments and to optimize the effect of policy implementation.

Third, climate change mitigation requires the orchestration of non-state actors in effectively addressing climate change concerns. Consider that climate change is a typical common-pool resources issue: attributing the responsibility of climate change governance to the government would inevitably risk government failure. Meanwhile, confronted with the growing tension between climate change mitigation and maintaining economic growth [85], most developing countries find it hard to prioritize energy conservation prior to economic growth. To fully carry out ambitious national goals in reducing GHG emissions, the meaningful involvement of societal actors at all policy levels is essential. On the one hand, less administrative intervention and

supervision from the government will afford non-state actors more incentives and freedom with respect to promoting an inclusive low-carbon transition at the sub-national level. On the other hand, improving non-state actors' capabilities contributes to the maturity of the non-state field and is effectively complementary to, or the "means of implementation" of, national goals [2,86].

Last but not least, as a global commons issue, an effective climate change governance is not independent of ambitious policy steering at the international level. The Paris Agreement is promising, as it provides prospects for further collective action between countries on a global scale, which is beneficial when tackling single action and the associated governance problems, such as shifting or rebound effects [17]. However, despite the far-reaching temperature goals of limiting warming to no more than 2 °C, and even the 1.5 °C set at the Paris Agreement, the aggregation of the NDC of countries is insufficient [87,88]; there is still a long way to go to meet the targets and to achieve a global transformation of zero-carbon development pathways. Referring to the benchmarking countries, China is projected to overachieve the unconditional NDC by less than 15% with currently implemented policies [89], whereas as for reaching the 2 °C target, China is responsible for increasing the target of reducing carbon intensity from "by 60%–65% by 2030" to "by 74%–87% by 2030," while setting emission reduction targets to a greater extent for further reaching the "well below 2 °C" or the 1.5 °C target [90]. By contrast, the US still requires intensive policy measures and enhanced action of achieving NDC. Given that President Trump withdrew from the Paris Agreement and moved the country's emission trajectory in the opposite way, the progress towards the 2 °C target is subject to more uncertainty and unpredictability. In other words, all countries are expected to accelerate efforts and initiate an increasingly ambitious NDC, with greater commitments made to abate emissions.

Conclusions

This study compares climate change governance between China and the US systematically and multidimensionally, with critical

analytical aspects captured through the meta-framework of governance modes. Based on the preliminary data generated from semi-structured interviews and focus groups in both the two countries and desk research using both scoping methods and a documentary analysis, the paper reveals that climate change practices in the two countries differ substantially, each with inherent opportunities and obstacles. The climate change governance arrangement in China is characterized by centralized planning and hierarchical governance, by which China is able to secure a national policy continuity in climate action. Although hybrid policy instruments have been deployed, a well-functioning market mechanism and sound regulatory system are still lacking. By contrast, US federal climate policies are considered inadequate, and the success in addressing climate change challenges mainly lies in the sub-national actions and persistent efforts of non-state actors. The comparison indicates that an integrated institutional framework with an embedded optimized policy instruments portfolio is necessary with respect to climate change response. The collective engagement of societal actors in climate practice is critical and is not independent of the government's support. To further improve the effectiveness of climate change governance and to achieve the temperature goals of the Paris Agreement, a substantial enhancement of endeavors, including more ambitious NDC proposed by all countries and stringent policy implementation within countries, is urgently required. In summary, this paper helps us to understand the divergence of climate change governance in China and the US, with practical implications drawn for policymakers and practitioners in addressing climate concerns. Additionally, this comparative study could serve as a basis for further research on comparative governance in other countries, as well as in confronting other social and institutional challenges.

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