

China and the United States' Critical Roles in Tackling Climate Change and Shaping the International Regimes*

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This paper argues that major powers can play critical roles in a complicated regime system, as evidenced by China and the U.S. which have had pivotal influence in the construction of the post-2020 climate regime. China and the U.S. have participated in multilateral consultations beyond the scope of the United Nations Framework Convention on Climate Change (UNFCCC) while making use of many political platforms, such as Asia-Pacific Economic Cooperation (APEC), G20, and informal meetings and dialogues to bridge the gap among various approaches to mitigating climate impacts. China-U.S. bilateral cooperation has incorporated energy and climate issues into the strategic and economic dialogue (S & ED) and launched other schemes, such as EcoPartnerships and wide-ranging dialogues and initiatives on clean energy/clean vehicles. These schemes support the reconciliation of ideas related to domestic abatement policies in the areas of energy, climate change, and environmental protection. Since the Trump administration came to power in 2017, the bilateral cooperation at national level has been retreated significantly and therefore slowdown the UN's institutional response to climate change. At the stage, the U.S. may not be able to play a critical role in shaping the regime, yet China is regarded to be the most important player in negotiations under the Paris Agreement.

Keywords: Sino-U.S. relations, climate change, the Paris Agreement, Major Economies Forum on Energy and Climate Change (MEF), S & ED, EcoPartnerships, UNFCCC

Introduction

Recent studies have analyzed international regimes related to the issue of climate change from the viewpoint of the regime complex. For example, Robert O. Keohane and David G. Victor have emphasized fragmentation in the international system that deals with climate change by proposing the concept of a regime complex. The regime complex for climate change has been explained by Keohane and Victor (2010) as “a loosely coupled system of institutions; it has no clear hierarchy or core, yet many of its elements are linked in complementary ways”. Through rounds of climate change negotiations, many regime types have formed, reflecting a complicated interest structure among countries, and this trend is continuing (Raustiala & Victor, 2004; Alter & Meunier, 2006). This indicates that contemplation of climate change negotiations after the Paris Agreement and the future collaboration among organizations based on the concept of a regime complex will be useful. However, it is still not clear why “complementary linkage” between overlapping regimes is possible.

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It is generally stated that overlapping regimes likely compete, and this competition, in some cases, reduces the efficiency of cooperative systems. However, considering negotiations that continued until the Paris Agreement was officially adopted by the UN in 2015, the following observations can be made.

First, the United Nations Framework Convention on Climate Change (UNFCCC) is still considered a legitimate platform for the construction of an international cooperation system, despite the creation of many alternative regimes (UNFCCC, 2012). The role of the UN has long been under criticism, but, in fact, it is still regarded as a core international regime through which to address climate issues. This point of view has gained support since the Paris Agreement was adopted and entered into force. Thus, we need to ask why the UN succeeded in shaping the framework of cooperation. Second, many concrete ideas about constructing a post-Kyoto Protocol system resulting from discussions outside the UN were agreed upon within the UNFCCC. Accordingly, it is instructive to ask who brought outside influences into UN negotiations. Third, confrontation between major countries has not always worsened, mainly owing to improvements in relationships via platforms outside the UN. In pushing forward bilateral or multilateral approaches, major emitters, including the U.S. and China, share common goals that are agreed upon within the UN. Why and how have the U.S. and China shifted their relationship from a rivalry to a partnership? Despite our focus on outcomes achieved through UN negotiations, it is also important to consider factors unrelated to the UN that positively determined UN outcomes.

All the above-mentioned developments in climate change negotiations are not explained in terms of overlapping regimes characterized with respect to the regime complex. This paper makes a theoretical argument for why complementary relationships can be generated between overlapping regimes. Additionally, it examines the roles of major actors outside the UN by looking at progress in international negotiations and improvements in the relationship between the U.S. and China to complement Keohane and Victor's concept of a climate change regime complex.

Regime Complex for Climate Change and “Critical Roles” of Major Actors

Regime Complex for Climate Change

The concept of a regime complex, which involves a complicated international regime system, was first introduced by Raustiala and Victor. They defined a regime complex as “an array of partially overlapping and nonhierarchical institutions governing a particular issue-area”; in particular, “where interests are varied and complex it is difficult to specify precise rules *ex ante*, and the transaction costs for making formal changes to rules that span multiple regimes is [sic]high” (Raustiala & Victor, 2004, p. 280). They also indicated “the rules in these elemental regimes functionally overlap, yet there is no agreed upon hierarchy for resolving conflicts between rules” (Raustiala & Victor, 2004; Keohane & Victor, 2010). This raises the following question: how can overlapping rules possibly function complementarily?

Dealing with climate change is already an urgent and universal problem, but friction over national interests is unchanged because there is no clear hierarchy among nation-states. Keohane and Victor tried to understand current international climate change-related cooperation by applying the regime complex, describing it as “a wide range that includes nested (semi-hierarchical) regimes with identifiable cores and non-hierarchical but loosely coupled systems of institutions” (Keohane & Victor, 2010).¹ Instead of building a new architecture or agreeing on a universal treaty, they promote regime complexes to address climate change by taking advantage

¹ “The climate change regime complex is a loosely coupled system of institutions—it has no clear hierarchy or core yet many of its elements are linked in complementary ways” (Keohane & Victor, 2010, p. 4).

of existing international regimes and systems. Two merits of using the concept of the regime complex, which is built to resolve environmental deterioration in many ways, can be acknowledged, as follows.

First, the regime complex provides a framework to comprehensively consider many systems that have been established to deal with climate change. Since climate change is a multidimensional and complicated problem relevant to various fields, such as the natural sciences, environmental science, politics, security, economics, society, industry, and technology, it should be favorable to involve many professional institutions. Regime complex explicitly acknowledges the involvement of various specialized institutions and international institutions and organizations, and accordingly the situation can be considered in a more realistic manner and with more flexibility.

Second, the regime complex for climate change serves as a basis for policy analysis. In other words, from this point of view, it is possible to avoid significant changes to the current international cooperation system and to minimize the cost of building a structure (Keohane & Victor, 2010). The regime complex for climate change argues that by effectively utilizing the existing international regime, the cost of establishing the post-Kyoto framework can be minimized. The Kyoto Protocol, with the first commitment period of four years from 2008 to 2012, although agreed upon as a comprehensive international treaty, regulated only 27% of the total worldwide Greenhouse Gas (GHG) emissions owing to the U.S. withdrawal and emerging economies' refusal to regulate emissions. Making use of the established international regime to lower the cost of international negotiations would be a rational response. This implies that a policy approach to climate change, developed in accordance with the concept of a regime complex, has substantial advantages.

One problem with the climate change regime complex presented by Keohane and Victor is related to the complementary relationship between overlapping regimes, as mentioned in the "Introduction". They identified the regime complex as "a loosely coupled system of institutions—it has no clear hierarchy or core, yet many of its elements are linked in complementary ways"; at the same time, they did not offer a clear theoretical interpretation for why complementary linkage between regimes is achievable. Therefore, it is thought to be difficult to obtain a logical explanation for the complex international negotiations in the post-Kyoto framework. In fact, there are many bilateral and multilateral negotiations that overlap with each other during the process of decision-making with respect to post-Kyoto agreements, and these overlapping regimes or arrangements seem to include not only oppositional but also complementary or cooperative relationships, all of which complicate the current situation regarding climate negotiations. This paper aims to provide a theoretical explanation for complementary relationships that have been generated between international regimes and arrangements.

Two factors are considered to explain theoretical ambiguity regarding the formation of complementary relationships between overlapping regimes under Keohane and Victor's viewpoint. The first is that they regard international regimes as having been developed and maintained by path-dependence or historical contingency (Keohane & Victor, 2010).² However, in some cases, states in fact flexibly adjust confrontation over complicated interests and even establish an international regime to effectively practice diversifying measures. For instance, in the process of negotiations over the regulation of GHG emissions, even though many policy makers felt it was difficult to achieve a global agreement, major emitting countries set up various international

² "...international regimes often come about not through deliberate decision making at one international conference, but rather emerge as a result of 'codifying informal rights and rules that have evolved over time through a process of converging expectations or tacit bargaining.' That is, they emerge in path-dependent, historically-shaped ways" (Keohane & Victor, 2010, pp. 3, 9).

regimes or arrangements to break through the stagnant situation, where mitigation, adaptation, and so on were discussed in parallel with the UN negotiation.

The second explanation for the ambiguity is that the concept is based on a fixed interest structure between main actors, without considering dynamic transformations of interest structures. Keohane and Victor (2010) argued that the fragmentation of international regimes occurs owing to inconsistencies in the interests of major actors with respect to faith, power, information, benefits, and so on.³ However, due to the uncertainty of climate change and changes in interests over time, it is impossible to exclude the possibility that the bargaining power of major countries will change, thereby affecting the structure of conflicts of interest. In fact, it was observed that the United States and China, which are the most important countries that influence the success or failure of international cooperation, alleviated conflicts of interest and resolved a conflict situation to a considerable extent.

Critical Roles of Major Actors Under the Regime Complex

The regime complex for climate change points out the difficulties and limitations of the construction of a single international regime to deal with the climate change problem and provides a feasible solution. However, from the viewpoint of Keohane and Victor, although overlapping complementary relations between international regimes are emphasized, the conditions for the formation of a complementary relationship between regimes are not discussed. Therefore, this paper presents conditions and considers the “critical role” played by major actors, that is, the U.S. and China, in the progress of international negotiations in recent years within and outside of the UN.

Diversification and the share of corresponding measures. Despite its adoption in 1997, the Kyoto Protocol lost its effectiveness due to the withdrawal of the United States, and the reduction obligation was not imposed on developing countries, including China.⁴ Thus, in the negotiations for a post-Kyoto framework, the requirement for comprehensive cooperation between major economies and emitters, including both developed and developing countries, intensified. In addition to GHG emission reductions, major countries began to emphasize the importance of adaptation to the negative consequences of the frequent occurrence of natural disasters and extreme weather events. In addition, instead of setting legal numerical targets for reducing GHG emissions, “mitigation” which does not necessarily set absolute reduction targets and reduces relative increases in emissions, and “adaptation” which refers to coping with the negative impacts of climate change, have both become important and are increasingly emphasized.

The basis for proactively promoting mitigation and adaptation measures is the expansion of climate-related natural disasters and associated damage. The international society has engaged in negotiations involving a great deal of time and effort over the years, but the GHG concentration in the atmosphere is increasing worldwide and the impact of climate change-related extreme weather events can no longer be ignored.⁵ It is argued that melting sea ice, rising sea levels, frequent occurrences of extraordinary weather, and depletion of water resources caused by severe climate change represent a direct threat to human society (Busby, 2008).

³ “...When patterns of interests (shaped by beliefs, constrained by information and weighted by power) diverge to a greater or lesser extent, major actors may prefer a regime complex to any feasible comprehensive, highly integrated, institution” (Keohane & Victor, 2010, p. 3).

⁴ World GHGs emissions have grown 14% after the enforcement of the Kyoto Protocol. “Total GHG Emissions Excluding LUCF, 2005-2010”, World Resources Institute, Climate Analysis Indicators Tool (CAIT) 2.0. Beta (accessed on September 1, 2013).

⁵ “Summary for Policymakers: Climate Change 2014: Synthesis Report”, accessed on January 31, 2014).

Other researchers have also pointed out that the progression of climate change strengthens existing social and political contradictions and factors that may trigger conflict and accordingly can weaken domestic, social, and political stability (Homer-Dixon, 1999; Barnett & Adger, 2007). In any case, the seriousness of climate change is an objective phenomenon and is the result of economic activities of mankind; its progression has long-term impacts on the economy, society, politics, culture, and human livelihoods. Given that the broad impacts and adverse effects on the natural environment must be addressed with urgency, major countries with different positions must commonly recognize the importance of collective effort (UN Security Council, Department of Public Information, 2007; UN Security Council, 2011).

Exercise of major countries' critical roles. Regarding the quantitative reduction of GHG emissions in the framework of the Kyoto Protocol, the U.S. repeatedly claimed that emerging economies, such as China, should be responsible for as much of the burden as developed countries, while China firmly refused to share the burden. The difference in the interest structure between these two major superpowers is the fundamental cause of the difficulties in international cooperation.

China's economy and emissions have grown significantly since the 1990s, and GHG emissions by the U.S. and China together account for 41% of the world's total emissions (International Energy Agency [IEA], 2011). If major powers, such as the U.S. and China do not actively enforce emissions reduction and mitigation measures, problems will continue to worsen without effective remedial measures against climate change (Clarke et al., 2009). Owing to their large contributions to climate change, including emissions, the two countries are major powers that can play critical roles in the post-Kyoto framework. Thus, the policy-making process involving international cooperation is substantially influenced by these countries. The structure of the interests of the two countries is not always fixed or constant. The two countries may coordinate conflicts of interest according to their respective purposes, playing a critical role in the establishment of the international regime and international cooperation.

In fact, the U.S. and China have already predicted that changing climate and dead-end international negotiations will delay cooperative efforts and eventually have a serious impact on both countries; thus, the two countries began working together to break through the stagnation. Concretely speaking, the two governments have engaged in dialogues on climate change measures and the efficient use of energy to ensure economic stability, environmental protection, and energy security, and have supported the continuation of international negotiations in the UN. This seems to represent a shift in the structure of conflicting interests by gradually forming a common aim to construct a scheme from which both sides could benefit. In this way, it is supposed that the complementary relationship was enabled between the UN, an established international regime, and other multilateral talks because the U.S. and China have effectively balanced inter-country interests under various multilateral platforms outside the UN.

It can be argued that the critical roles of the U.S. and China have been influenced by at least three dimensions in the process of building the international regime of the post-Kyoto Protocol. The first dimension is *building mutual trust*. After climate negotiations reached a deadlock owing to the absence of mutual trust between the U.S. and China, bilateral climate cooperation was subsequently promoted as one of the major themes to improve bilateral relations. The second factor is *the clarification of issues and compromises*. Owing to frequent dialogue between the U.S. and China, the core areas of conflict in climate negotiations became clear, resulting in a common awareness of various countermeasures and solutions. The third is *the adjustment of conflicting interests*. By coordinating interests among countries by efforts outside the UN, severe controversy at

UN negotiations and a collapse of the UNFCCC conference were avoided, and thereby a power-driven system was built.

In discussions regarding international cooperation on the issue of climate change, it has been fundamental for interests of actors to be invariable, based on neo-liberalism, in which absolute gains are emphasized. However, the interests of actors are not necessarily constant; they can vary according to various factors, such as the diversification of coping methods, technological innovation, and stochastic or unexpected changes in circumstances. With respect to these points, which have often been overlooked, the following sections of the paper spotlight how the U.S. and China diversified abatement approaches, supported innovation, and reduced uncertainty, through a case study.

The Sino-U.S. Strategic Partnership on Energy and Climate Change

Notwithstanding the disagreement between the U.S. and China over the responsibility for tackling climate change, which was identified as the main cause of the stalemate in their negotiations, the two countries have recently agreed to cooperate to reduce or slow the increase in GHG emissions (Han, Hallding, Carson, Thai, & Nilsson, 2009; International Energy Agency, 2015). Sino-U.S. cooperation on climate change has expanded and intensified to a great extent in recent years (Cheng, 2015). To better understand the effects of bilateral partnerships on climate change, energy, and the environment in each country, the development of bilateral cooperation is discussed below by reviewing the frameworks and projects that have been implemented in recent years.

Sino-U.S. SED (G.W. Bush Administration) and S & ED (Obama Administration)

The U.S.-China strategic economic dialogue (SED) was established to facilitate discussion on topics related to U.S. and Chinese economic issues under the G.W. Bush and Hu Jintao administrations in 2006. SED was held five times in total, with periodic meetings from 2006 to 2008, and it has continued as the U.S.-China strategic and economic dialogue (S & ED) under the Barack Obama administration since 2009 (U.S. Department of State, 2011). SED was initiated by the U.S. Department of Treasury, spearheaded by its former Secretary Henry Paulson, who advocated closer economic relations with China, including policies for environmental protection and sustainable economic growth. SED later expanded its focus to embrace a wider range of topics, and as a result the current U.S. State Department was given a broader authority by the Obama administration.⁶

To deal with energy and environmental issues, the Ten-Year Framework for Cooperation on Energy and Environment (TYF) was established in 2008 at the fourth SED. The TYF aims to foster innovative solutions for existing energy and environmental problems by facilitating the exchange of information and best practices (U.S. Department of State, 2012). To date, the TYF has had seven focus areas, involving various sub-national public and private actors from the U.S. and China in order to encourage innovation and sustainable development among state and non-state stakeholders. Further details on the TYF are provided in the next section.

Since 2009, China and the U.S. have held S & ED periodically to discuss critical issues. At the first S & ED, held in July 2009, the U.S. and China signed the Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and the Environment (MOU), which can be considered a starting point for

⁶ Author's interview with a research fellow at the Center for Strategic and International Studies (CSIS), Washington, DC, November 2014.

cooperation on energy and climate change. The 2009 MOU was aimed at cooperation on a wide range of issues, while strengthening the existing TYF (see Figure 1 and Table 1).

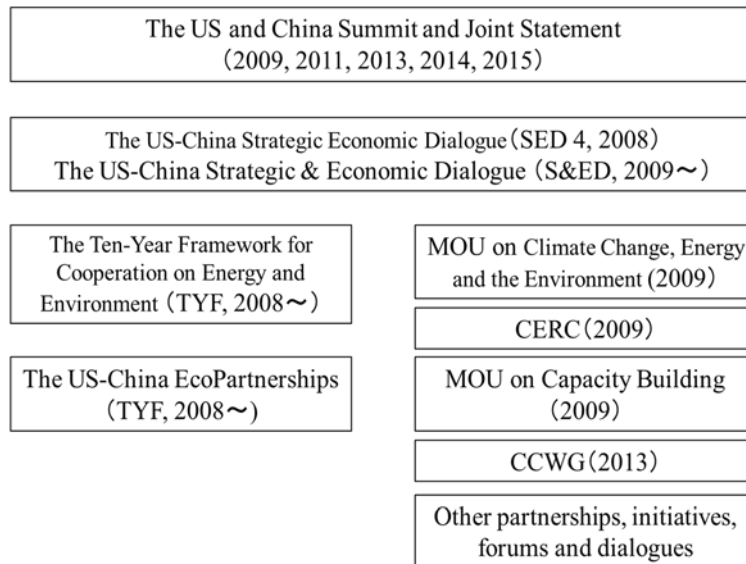


Figure 1. Structure of Sino-U.S. partnerships on energy and climate change (Source: Author).

Table 1

Sino-U.S. Cooperation on Energy and Climate Change

Cooperation	Cooperation topics/Focuses areas
SED IV Initiating TYF and EcoPartnerships	(1) Energy saving for electric power systems and logistics (2) Efficiency of transportation (3) Water pollution (4) Air pollution (5) Forests and wetlands protection
S & ED I Joint Press Statement of the First S & ED	Signature of First Memorandum on climate change
S & ED I Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and the Environment	Ten fields in a cooperative relationship including: Energy-saving Renewable energy Clean coal Carbon Capture and Storage (CCS)
The Sino-U.S. Joint Statement (President Obama visits China)	To launch or to establish: (1) The clean energy research center (2) The Electric Vehicles Initiative (3) New energy saving action plan (4) New renewable energy partnership (5) Large-scale CCS project (6) Promotion of clean coal (7) New Shale Gas Initiative (8) The Energy Cooperation Program (ECP)
Protocol for Cooperation on a Clean Energy Research Center	Research subjects include: Energy efficiency of buildings Clean energy CCS Clean vehicles To support: (1) The Electric Vehicles Initiative (2) Large-scale CCS project

Table 1 to be continued

The Sino-U.S. Joint Statement (President Hu visits the U.S.)	Confirmation of current dialogues and negotiations Support for UNFCCC, COP, and the Cancun Agreement
S & ED III Improvement of TYF and EcoPartnerships	Signature of the six new EcoPartnerships under the TYF
Joint Sino-U.S. Statement on Climate Change	Establishment of the Sino-U.S. Bilateral Working Group on Climate Change (CCWG)
The Sino-U.S. Joint Statement (President Xi visits the U.S.)	Phase down the consumption and production of hydro fluorocarbons (HFCs) under the Montreal Protocol
S & ED V The Sino-U.S. Joint Statement	Continuation of the current work of the CCWG Five fields of cooperation added to prompt GHG emission reduction
S & ED VI	Eight new EcoPartnerships CCWG special event on the private sector Policy dialogue among top negotiators
APEC Summit (Beijing) Sino-U.S. Joint Announcement on Climate Change and Clean Energy Cooperation	Reduction of 26%-28% GHG emissions by 2025 from 2005 levels in the U.S. CO ₂ emissions to peak out around 2030 in China; Increase in the non-fossil fuel share of all energy to around 20% by 2030
S & ED VII	Two high-level events to strengthen joint efforts on climate change: a public dialogue and a private joint session on climate change Announcement of new projects, initiatives, programs, and EcoPartnerships Discussion on 2015 Paris Agreement through an "enhanced policy dialogue"

Notes. Source: Author; References: U.S. State Department; Committee on Sino-U.S. Cooperation on Electricity from Renewable Resources et al. (2010, pp. 205-216); Sino-U.S. EcoPartnership official website.

In the MOU, the U.S. and China agreed to launch a new action plan for energy efficiency under the TYF. Furthermore, to achieve mutual goals, the Memorandum of Capacity Building⁷ and the Protocol Clean Energy Research Center (CERC)⁸ were also signed (see Figure 1). At the second S & ED in May 2010, the countries agreed to address energy and climate change-related issues by announcing an action plan under the S & ED and TYF, and they signed an Implementation Plan for EcoPartnerships. These partnerships aim to promote collaborative relationships between the public and private sectors. In addition, the dialogue was designed to accelerate the application of clean energy by improving technologies and the competitiveness of companies.

The subject of climate change was again taken up in a Joint Statement at the Sino-U.S. Summit in January 2011, when Chinese President Hu Jintao visited the U.S. Both sides agreed to support the Clean Energy Research Center, the Renewable Energy Partnership, the Joint Statement of Cooperation on Energy Security, the TYF, and the Cancun Agreement (U.S. Department of State, 2011). They also agreed to continue to negotiate under the UNFCCC. In 2013, the Bilateral Sino-U.S. Working Group on Climate Change (CCWG) was established and became one of the most important focal points of the strategic partnerships (U.S. Department of State, 2013a).

The two sides agreed on a joint effort to phase out the emission and consumption of hydro fluorocarbons (U.S. Department of State, 2013b). This is the first direct cooperation between the U.S. and China to reduce

⁷ Full title: "The Memorandum of Cooperation between the National Development and Reform Commission of the People's Republic of China and the Environmental Protection Agency of the United States of America to Build Capacity to Address Climate Change".

⁸ Full title: "The Protocol between the Department of Energy of the United States of America and the Ministry of Science and Technology and the National Energy Administration of the People's Republic of China for Cooperation on a Clean Energy Research Center".

GHG emissions, and both actors confirmed that they would continue their efforts at the fourth S & ED in 2014. The CCWG aims to intensify this cooperative relationship facilitating enhanced policy dialogues among major policy makers and stakeholders in public and private sectors (U.S. Department of State, 2014a). Both sides agreed to work together to reach a global agreement by the 21st Conference of Parties (COP) of the UNFCCC, scheduled to be held in Paris in December 2015 (Stern, 2014). The working group issued its first report to the 5th S & ED in July 2013, with suggestions for launching new action plans for future cooperation. Later, in November 2014, before the close of the 22nd APEC economic leader's meeting, President Obama and President Xi released a Joint Announcement on Climate Change and Clean Energy, including their targets to cut 26% to 28% of GHG emissions from the 2005 levels by 2025 in the U.S., and to peak out CO₂ emissions by 2030 in China (U.S. Department of State, 2015a; 2015b; 2016).

The current position of the U.S. and China on climate change and clean energy has been shaped by their bilateral cooperation and through consecutive dialogues and communication. Of note, the S & ED has provided a bilateral platform for the two countries to negotiate international agreements. With the CCWG, TYF, EcoPartnerships, and many other initiatives, the S & ED has brought about both political-strategic and practical outcomes through dialogues and projects involving national and sub-national public and numerous private actors. Although international negotiations were in a deadlock for decades, the Sino-U.S. bilateral cooperation became enhanced because energy-related technology transfers and information exchanges certainly served the interests of both the U.S. and China. In other words, the objective to search for a strategic foundation to break through the stagnation in international negotiations, while meeting their practical goals, remains crucial for the two countries to secure their national interests and to maintain influential positions in international negotiations.

The U.S. Announcement of Withdrawal From the Paris Agreement under Trump Administration

As demonstrated above, the Sino-U.S. bilateral cooperation on climate change has increased significantly via the initiation of dialogues and various programs in recent years. However, certain potential issues persist. For example, the partnerships are not compulsory. In other words, they are not legally binding, but are simply based on initiatives, forums, dialogues, and voluntary projects/programs, each of which could be negatively influenced by political confrontations or other exogenous factors. The changed administration in the U.S. was the best counter-evidence. Since President Trump took office, the U.S.-China turned out to make no specific progress in high level cooperation on related issues. Although there may have a chance to be altered again after President Trump stepped down.

Soon after the inauguration of Presidential Donald Trump, he announced U.S. withdrawal from the Paris Agreement on June 1, 2017, along with refusing to provide financial support to Global Climate Fund (GCF) for developing countries in responding climate change (The White House, 2017). Negotiation on finance related issues are always the most sensitive one. So that stopping funding GCF irritates most of the developing countries and may significantly erode political trust in the UN-based multilateral system (Urpelainen & Van de Graaf, 2018).

As federal government's domestic response to climate policy, President Trump not only repealed Obama's clean power plant act (CPP) but also encouraged the use of coal-fired power plant, rolled back motor vehicle emission standards (Jotzo, Depledge, & Winkler, 2018; Berardo & Holm, 2018). The administration also cut the research budget on climate science, such as climate change related programs at National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA), and on

research and development grant of renewable and clean energy under current EPA. All in all, these actions targeted with taking away the role of U.S. in reducing carbon emission and playing as global leader in regime building, which is consistent with President Trump's criticism on multilateralism (Robinson, 2017). The retreat of the U.S. inevitably reduces other countries' emission space, raising emission reduction cost thus put huge pressure for the global community to achieve 2-degree goal (Dai, Zhang, & Wang, 2017; Zhang, Dai, Lai, & Wang, 2017; Sprinz, 2018; Jotzo et al., 2018).

In contrast to Trump's opposing to tackle climate change and federal government's negative attitude on de-carbonization, sub-national cooperation has been further facilitated under state government's initiatives and became more important (Chen et al., 2018; Galik, De Carolis, & Fell, 2017; Pickering, McGee, Stephens, & Karlsson-Vinkhuyzen, 2018). Regarded as a symbolic event, recently organized conference, the Global Climate Action Summit, which held on September 12-14 in San Francisco, shows that the U.S. current leadership goes from global and international to regional and sub-national.

According to the Paris Agreement, although the official withdrawal will not come into effect until 2021, the withdrawal decision has caused huge political impact on the progress of global regime construction under the Agreement. The impact includes the foundation of global climate governance and process of climate cooperation (Zhang, Chao, Zheng, & Huang, 2017; Jotzo et al., 2018). Thus, based on its ability and attitude, China's role was naturally expected by European and other developing countries' leaders. Whether China can lead the world to implement the climate agreement without the U.S. is not the subject of the paper, but it is foreseeable that China will still play a key role in global governance in responding climate change (Robinson, 2017; Jotzo et al., 2018; Urpelainen, 2018).

Sino-U.S. Cooperation on Climate Change and Their Critical Roles

The Sino-U.S. strategic relationship has promoted cooperation between the U.S. and China to achieve the diversification of corresponding measures, including CCS, energy efficiency, and clean and renewable energy. These developments provided a strong basis for the U.S. and China to exercise their critical roles in the negotiations to build the post-Kyoto framework.

The rhetoric of the leaders in both countries after the Copenhagen conference shifted to become relatively constructive, contributing to the formation of a complementary relationship between the UN and other multilateral political consultations and arrangements. One of the most important objectives of the Obama administration was to reach an alternative and practical agreement, while maintaining its satisfactory relations with China. Soon after his inauguration, President Obama explicitly emphasized the impact of climate change and indicated that it is an urgent issue that must be dealt with in a serious way (Holland, 2008). Building mutual trust became an urgent task under Obama's administration to facilitate progressive international negotiations.

Furthermore, U.S. Secretary of State Hillary Clinton delivered a speech before attending the Fifth East Asia Summit, in which she emphasized the common strategic interests of the U.S. and China on global issues. She stated, "The two countries share the responsibility of constructing an obvious strategy in addressing climate change" (Clinton, 2010). The political will of top leaders has provided positive incentives for the U.S. to cooperate with China for strategic purposes on energy, the environment, and climate change. Considering its recent outcomes, the Sino-U.S. cooperative relationship on climate change and energy contains a wide range of projects aimed at a goal, namely, to facilitate negotiations and reach international agreements that best suit both

sides' interests. U.S. and Chinese leaders have emphasized the importance of working together to continue dialogues and forums with the primary aim of understanding each other better. After repeated dialogues, the two countries clarified core issues that need to be resolved and identified primary common ground to successfully achieve a global pact for tackling climate change.

Furthermore, both countries have re-evaluated and adjusted their ever-present conflicting interests. One of the primary aims of the S & ED relates to economic perspectives (e.g., industry, the market, and employment). Some have argued that the Obama administration tends to expand its rights and interests by integrating standards and regulations with China on environmental technologies (Sasaki, 2011, p. 10). It is also critical for China to solve domestic environmental degradation, such as air pollution and energy resource concerns, by introducing efficient technologies and systems while maintaining economic growth (Chinese State Council, 2007). Under the Sino-U.S. S & ED, as shown in Table 1, technological development, such as CCS, clean and renewable energy, and electric vehicles, represents a large proportion of the current environmental and energy cooperation.

By agreeing that climate change should be tackled through a balanced approach that combines environmental technologies and opportunities for further economic growth, the U.S. and China have come to consider energy efficiency and technological cooperation as crucial tasks to meet their common interests in promoting emissions reduction (Cheng, 2015). For instance, both sides try to integrate industrial and technological specifications and regulations while dealing with climate change and air pollution through measures such as CCS. A major achievement was the joint effort to quantitatively reduce hydro fluorocarbons, a potent type of GHG with high global warming potential. This was the first time that the two countries agreed to work together to reduce GHGs. The progress described above contributes to the formation of complementary relationships among regimes inside and outside of UN negotiations.

After Trump administration came to power, project-based China-U.S. national cooperation has been down-streamed significantly. Served as official and political platform of bilateral cooperation on climate change under Obama administration, numbers of new EcoPartnership had decreased drastically and so far, there is no new program since 2018 although the framework still exists. On the other hand, the S & ED had its eighth session in 2016 also suspended after President Trump took office.

Turning to the negotiations under UNFCCC, since the U.S. presidential election ended in 2016, the UN process of negotiation on political issues has been moving extremely slowly with many technical and detail items that needs to be addressed; however, strong political will among top emitters, particularly China's, has weakened greatly due to the U.S. attack on multilateralism and its decision of withdrawal from the Paris Agreement. France, under the Macron administration, has been trying to maintain the political momentum by emphasizing the importance of stay with the Agreement. Yet, the centripetal force is regarded limited since the emission of France only accounts less than 1% of world emission and EU's post on emissions reduction is originally high. As a result, lack of major emitters, that is, U.S. and China's participation to engage the international negotiation, to certain degree has slowed down (or so called "chilling") the progress of finalizing the rules and procedures, particularly on agendas with political controversy, to implement the Paris Agreement (Jotzo et al., 2018).

We have witnessed that there are no prominent outcomes decided at COP22 in Marrakesh and COP23 in Bonn. At these COPs, President Trump did not send high level governmental representatives and decided not to organize national pavilion, although the sub-national, such as California is active in engaging the process. On

the contrast, China rhetorically shows its intentions to continue to realize its Nationally Determined Contributions (NDCs) and work with major emitters, such as EU; however, it faces domestic pressure of reducing GHGs emissions since the U.S. had decided to hold back its leading role. At present, the U.S. withdrawal has caused the stagnant of negotiations which means it may not be able to play the critical role in regime building, yet China is now regarded to be the most important player under the Agreement. However, because there is no external pressure from the U.S., whether China can continue to play its critical role needs further observation and analysis.

Conclusion

Discussions on the Sino-U.S. relations on climate change have focused on the rivalry between these two major emitters and their reluctance to contribute to international cooperation. This study, in contrast, argues that cooperative partnerships have been established to a significant degree in recent years to promote bilateral cooperation on climate-related issues.

In recent years, the U.S. and China have begun to take the various adverse effects and risks of climate change seriously and to tackle the issue by facilitating mutual technological, academic, financial, and capacity-building support. In particular, energy efficiency and environmental protection, including climate change, have been adopted as sufficient basis for constructing a mutually beneficial relationship. The two countries have developed reciprocal relations in many areas by initiating a range of projects, for example, those related to renewables, clean energy, electric vehicles and Combined Charging System (CCS), clean water, and clean air. At the same time, these efforts enable the achievement of mutual sustainable development, while minimizing confrontations or contradictions within each country. Through dialogues and implementation, cooperation on energy and environment-related issues has come to play an important part in enhancing U.S.-China relations.

Since the Copenhagen Accord in 2009, the adoption of the Cancun Agreement in 2010 allows the registration of voluntary targets decided by countries. In the 2015 Paris Agreement, it is stipulated that each party, including the U.S. and China, must submit its Nationally Determined Contributions, in which domestic countermeasures or voluntary emissions reduction targets and mitigation activities are set. The position of the U.S. and China is consistent with the contents of the Copenhagen Accord, the Cancun Agreement, and the Paris Agreement, which formed the framework of the post-Kyoto Protocol. It became important for the major powers to share their abatement approaches through various measures, while realizing their own purposes. It can be concluded that the U.S.-China cooperation has triggered a multilateral agreement at the UNFCCC and other multilateral talks since 2009 and has eased rival relations between international regimes and made complementary relations possible. At the root of this progress was the development and strengthening of strategic cooperative relations between the U.S. and China.

Through multi-leveled bilateral consultations, dialogue, and forums, the U.S. and China have promoted the provision of resources, information sharing, and a shift toward a reciprocal interest structure. Multilateral cooperation is substantially influenced by the diversification and the share of corresponding measures and by the major powers' endeavor. Different from the concepts of "forum shopping" or "regime shifting", international cooperation shaped by the critical roles of the U.S. and China has made it possible to form mutually complementary relations between international regimes, thus contributing to existing UN negotiations. Undoubtedly, the motivations for the U.S. and China to cooperate on energy and climate policies derive from

their own interests. That is, they became aware that national interests could be promoted by facilitating collaboration on energy/climate-related clean technologies and policies.

Lastly, it is important to continuously observe Sino-U.S. cooperation on energy efficiency and climate change for two reasons. Firstly, both the U.S. and Chinese domestic response in tackling climate change could influence the effectiveness of the Paris Agreement. Secondly, the bilateral cooperation was initially established based on political purposes; therefore, other potential concerns and extrinsic factors, such as security, political, even economic events, may negatively influence the cooperation, particularly after President Trump came to power. Fortunately, inter-sub-national and inter-regional cooperation continues between the two countries, and Chinese influence and bargaining power has been assumed to expand in climate negotiations.

At this stage, the U.S. withdrawal has obviously caused the stagnant of negotiations with its critical role became limited. Meanwhile, as for China, since external pressure and engagement from the U.S. has disappeared, whether China can continuously exert its critical role needs further observation and analysis.

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