Experts and the science-policy interface in China’s climate policy

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This thesis explores the ways in which experts engage in China’s climate policies at four different administrative levels (i.e. international, national, provincial, and prefectural) and how politics simultaneously influences the science-policy interface (SPI) in an authoritarian context and a multi-level governance framework.

First, experts play an essential role in shaping China’s foreign climate policy by loading science/politics co-constituted ammunition to negotiate with their counterparts in global climate politics. At the national level, the demand of Chinese policymakers is setting the related targets and developing the policy framework for both climate change mitigation and adaptation. While the experts provided sufficient scientific advice, policymakers tend to add some political considerations due to different timing and factors at the higher (international) and lower (subnational) governance levels before making the final decision. Given that local Chinese officials, in general, lack capacity and expertise for addressing climate change, experts engage not only in formulating low-carbon development-related plans but also in carrying out such policy programmes. Political performance and accomplishment, feasibility and achievability of policy goals, and regional competition are considerations regarding the uptake of experts’ advice at the lower government levels.

While the past SPI literature focuses primarily on the scientification of policymaking, the political considerations and conditions for explaining SPI identified in the thesis can be a hypothesis to test in other countries to improve our understanding of the science-policy-politics nexus.
Experts and the Science-policy Interface in China’s Climate Policy

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Experts and the Science-policy Interface in China’s Climate Policy
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Executive Summary

The Problem: Although a considerable amount of climate change related scientific knowledge and information has been provided to policymakers, there is a persistent gap between knowledge production and use in human response to climate change. Even after three decades of efforts to tackle climate change since 1990, the incremental progress of the international climate negotiations and the slow-moving policy implementation at the domestic level is unlikely to meet the long-term objective of the 2015 Paris Agreement on Climate Change. Understanding when, why, and how policymakers use scientific evidence and expert knowledge to tackle climate change is critical. Further, as international climate negotiations are moving from a top-down to a more bottom-up process where countries state what they are willing to do, bridging the gap between science and climate policy at multiple levels of governance in varied political environments becomes more challenging.

While there is growing knowledge on how science and policy interact in general and in the climate change field in particular, there are at least four knowledge gaps in the existing literature: (1) A lack of exploration of the science-policy interface (SPI) in the Global South context; (2) A lack of exploration of SPI from a multi-level or cross-level perspective; (3) A lack of theoretical discussion and concept definition of SPI; and (4) A lack of exploration of SPI and China’s climate policy together.

Research questions: To address these knowledge gaps, this thesis studies China and addresses the overarching question: Under what conditions and in which ways do experts influence China’s climate policy across multiple levels of governance, and what does this mean for the future of China’s climate policy? Related sub-questions are: (1) Who are the experts that are engaging with the policy process? Who are the policymakers? (2) What kinds of science do experts generate and what kinds of science do policymakers need in order to make decisions, and why? (3) What kinds of political considerations do policymakers take into account before making the decisions?

Analytical Framework: This thesis reviews the scholarly literature on science-policy interface and problem solving in order to formulate an analytical framework to look upon SPI in China’s climate policy across multiple levels of governance. It examines three elements of SPI: (1) the input of science, (2) the intersection process of science and politics, and (3) the output of SPI. First, it investigates four types of knowledge policymakers demand and experts provide as input for China’s climate policy: (1) Fundamental knowledge that contains scholarly/technical information and scientific understanding of
an issue; (2) Applied knowledge for designing projects, policies, and laws for achieving social goals; (3) Stakeholder knowledge based on common sense and local practice; and (4) Discursive knowledge that presents a frame, narrative or discourse, indicating a certain way of dealing with the given issue. Second, it applies three models to explain the intersection process of science and politics in China’s climate policy: (1) The science-push model focuses on the ways in which the experts influence policymaking; (2) The policy-pull model highlights how policymakers’ demand for policy-relevant knowledge pulls experts to provide assistance; and (3) The co-production model stresses that rather than ‘science speaking truth to power,’ science and politics are ‘making sense together’ to co-generate a policy. While the three models of SPI may co-exist in a policy issue, they provide insightful lenses to examine the relationship between experts, policymakers, and policy. Lastly, regarding the output of SPI, I develop a five-level cumulative scale of policymakers’ response to the experts’ scientific input to evaluate science’s impact on policy: (1) Policymakers are informed and have taken note of the input; (2) Policymakers put the suggested ideas on the policy agenda for debate; (3) Policymakers agree with the recognition of policy problems but are contesting regarding the solutions; (4) Policymakers accept the experts’ advice and make decisions based on political considerations; and (5) Policymakers accept all advice and directly put it into policy practice. This thesis assumes to some extent that there is consensus among the scientists regarding what should happen at the respective governance levels. Concerning the theoretical lens for analysing SPI, the thesis builds on a typology of policy problems with four types of structures mapped out in two dimensions: (1) Structured, (2) Unstructured, and two kinds of moderately structured problems: (3) Moderately structured problem (means) and (4) Moderately structured problem (ends). A problem is termed structured when there is a high consensus on norms and values among policy stakeholders and can be solved by standardised techniques and procedures since there is a certainty on what kind of knowledge is relevant and the values that should underlie policy instruments. Meanwhile, a problem is labelled as unstructured when there is a disagreement on values and relevant knowledge among policy stakeholders. Further, a moderately structured problem (ends) occurs when there is consensus on relevant values but uncertainty or dissent on what kind of knowledge is relevant. Lastly, a moderately structured problem (means) indicates that there is a certainty of relevant knowledge, yet the norms and values remain contested.

Methods: This research assumes a constructivist ontology and a hermeneutic epistemology while employing an interpretive policy analysis (IPA) approach to examine SPI and China’s climate policy. It adopts the single-country case study approach and the embedded multiple case study design. The People’s Republic of China (PRC) is chosen as the case study since China is the largest greenhouse gas (GHG) emitter and is an
authoritarian regime; this allows me to investigate SPI in a non-democratic situation. Based on the analysis of nine selected policy issues, I examine the ways in which Chinese experts engage in climate policies at four different administrative levels (i.e., international, national, provincial, and prefectural levels) and the output of SPI. Research methods include an extensive review of varied sources of publications and academic literature, content analysis of policy documents, fieldwork, and 67 semi-structured in-depth interviews with experts and other categories of policy actors in Beijing and Guangzhou City (Guangdong Province). The research focused on 9 policy issues (see Table).

Table. Nine policy issues analysed in this research

<table>
<thead>
<tr>
<th>Selected cases</th>
<th>Level of governance</th>
<th>Problem type</th>
<th>Stages of a policy cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The principle of counting cumulative emissions per capita</td>
<td>International</td>
<td>Unstructured</td>
<td>Agenda-setting; policy formulation</td>
</tr>
<tr>
<td>2. The carbon budget proposal</td>
<td>International</td>
<td>Unstructured</td>
<td>Agenda-setting; policy formulation</td>
</tr>
<tr>
<td>3. The negotiation on technology development and transfer</td>
<td>National</td>
<td>Moderately structured (ends)</td>
<td>Agenda-setting; policy formulation</td>
</tr>
<tr>
<td>4. National target-setting on CO₂ emissions reductions</td>
<td>National</td>
<td>Moderately structured (ends)</td>
<td>Agenda-setting; policy formulation</td>
</tr>
<tr>
<td>5. The Climate Law</td>
<td>National</td>
<td>Unstructured</td>
<td>Agenda-setting; policy formulation</td>
</tr>
<tr>
<td>6. Policy choice between carbon tax and carbon trading</td>
<td>Provincial / prefectural</td>
<td>Moderately structured (ends)</td>
<td>Agenda-setting; policy formulation</td>
</tr>
<tr>
<td>7. Low-carbon province and city pilot programme</td>
<td>Provincial / prefectural</td>
<td>Moderately structured (means)</td>
<td>Agenda-setting; policy formulation; implementation</td>
</tr>
<tr>
<td>8. The GHG emissions inventory</td>
<td>Provincial / prefectural</td>
<td>Moderately structured (ends)</td>
<td>Implementation</td>
</tr>
<tr>
<td>9. The pilot emissions trading scheme (ETS)</td>
<td>Provincial / prefectural</td>
<td>Moderately structured (ends)</td>
<td>Agenda-setting; policy formulation; implementation</td>
</tr>
</tbody>
</table>
Chapter 4 examines how Chinese politics and policymaking have been changing and what this implies for the distinctive features of China’s climate politics and policymaking today. China’s climate policy has evolved since 1990 in five phases: Phase 1 (before 1997) identified the international scientific and environmental aspects; Phase 2 (1998~2006) focused on how this issue became a domestic challenge focusing on economics and energy; Phase 3 (2007~2009) signified a big proactive change towards climate policy; Phase 4 (2010~2019) moved from central planning to local operationalisation; and Phase 5 (2020~) focuses on operating the domestic ETS to ensure that CO\textsubscript{2} emissions in China peak before 2030 and carbon neutrality is achieved by 2060. The features of current Chinese politics and policymaking are: (1) Fragmented authoritarianism and bureaucratic competition at the horizontal level; (2) Centre-local relations, implementation gaps, and vertical bargaining between different levels of government; (3) The use of policy experimentation/pilot projects before scaling up; and (4) The emphasis on scientific decision-making. When moving from Phase 1 to Phase 2, the National Development and Reform Commission (NDRC) and the Ministry of Foreign Affairs (MOFA) incrementally became the two dominant players that held the decision-making power during the progress of international climate negotiations. The two Ministries’ dominant position was a result of bureaucratic competition where the economic development and energy ministry took control from the environmental and meteorological sector in steering China’s climate policy. During Phase 3 and Phase 4, tackling climate change has been translated domestically by the Chinese government as ‘energy-conservation and emissions-reduction’ and ‘low-carbon development’ as the dominant discourse. Apart from bureaucratic competition, experts play a critical role in shaping China’s climate policy as a repackaging of energy policy. From Phase 4 to Phase 5, China has launched a series of low-carbon related pilot programmes at the local levels and the nationwide emissions trading system, showing its ambition to peak its carbon emissions before 2030 and carbon neutrality by 2060.

Chapter 5 examines how Chinese experts engage in China’s foreign climate policy, particularly how they participate in the Intergovernmental Panel on Climate Change (IPCC) Working Groups (WGs) as well as the international climate negotiations. The science-push and the co-production models can be applied to depict the feature of Chinese experts’ involvement at this level. Concerning the Chinese experts’ impact on IPCC, the experts in WGI (the physical science basis) are more influential than those in WGII (impacts, adaptation, and vulnerability) and WGIII (mitigation of climate change) in terms of the number of selected participants and the publications cited as references in the Assessment Reports (ARs). In order to gain influence in global climate politics, Chinese policymakers need not only fundamental but also discursive knowledge. Hence, the Chinese experts who
come from top universities and semi-official think tanks speak on behalf of China, not only as scientists but as political representatives, to other countries. Yet, the space for negotiation is based on what has been decided at China’s domestic level, indicating that Chinese experts are putting forward views that have been internally negotiated in order to guide policy in international climate talks. The three case studies show that experts play a key role in shaping China’s foreign climate policy by loading science/politics co-constituted ammunition to negotiate with their counterparts in global climate politics.

Chapter 6 analyses the experts’ engagements with China’s climate policy at the national level and the results show that the science-push and policy-pull model can best describe the science-policy intersection. The demand of Chinese policymakers at this level is setting the related targets and developing the policy framework of both climate change mitigation and adaptation. Concerning the input for policymaking, not only semi-official research institutes but also universities, NGOs, and other categories of expert institutes are involved in the policy process. Yet, while each research institute can undertake research, Chinese policymakers often listen to voices from some specific institutes. Among all, the Energy Research Institute (ERI), the National Centre for Climate Change Strategy and International Cooperation (NCSC), and Tsinghua University are the most influential knowledge suppliers for the central government. In terms of the output of SPI, my study shows that while the experts provided sufficient scientific advice, some political considerations influence the policymakers’ final decision. First, timing matters. Different timing leads to different considerations (e.g., to set an ambitious goal and ensure the goal is achievable). Second, scale matters. While making a policy decision, not only the factors at the present governance level, but factors at the higher (international) and lower (subnational) governance levels will be considered by Chinese policymakers. Third, the features of China’s political system (i.e., fragmented authority and bureaucratic competition) remains an obstacle that hinders policy uptake of experts’ scientific input.

Taking Guangdong Province and three prefecture-level cities (Guiyang, Guangyuan, and Qingdao) in Western and Eastern regions of China as examples, Chapter 7 and Chapter 8 address the experts’ engagement in China’s provincial and local climate governance respectively. All the three models—the science-push, policy-pull, and co-production model can be found in policy practice. Instead of fundamental knowledge, local Chinese policymakers need primarily applied knowledge and stakeholder knowledge that help to carry out the climate-related policy projects and facilitate the compliance of local industries and enterprises. Considering that the officials at the lower government levels, in general, lack capacity and expertise for addressing climate change, experts have a higher degree of impact on both policymaking and implementation. In terms of who ‘the’ experts
are, the research centres for addressing climate change established by provincial and local governments, alongside local universities and expert institutes, provide key scientific input for local climate policy. Meanwhile, quite often local officials accept assistance provided by research institutes that come from the higher (i.e., provincial and national) levels. At the initial stage, experts play the role of ‘policy entrepreneurs’ that introduce the concept of low-carbon development (LCD) and low-carbon economy (LCE) to local officials through capacity building. Then, they act as advisors with expertise that assist local officials by generating plans and guidelines. When stepping to the stage of policy implementation, experts play the role of practitioners with an administrative professional that helps officials carry out the policy projects. In terms of the output of the SPI, the case studies showed that the experts have a substantial impact on China’s local climate policy. Yet, the political environment at the local levels (characterised e.g., by parochialism and regional competition) and the priorities and considerations of local officials (e.g., achieving their target responsibilities set by the centre) are decisive to the policymakers’ final policy decisions.

While Chapters 5 to 8 deal with experts’ involvement in China’s climate policy from the international, national, provincial to the prefectural level, respectively, Chapter 9 explains how the experts and policymakers interact across multiple levels of governance. First, it shows that the international-domestic linkages between foreign and Chinese research institutes and the centre-local and provincial-municipal interactions among expert institutes jointly form the scientific input for China’s climate policy. While foreign research institutes and international donors consistently provide scientific, technology and funding support, expert institutes in Beijing play an essential role in: (A) Lobbying the officials to experiment with pilot programmes; (B) Developing methodological instructions for capacity-building training; and (C) Reviewing policy documents submitted by the localities. Meanwhile, local experts facilitate bottom-up knowledge travel by sharing local experiences of low-carbon related pilot programmes. Apart from the division of labour (cooperation), there are also tensions between experts at different administrative levels regarding the core concerns of policy and the strategies for completing the work. For instance, while the Beijing experts develop a meticulous framework aiming to compile a comprehensive GHG emissions inventory, local experts adopt the strategy of ‘grasping the large and releasing the small’ to complete the work in a practical way. Second, all the three SPI models occur in cross-level dynamics of China’s climate policy. Specifically, the science-push model is more appropriate to depict the experts’ engagement with China’s climate policy at the higher levels of governance, and the policy-pull model appears more often at the lower government levels. Third, in terms of the output of the SPI in China’s climate policy, it is more likely that experts at the lower governmental levels successfully influence
policymaking and implementation than experts at the higher governmental levels.

**Chapter 10** revisits the relationships between science and climate policy in China, and the theoretical reflections we can learn from the Chinese case study. The answers to the sub-questions are: (1a) Concerning who ‘the’ experts are, rather than only semi-official think tanks being dominant in the policy process, there are multiple scientific input providers (e.g., experts from universities, NGOs, and international organisations) into China’s climate policy at different levels of governance; (1b) Regarding who ‘the’ policymakers are, the powerful ministry has evolved from the scientific and environmental protection administration (the CMA and NEPA) in the early 1990s to the energy and economic development ministry (the NDRC) ever since the 2000s. Recently, the distinctive institutional change of China’s climate policy is that the Ministry of Environmental Protection (MEP) was reorganised as the Ministry of Ecology and Environment (MEE) and took over the NDRC’s role in leading the planning and coordination for addressing climate change in 2018. The government restructuring indicates the Chinese government’s dual attempts. First, China seeks to resolve the long-standing problem of fragmentation of authority—while the MEP is responsible for regulating carbon monoxide (CO), control of carbon dioxide (CO₂) falls under the NDRC. Second, highlighting the concept of ecological civilisation (EC) as the core doctrine of its global and national development strategy, China attempts to situate climate change with environmental governance and pollution control under the EC discourse; (2) Regarding the types of knowledge policymakers need in order to make decisions: (a) Policymakers at the higher levels of governance (i.e., international and national level) demand and accept more fundamental and discursive knowledge to gain influence in global climate politics and to guide domestic policy directives. For instance, a science-based proposal to negotiate with China’s allies and opponents for fair burden sharing of GHG emissions reductions, and an understandable narrative with vision to convince domestic stakeholders to guide China’s low-carbon development; (b) Policymakers at the lower governmental levels (i.e., provincial and prefectural levels) demand and accept more applied knowledge due to their limited capacity and expertise for policy planning and implementation. This includes, for instance, the toolkits for developing the low-carbon plan for provinces and cities and the administrative guidelines for emissions inventories and running the ETS; (3) Regarding SPI in cross-level dynamics of China’s climate policy, the science-push model is more appropriate to depict the experts’ engagement with China’s climate policy at the higher governmental levels, and the policy-pull model appears more often at the lower levels.

To offer a comprehensive picture of SPI in China’s authoritarian context, this thesis identified several political considerations of Chinese policymakers for the adjustment and
uptake of the experts’ scientific advice and policy suggestions: (A) Timing: Chinese policymakers will not announce a decision when the time is not ripe; (B) National interests: Chinese policymakers will defend their perceived national interests in the international climate negotiations; (C) Scale: Policymakers consider not just factors at the present governance level but also factors at the higher and lower levels; (D) Political performance and accomplishment: When setting a target or deploying a policy instrument, policymakers are concerned more with political performance and accomplishment; (E) Feasibility and achievability: When setting a policy goal, it must be feasible and achievable; (F) The target responsibility system (TRS) set for assessing the performance of local officials and Party cadres; and (G) Regional competition: low-carbon development (LCD) and low-carbon economy (LCE) become local policymakers’ leverages to promote their territories.

Based on the nine case studies, this research demonstrates that the typology of four policy problems could help illuminate the varied roles of experts and their policy impacts. While the experts’ impact on unstructured problems is limited (CEPC, CBP, and the Climate Law), they have a significant effect on moderately structured problems (ends) (TD&T, Target-setting on CO₂ emissions reduction, carbon tax vs carbon trading, EI, and pilot ETS) and moderately structured problems (means) (LCPC). The nine case studies also echo the notion that experts can stimulate problem structuring by mediating SPI to reconstruct the present problem as a structured problem.

**Theoretical implications:** This thesis contributes to theorising SPI by employing an interpretive policy analysis (IPA) and a multiple/cross-level analysis of SPI in an authoritarian context. First, while the extant SPI literature primarily focuses on the role of science at the stage of policymaking, this thesis expands our understanding of the experts’ engagement with virtually all phases of China’s climate policy. It reveals that China’s climate policy is not just about national policymaking/state regulation vs local implementation/compliance. Rather, local actors are learning and redefining policies based on local knowledge and trial-and-error in each stage of the policy process. Concerning the policy-relevant knowledge, while only high-level political decision-makers demand fundamental (scientific) knowledge, policymakers at all governance levels demand discursive and applied knowledge to make decisions and disseminate to the target groups and stakeholders.

Second, the multiple-/cross-level analysis of SPI shows that both top-down and bottom-up knowledge travel occurs in China’s multi-level climate governance. Meanwhile, policymakers make decisions not just under the political settings at the given governance level; they also have to consider factors from the higher and lower governance levels (e.g.,
the policy choice between carbon taxation and carbon trading in Chapter 6). Additionally, I demonstrate that the same experts’ engagement with the policy process could be interpreted through different SPI models. For instance, while one can adopt the science-push model to describe Beijing experts’ contribution to developing guidelines and toolkits for local actors, it is also a policy-pull model since Chinese central policymakers demand that the experts do so (Chapter 9).

Lastly, while the existing literature has accumulated limited knowledge about SPI in an illiberal and authoritarian context, this research presented the political considerations and conditions for explaining the policymakers’ uptake of experts’ scientific input in China’s authoritarian regime. While the past SPI literature focuses primarily on the scientification of politics and policymaking, this research also contributes to understanding the politics/politicisation of science/knowledge. I argue that the political considerations and conditions for explaining SPI identified in this research (e.g., horizontal/vertical power relations and concerns of timing and political performance) could be a hypothesis to test in other countries, not just authoritarian regimes. Further, I hypothesise on the basis of this thesis that while in authoritarian countries local governments will be satisfied with applied knowledge once the central government has accepted the fundamental and discursive knowledge. This may not be the case in democratic countries where even local governments may need convincing about the fundamental and discursive aspects of the program. To sum up, researchers should consider the nature of politics to better understand the interplay between science and policy.
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## Abbreviation

<table>
<thead>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>AR</td>
<td>Assessment Report</td>
</tr>
<tr>
<td>AWG-ADP</td>
<td>The Ad Hoc Working Group on the Durban Platform for Enhanced Action</td>
</tr>
<tr>
<td>AWG-KP</td>
<td>The Ad Hoc Working Group on Kyoto Protocol</td>
</tr>
<tr>
<td>AWG-LCA</td>
<td>The Ad Hoc Working Group on Long-term Cooperative Action</td>
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<tr>
<td>BASIC countries</td>
<td>Brazil, South Africa, India, and China</td>
</tr>
<tr>
<td>CA</td>
<td>Contributing Author</td>
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<tr>
<td>CAAS</td>
<td>Chinese Academy of Agricultural Sciences</td>
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<td>CAEP</td>
<td>Chinese Academy of Environmental Planning</td>
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<tr>
<td>CAFS</td>
<td>Chinese Academy of Fiscal Science</td>
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<td>CAMS</td>
<td>Chinese Academy of Meteorological Sciences</td>
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<td>CANGO</td>
<td>China Association for NGO Cooperation</td>
</tr>
<tr>
<td>CAS</td>
<td>Chinese Academy of Sciences</td>
</tr>
<tr>
<td>CAS-IAP</td>
<td>Institute of Atmospheric Physics, Chinese Academy of Sciences</td>
</tr>
<tr>
<td>CAS-IPM</td>
<td>Institute of Policy and Management, Chinese Academy of Sciences</td>
</tr>
<tr>
<td>CASS</td>
<td>Chinese Academy of Social Sciences</td>
</tr>
<tr>
<td>CASS-IUE</td>
<td>Institute for Urban and Environmental Studies, Chinese Academy of Social Sciences</td>
</tr>
<tr>
<td>CASS-RCSD</td>
<td>Research Centre for Sustainable Development, Chinese Academy of Social Sciences</td>
</tr>
<tr>
<td>CBA</td>
<td>Carbon Budget Account</td>
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<tr>
<td>CBAP</td>
<td>Caron Budget Account Proposal</td>
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<td>CBDR</td>
<td>Common but differentiated responsibilities</td>
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<td>CBEEX</td>
<td>China Beijing Environment Exchange</td>
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<tr>
<td>CBP</td>
<td>Carbon budget proposal</td>
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<tr>
<td>CCCPC</td>
<td>Central Committee of Communist Party of China</td>
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<tr>
<td>CCI</td>
<td>Clinton Climate Initiative</td>
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<td>CCICED</td>
<td>China Council for International Cooperation on Environment and Development</td>
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<tr>
<td>CCP</td>
<td>Chinese Communist Party</td>
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<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
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<td>CEEX</td>
<td>China Emissions Exchange at Guangzhou</td>
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<td>CEPC</td>
<td>Cumulated Emissions Per Capita</td>
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<td>Abbreviation</td>
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<tr>
<td>CEPREI</td>
<td>The CEPREI Calibration &amp; Testing Centre</td>
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<td>CER</td>
<td>Certified Emissions Reduction</td>
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<td>CIFD</td>
<td>China Academic Journals Full-text Database</td>
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<td>CLA</td>
<td>Coordinating Lead Author</td>
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<td>CLEMF</td>
<td>China Low-carbon Economy Media Federation</td>
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<td>CMA</td>
<td>China Meteorological Administration</td>
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<td>CNCCP</td>
<td>China’s National Climate Change Programme</td>
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<td>CNKI</td>
<td>China National Knowledge Infrastructure</td>
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<tr>
<td>CO</td>
<td>Carbon monoxide</td>
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<td>CO₂</td>
<td>Carbon dioxide</td>
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<td>COP</td>
<td>Conference of the Parties</td>
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<td>CQC</td>
<td>China Quality Certification Centre</td>
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<td>CRELE</td>
<td>Credibility, relevance, and legitimacy</td>
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<tr>
<td>CTC</td>
<td>The Climate Technology Centre</td>
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<tr>
<td>CTCN</td>
<td>The Climate Technology Centre and Network</td>
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<tr>
<td>CUPL</td>
<td>China University of Political Science and Law</td>
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<tr>
<td>DCC</td>
<td>Department of Climate Change (central government) / Division of Climate Change (provincial government)</td>
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<tr>
<td>DRC</td>
<td>Development and Reform Commission</td>
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<tr>
<td>DRC</td>
<td>Development Research Centre under the State Council</td>
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<tr>
<td>EC</td>
<td>Ecological civilisation</td>
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<td>ECA</td>
<td>Epistemic community approach</td>
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<td>EDF</td>
<td>Environmental Defense Fund</td>
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<td>EI</td>
<td>Emissions inventory</td>
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<td>ENGO</td>
<td>Environmental non-governmental organisation</td>
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<td>ERI</td>
<td>Energy Research Institute</td>
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<td>Emissions Trading Scheme</td>
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<td>European Union</td>
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<td>FA</td>
<td>Fragmented authoritarianism</td>
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<td>FYP</td>
<td>Five-Year Plan</td>
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<td>Group of 77</td>
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<td>GCB</td>
<td>Global carbon budget</td>
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<td>Green Climate Fund</td>
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<td>GD-DRC</td>
<td>Guangdong Provincial Development and Reform Commission</td>
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<td>GD-DST</td>
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<td>GDAF</td>
<td>Guangdong Academy of Forestry</td>
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<td>GDCC</td>
<td>Guangdong Climate Centre</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GDRCCC</td>
<td>Guangdong Research Centre for Climate Change</td>
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<tr>
<td>GDTE</td>
<td>Guangdong Techno-economy Research and Development Centre</td>
</tr>
<tr>
<td>GEE</td>
<td>Guizhou Environment and Energy Exchange</td>
</tr>
<tr>
<td>GEF</td>
<td>Global Environmental Facility</td>
</tr>
<tr>
<td>GEI</td>
<td>Global Environmental Institute</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
</tr>
<tr>
<td>GIEC</td>
<td>Guangzhou Institute of Energy Conversion, Chinese Academy of Science</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</td>
</tr>
<tr>
<td>GLCDPA</td>
<td>Guangdong Low-Carbon Development Promotion Association</td>
</tr>
<tr>
<td>GONGO</td>
<td>Government-organised non-governmental organisation</td>
</tr>
<tr>
<td>ICCSD</td>
<td>Institute for Climate Change and Sustainable Development</td>
</tr>
<tr>
<td>ICLEI</td>
<td>International Council for Local Environmental Initiatives</td>
</tr>
<tr>
<td>iGDP</td>
<td>Innovative Green Development Programme</td>
</tr>
<tr>
<td>INDC</td>
<td>Intended Nationally Determined Contribution</td>
</tr>
<tr>
<td>INGO</td>
<td>International non-governmental organisation</td>
</tr>
<tr>
<td>IPA</td>
<td>Interpretive policy analysis</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>JI</td>
<td>Joint Implementation</td>
</tr>
<tr>
<td>IR</td>
<td>International Relations</td>
</tr>
<tr>
<td>KP</td>
<td>Kyoto Protocol</td>
</tr>
<tr>
<td>KU</td>
<td>Knowledge utilisation</td>
</tr>
<tr>
<td>LA</td>
<td>Lead Author</td>
</tr>
<tr>
<td>LCB</td>
<td>Low-carbon Bureau</td>
</tr>
<tr>
<td>LCC</td>
<td>Low-carbon city</td>
</tr>
<tr>
<td>LCD</td>
<td>Low-carbon development</td>
</tr>
<tr>
<td>LCE</td>
<td>Low-carbon economy</td>
</tr>
<tr>
<td>LCEC</td>
<td>Low-carbon eco-city</td>
</tr>
<tr>
<td>LDC</td>
<td>Least developed countries</td>
</tr>
<tr>
<td>LDCEF</td>
<td>Least Developed Countries Fund</td>
</tr>
<tr>
<td>LNG</td>
<td>Liquefied natural gas</td>
</tr>
<tr>
<td>LPG</td>
<td>Liquid petroleum gas</td>
</tr>
<tr>
<td>LCCP</td>
<td>Low-carbon city pilot</td>
</tr>
<tr>
<td>LCPC</td>
<td>Low-carbon province and city pilot</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>LCPPP</td>
<td>Low-carbon province pilot programme</td>
</tr>
<tr>
<td>MEE</td>
<td>Ministry of Ecology and Environment</td>
</tr>
<tr>
<td>MEP</td>
<td>Ministry of Environmental Protection</td>
</tr>
<tr>
<td>MICE</td>
<td>Meetings, incentives, conferences, and exhibitions</td>
</tr>
<tr>
<td>MLG</td>
<td>Multi-level governance</td>
</tr>
<tr>
<td>MOA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>MOF</td>
<td>Ministry of Finance</td>
</tr>
<tr>
<td>MOHURD</td>
<td>Ministry of Housing and Urban-Rural Development</td>
</tr>
<tr>
<td>MOST</td>
<td>Ministry of Science and Technology</td>
</tr>
<tr>
<td>MOU</td>
<td>Memorandum of Understanding</td>
</tr>
<tr>
<td>NDRC</td>
<td>National Development and Reform Commission</td>
</tr>
<tr>
<td>NCC</td>
<td>National Climate Centre</td>
</tr>
<tr>
<td>NCGCC</td>
<td>National Coordination Group on Climate Change</td>
</tr>
<tr>
<td>NCGCCS</td>
<td>National Coordination Group on Climate Change Strategy</td>
</tr>
<tr>
<td>NCSC</td>
<td>National Centre for Climate Change Strategy and International Cooperation</td>
</tr>
<tr>
<td>NDC</td>
<td>Nationally Determined Contribution</td>
</tr>
<tr>
<td>NECCCC</td>
<td>National Expert Committee on Climate Change</td>
</tr>
<tr>
<td>NEA</td>
<td>National emissions account</td>
</tr>
<tr>
<td>NEA</td>
<td>National Energy Administration</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Protection Agency</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organisation</td>
</tr>
<tr>
<td>NLGACC</td>
<td>The National Leading Group for Addressing Climate Change</td>
</tr>
<tr>
<td>NLGACCECER</td>
<td>The National Leading Group for Addressing Climate Change and Energy Conservation and Emissions Reduction</td>
</tr>
<tr>
<td>NO&lt;sub&gt;x&lt;/sub&gt;</td>
<td>Nitrogen oxide</td>
</tr>
<tr>
<td>NPC</td>
<td>National People’s Congress</td>
</tr>
<tr>
<td>ODS</td>
<td>Ozone depleting substances</td>
</tr>
<tr>
<td>PAC</td>
<td>Policy package of China</td>
</tr>
<tr>
<td>PNS</td>
<td>Post-normal science</td>
</tr>
<tr>
<td>QDECI</td>
<td>Qingdao Engineering Consulting Institute</td>
</tr>
<tr>
<td>QIBE BT</td>
<td>Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences</td>
</tr>
<tr>
<td>QUST</td>
<td>Qingdao University of Science and Technology</td>
</tr>
<tr>
<td>RC</td>
<td>Respective capabilities</td>
</tr>
<tr>
<td>RE</td>
<td>Review Editor</td>
</tr>
<tr>
<td>RIFS</td>
<td>Research Institute for Fiscal Science</td>
</tr>
<tr>
<td>PECE</td>
<td>Programme of Energy &amp; Climate Economics</td>
</tr>
</tbody>
</table>
ABBREVIATIONS

PHCER  Tan Pu Hui certified emissions reduction
PRC  People’s Republic of China
RUC  Renmin University of China
SAR  Scientific Assessment Report
SBSTA  Subsidiary Body for Scientific and Technological Advice
SCCF  Special Climate Change Fund
SCLGECER  The State Council Leading Group on Energy Conservation and Emissions Reduction
SDPC  The State Development Planning Commission
SEI  Stockholm Environment Institute
SO₂  Sulphur dioxide
SOE  State-owned enterprise
SPF  Strategic Programme Fund
SPI  Science-policy interface
SSTC  State Science and Technology Commission
STS  Science and technology studies or the study of science, technology and society
SYSU  Sun Yat-sen University
TA  Technical assistance
TD&T  Technology development and transfer
TEC  Technology Executive Committee
TM  Technology Mechanism
TRM  The Technology Roadmap
TRS  Target responsibility system
TWN  Third World Network
UNDP  United Nations Development Programme
UNEP  United Nations Environment Programme
US  United States of America
UK  United Kingdom
UNFCCC  United Nations Framework Convention on Climate Change
WBGU  German Advisory Council on Global Change
WCP  World Climate Programme
WG  Working Group
WOS  Web of Science
WMO  World Meteorological Organisation
WRI  World Resources Institute
WWF  World Wild Fund for Nature
Chapter 7 is written on the basis of the author’s published peer-reviewed article: