Climate Mitigation Efforts After the *Paris Agreement*:

Achievements, Remaining
Debates, and New Challenges

Huang Yitian

Abstract: Climate change has been widely recognized as a global challenge that must be addressed in the twenty-first century. As an important step toward a post-2020 climate regime, the *Paris Agreement* has shown great achievements as well as future directions of global climate mitigation. Although some key features can be found in the mitigation provisions of the agreement, such as dual goals of temperature increase, reliance on “nationally determined contributions,” the blending of market and non-market elements, and ambiguity in financial and technology transfer, yet remaining debates including the allocation of responsibilities and the fairness of international transfer of mitigation outcomes will continue to affect the future of global climate governance. Furthermore, new challenges have also emerged after the Paris deal. Political and economic uncertainties, “carbon leakage” among industrializing countries, and the overgrowth of climate financial institutions will all generate impacts on future climate mitigation efforts. There is no ready panacea to these problems. Nevertheless, a few

Huang Yitian is Assistant Professor at the School of International Relations and Public Affairs, Fudan University. His mailing address is 220 Handan Road, Shanghai, 200433, and he can be reached at: huangyitian@fudan.edu.cn.

options of policy and institutional innovation at the technical level should be considered to generate incremental progress.

Keywords: Paris agreement; global climate governance; institutional innovation; policy option.

Global climate change has become one of the major challenges for humanity in the twenty-first century. Since the 1980s, many efforts have been taken on the global scale to reduce greenhouse gas (GHG) emissions, with the establishment of the *United Nations Framework Convention on Climate Change* (UNFCCC) in 1992 forming the cornerstone of a global climate regime. Despite a broad-based consensus on the necessity and scope of GHG emission reduction, the allocation of mitigation responsibilities has proved to be a topic of lasting controversy.¹ The United States withdrew from the *Kyoto Protocol* in 2001, concerned that the exemption of China, India, and other developing countries from mandatory mitigation responsibilities might put it at a disadvantageous position. As the second commitment period of the *Kyoto Protocol* only spans from 2013 to 2020, the past few years have seen intense bargaining over an international agreement for the post-2020 period. In December 2015, the *Paris Agreement* was finally reached at the 21st Conference of the Parties to the UNFCCC (COP 21) — a milestone in the evolution of global climate institutions.²

From the perspective of rational choice and institutional competition, this article assesses the existing global mitigation efforts and explores their future prospects.³ The protracted global climate negotiations suggest that

¹Sevasti-Eleni Vezirgiannidou, "The Kyoto Agreement and the Pursuit of Relative Gains," *Environmental Politics*, Vol. 17, No. 1 (2008), pp. 40–57.

²Elizabeth Burleson, "Paris Agreement and Consensus to Address Climate Challenge," *ASIL Insight*, Vol. 20, No. 8 (2016), <https://www.asil.org/insights/volume/20/issue/8/paris-agreement-and-consensus-address-climate-challenge>.

³Mathew Frederick, "A Realist's Conceptual Definition of Environmental Security," in Daniel Deudney and Richard Matthew, eds., *Contested Grounds: Security and Conflicts in the New Environmental Politics* (Albany, N.Y.: State University of New York Press, 1999); Richard Rosecrance, "Has Realism Become Cost-benefit Analysis?," *International Security*, Vol. 26, No. 2 (2001), pp. 132–154; and Adil Najam, Saleemul Huq, and Youba Sokona, "Climate Negotiations beyond Kyoto: Developing Countries Concerns and Interests," *Climate Policy*, Vol. 3, No. 3 (2003), pp. 221–231.

countries are sometimes more concerned about relative gains, although the well-being of the international community is the common consideration. The impact of climate change is not evenly distributed across the world. The most vulnerable countries are usually least developed ones that are incapable of curbing GHG emissions, yet the burden of emission reduction is shared mainly based on national boundaries. While international climate institutions aim at coordinating global efforts, countries are more inclined to compete for influence and other interests in institutional design and operation, which could undermine the effectiveness of the international climate regime.

This article will proceed in four steps. First, relevant features of the *Paris Agreement* are reviewed and its major achievements identified in comparison with the Kyoto mechanisms. The second section sheds light on some contentious issues that the *Paris Agreement* has not fully addressed, such as the allocation of mitigation responsibilities and the management of financial and technological resources. The third section addresses three emerging challenges for climate mitigation after the Paris negotiation. In the final section, three policy options are given based on the argument that the *Paris Agreement* has put high demands on ever closer international coordination.

The *Paris Agreement*: Key Features in Mitigation Provisions

Before and during the Paris climate conference, it was expected that countries could work toward a legally binding treaty that would engage the world's major emitters. On the one hand, accompanying the unstoppable trend of fast economic growth, the emissions in the developing world, especially China and India, had also increased exponentially. Developed countries and even some in the developing world demanded that emerging economies like China undertake more responsibilities. On the other hand, developing countries, as represented by the Group of 77, insisted that the advanced economies should take the lead and provide more financial and technological assistance to developing countries, given their historical records in GHG emissions. As it turned out, the conclusion of the *Paris Agreement* reflects a pragmatic compromise between developed and developing countries.

The most prominent feature of the agreement may be the setting of flexible goals in temperature increase. For example, it is stipulated in Article 2 that all countries need to work together to achieve the goal of “[h]olding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.” To countries that are most susceptible to climate change, the 1.5°C target would be preferable, while for small island countries threatened by dangerous sea level rise, a 1.5°C temperature increase could be catastrophic. To strike an “inconvenient” balance between the most susceptible and the most threatened, therefore, a 0.5°C flexible range is set in the mitigation goals.

The *Paris Agreement* also relies on “nationally determined contributions” to mitigate climate change. While the *Kyoto Protocol* prescribed the emission cut targets for Annex B countries, the *Paris Agreement* gives contracting parties ample leeway to determine the scope and intensity of their mitigation efforts. The reliance on “nationally determined contributions” could produce different implications. On the positive side, a relatively high degree of flexibility is necessary for engaging countries with conflicting viewpoints on the allocation of responsibilities, for it was in large part due to this reason that developed and developing countries were unable to reach a consensus on setting mandatory emission cut targets under the *Kyoto Protocol*.

The key question here is whether the new agreement will provide a strong incentive for some countries to “free-ride” on the mitigation efforts of others. As a “safeguard” measure, Article 3 of the *Paris Agreement* calls for efforts of contracting parties to “represent a progression over time.” Furthermore, the progressive efforts made by contracting parties will be put under review. Article 13 requires the establishment of “an enhanced transparency framework,” which incorporates international assessment and review mechanisms. Meanwhile, according to Article 16, the Conference of the Parties serves as the meeting of the Parties to this Agreement to keep a close eye on implementation of various issues, including the fulfillment of respective commitments.

Nevertheless, without absolute emission cut targets, the aggregate of all “nationally determined contributions” is far from sufficient to limit future temperature increase within 2°C. Before the Paris Conference, the UNFCCC Secretariat once conducted an evaluation based on 119 Intended

Nationally Determined Contributions (INDCs), which in total covered 86 percent of world GHG emissions.⁴ It was concluded that while much uncertainty remains, the aggregate effect of compulsory and non-mandatory commitments is still a far cry from what is expected to fulfill the 2°C goal.⁵

The *Paris Agreement* has shown considerable flexibility in its mitigation provisions that could generate both positive and negative implications.

Although potential progress made by contracting parties might vary significantly in the future, the situation has been further complicated by the institutional design of the “enhanced transparency framework.” Article 13 requires the framework to be implemented “in a facilitative, non-intrusive, non-punitive manner,” so as to fully respect state sovereignty. However, the problem of non-compliance has not been well addressed, which means the international community will still have to follow a political approach — for instance, through diplomatic pressure or admonition of international

public opinion — if some countries fail to fulfill their commitments.

The *Kyoto Protocol* established a series of mechanisms such as the “flexible mechanisms” and review procedures of national reports to promote compliance in addition to setting absolute targets for Annex B countries. However, as countries will not be subjected to penalty in case of non-compliance, the compliance mechanisms in the *Kyoto Protocol* indeed have “no teeth.”⁶ In contrast, the *Paris Agreement* is even more dependent on the goodwill of contracting parties to implement their INDCs. Following

⁴UNFCCC, “Synthesis Report on the Aggregate Effect of the Intended Nationally Determined Contributions,” UNFCCC Secretariat, October 30, 2015, <http://unfccc.int/resource/docs/2015/cop21/eng/07.pdf>.

⁵The results vary depending on assumptions. See Kelly Levin and Taryn Fransen, “INSIDER: Why Are INDC Studies Reaching Different Temperature Estimates?,” World Resource Institute, November 9, 2015, <http://www.wri.org/blog/2015/11/insider-why-are-indc-studies-reaching-different-temperature-estimates>; and UNEP, “Emissions Gap Report 2015: Executive Summary,” United Nations Environment Programme, http://uneplive.unep.org/media/docs/theme/13/EGR_2015.ES_English_Embargoed.pdf.

⁶Bert Metz, “The Legacy of the Kyoto Protocol: A View from the Policy World,” *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 4, No. 3 (2013), pp. 151–158.

the same logic, more controversies over due penalties for non-compliance are likely to emerge after 2020.

Furthermore, the *Paris Agreement* is designed to include market and non-market elements in its institutional arrangements. The cost of emission reduction varies across countries at different development stages or with different industrial structures. As a result, it is commonly agreed that countries suffering from high mitigation costs can purchase emission reduction outcomes from those spending comparatively less on mitigation efforts. The *Kyoto Protocol* established three “flexible mechanisms” to enable international transfer of emission reduction outcomes, namely, Joint Implementation, Emissions Trading, and Clean Development Mechanism (CDM). The CDM has long served as a major channel connecting developed and developing countries. With better infrastructure and institutional support than other developing countries, China ranked as the largest host country that accommodated almost half of all CDM projects between 2006 and 2012.⁷ Consequently, some stakeholders like the EU are concerned about China’s dominance and propose a reform on the CDM market, arguing that smaller developing countries have not benefited from the CDM as expected.⁸

By the end of the second commitment period of the *Kyoto Protocol* in 2020, the *Paris Agreement* might choose to distribute international cooperation projects through new institutional arrangements. Articles 6.1 and 6.2 require such cooperation to contribute to “higher ambition” and be “on a voluntary basis in cooperative approaches.” Article 6.4 establishes a potential mechanism, though without specific transaction rules yet. Meanwhile, Article 6.8 emphasizes the importance of non-market mechanisms to implement nationally determined contributions “in the context of

⁷UNEP-DTU, “CDM Projects by Host Region,” Center on Energy, Climate and Sustainable Development, May 1, 2016, <http://www.cdmpipeline.org/cdm-projects-region.htm#1>.

⁸EAC, *The Role of Carbon Markets in Preventing Dangerous Climate Change: Fourth Report Session 09–10* (London: House of Commons: Environmental Audit Committee, 2009); EC, “Questions & Answers on Emissions Trading: Use Restrictions for Certain Industrial Gas Credits as of 2013,” European Commission, November 25, 2010, http://europa.eu/rapid/press-release_MEMO-10-615_en.htm; and David Stanway, “EU Carbon Reform Proposals No Threat to China,” Reuters, July 14, 2009, <http://www.reuters.com/article/us-china-eu-carbon-interview-sb-idUSTRE56D0GH20090714>.

sustainable development and poverty eradication, in a coordinated and effective manner.” This stance is somewhat different from the Copenhagen, Cancun, and Doha climate conferences, all of which placed more emphasis on the market role. Nevertheless, it remains to be seen how contracting parties are going to harmonize market and non-market approaches.

Last but not least, the *Paris Agreement* attempts to balance the interests of developed and developing countries in financial and technology transfer. There has long been a general consensus that developed countries should provide financial and technological support to developing countries. Article 9 and 10 of the *Paris Agreement* stipulate the responsibility of developed countries in general terms. Meanwhile, compromises in phrasing have been made to reflect different concerns and interests. For example, Article 9.2 provides that “other parties are encouraged to provide or continue to provide such support voluntarily,” which means that capable developing countries are not exempted from the responsibility of financial assistance. With regard to the role of public funds, Article 9.3 only requires developed countries to note its significance. This provision occupies the middle ground between developing and developed countries, since the former highlight the importance of public funds, while the latter emphasize that a large volume of financial resources are owned by the private sector. Besides, Article 10.1 uses “a long-term vision” to depict the common stance of contracting parties on fully realizing technology transfer, which indicates that countries are actually not very confident about implementing large-scale technology assistance in the short and mid-term. Fortunately, some new institutional rules have been set to encourage the practice. For example, Article 9.5 requires developed countries to conduct biennial communication of their financial contributions; Article 10.4 also establishes “a technology framework” to facilitate technology cooperation and transfer.

Remaining Debates over Mitigation Responsibilities

Looking back on the climate negotiating process since the early 1990s, the debates among self-interested countries have been centered on two issues: the allocation of mitigation responsibilities, and the provision of financial and technological resources by developed countries. While the global political and economic context has dramatically changed over the past two decades, these issues still constitute obstacles to a full-fledged global

Fig. 1. An Environmental Kuznets Curve of Emissions Level?

Source: Drawn by author.

climate regime in the post-2020 period. The mitigation provisions of the *Paris Agreement* leave the two controversial issues to further bargaining.

The allocation of mitigation responsibilities may be the most contentious issue. To reduce GHG emissions incurs economic costs; in some cases, emission cuts might also have a direct bearing on strategic interests. Traditionally, the Environmental Kuznets Curve (EKC) suggests that the magnitude of pollution will decrease after economic development reaches a “tipping point.” Yet, this might not apply to GHG emission cuts. Although low-carbon development is an ideal path, the experience of developed countries suggests that per capita and total GHG emissions might increase or remain in the post-industrialization era (Fig. 1). Indeed, emissions might even continue to stay at a very high level nowadays in some industrialized countries like Australia.

The debate on responsibility sharing can be interpreted in two ways. On the one hand, the identification of mitigation responsibility for individual countries will continue to be controversial despite the signing of the *Paris Agreement*. The agreement introduced the concept of “nationally determined contributions” to circumvent this complicated issue. Furthermore, by using “should” instead of “shall” to require developed countries to undertake “economy-wide absolute emission reduction targets,” Article 4.4 indicates that the obligations of developed countries stipulated in this provision are not legally binding. Indeed, it was widely reported that the

U.S. delegation strongly opposed the use of “shall,” which might add difficulty to the ratification process of the treaty in the United States.⁹ Within the developing world, interests have also been divergent and somewhat conflicting. Small island states tended to align with major developed countries to call for highly ambitious mitigation goals.¹⁰ Besides, major developing countries including China, India, and several others believed that an increase in the absolute volume of GHG emissions was necessary for pursuing industrialization. In particular, while China is facing serious industrial overcapacity, other major developing countries like India are still at the early stage of industrialization. Without a clear definition of responsibility, the commitments made by both developed and developing countries will constantly be subject to dispute.

Debate on sharing mitigation responsibilities will remain after the *Paris Agreement* due to diversified national interests.

On the other hand, concerns linger over the fairness of international transfer of mitigation outcomes. Considering that developing and developed countries are at different development stages, financial resources channeled through international transfer of mitigation outcomes can contribute to the economic development of host countries. Meanwhile, it has been argued that developed countries can exploit the opportunity for developing countries to reduce emissions

at relatively low costs, which is termed as “low-hanging fruits,” through international transfer mechanisms such as the CDM. Consequently, developed countries are able to achieve emission cut targets without spending much, while developing countries will have to pay much higher prices in the long run. Article 6 of the *Paris Agreement* stipulates a few conditions for implementation, such as sustainable development, the delivery of overall mitigation results, etc. However, it does not respond to the above concerns

⁹John Vidal, “How a ‘Typo’ nearly Derailed the Paris Climate Deal,” *Guardian*, December 16, 2015, <http://www.theguardian.com/environment/blog/2015/dec/16/how-a-typo-nearly-derailed-the-paris-climate-deal>.

¹⁰Richard Valdmanis and Emmanuel Jarry, “How the World Learned its Lesson and got a Climate Deal,” Reuters, December 13, 2015, <http://www.reuters.com/article/us-climatechange-summit-ticktock-idUSKBN0TW0PR20151213>.

over the long-term impact of international transfer on the mitigation potential of host countries.

In addition to the allocation of mitigation responsibilities, the international transfer of financial and technological resources has been another hot-button issue. Compared with developing countries, developed countries historically contributed more to the accumulation of GHG in the atmosphere. Meanwhile, they possess the bulk of financial and technological resources for climate mitigation. Despite the normative arguments in favor of financial and technology transfer, key problems remain to be addressed.

For instance, to what extent are developed countries, as rational actors, willing to provide financial and technological resources when facing a high upfront cost? As mentioned before, the *Paris Agreement* only adopted general terms to stipulate the responsibilities of developed countries, which have been positioned somewhere between legal and moral obligations. It is notable that the UNFCCC already stipulated that developed countries should have taken the lead more than 20 years before, while the *Paris Agreement* does not make much difference in financial transfer provisions except a few procedural and institutional developments. It might be argued that developed countries have already promised to provide US\$100 billion annually as financial transfer before 2020, but it is still unclear how such “climate-focused” capital will be raised and calculated.

Another problem in this regard is the magnitude of technology transfer. Existing research on technology transfer on the CDM market have undoubtedly contributed to low-carbon development in developing countries. However, the CDM practice in many developing countries has also revealed some limits of technological transfer. The policy environment is identified as an influential factor.¹¹ The technologies transferred through the CDM projects do not have unlimited potential. Over 75 percent of the CDM projects have carried with them technologies in such fields as hydro, methane avoidance, wind, biomass energy, and landfill gas.¹² While those

¹¹David Popp, “Climate-Friendly Technological Change for Developing Countries,” in Lucas Bernad and Willi Semmler, eds., *The Oxford Handbook of the Macroeconomics of Global Warming* (New York: Oxford University Press, 2014), pp. 321–348.

¹²Rob Bryne, Adrian Smith, Jim Watson, and David Ockwell, “Energy Pathways in Low-Carbon Development: The Need to Go Beyond Technology Transfer,” in David Ockwell and Alexandra Mallett, eds., *Low-carbon Technology Transfer: From Rhetoric to Reality* (London: Routledge, 2015), pp. 123–142.

technologies are beneficial, developing countries in the industrialization process also need to reduce the carbon-intensity of heavy industries, which accounts for a large proportion of their total emissions. As the United Nations Development Programme (UNDP) estimated in 2010, China was then in short of about 70 percent of the key technologies that it needed for promoting emissions reduction.¹³ However, a formidable obstacle exists between developed and developing countries, since low-carbon technologies in heavy industries are often closely related to a country's industrial competitiveness and even strategic interests. Moreover, some highly energy-efficient technologies like gas turbine technology used in the integrated gasification combined cycle (IGCC) power generation can be employed for both civilian and military purposes. With regard to serious political and national security concerns, transferring these kinds of technologies will be extremely difficult.

New Challenges for Climate Mitigation

Climate negotiation and the implementation of climate treaties are always conducted in changing political and socioeconomic context. Developed countries argue that developing countries should no longer be exempted from undertaking mandatory mitigation responsibilities because of their rapidly increasing GHG emissions and rising economic power. Distinct from the Kyoto approach, the *Paris Agreement* to some extent reflects the power shift between developing and developed countries.

The evolving landscape of global political economy is posing grave challenges for climate mitigation after the Paris negotiation. The world economy has been struggling with the gloom of recession since the 2008 financial crisis, which continues to exert profound impact on state capacity as well as people's lives in both developed and developing countries.¹⁴ For developing countries, the negative impacts of the crisis such as unemployment, high inflation, and political unrest continue unabated. These troubles

¹³UNDP, *China Human Development Report 2009/10* (Beijing: China Translation and Publishing Corporation, 2010), <http://hdr.undp.org/sites/default/files/chine.2010.pdf>.

¹⁴"CITI: Risk of Global Recession Rising," CNBC, February 25, 2016, <http://www.cnbc.com/2016/02/25/citi-risk-of-global-recession-rising.html>; and Chris Matthews, "IMF Says the Global Economy Could Soon Go off the Rails," *Fortune*, March 9, 2016, <http://fortune.com/2016/03/09/imf-economic-derailment/>.

have seriously undermined the states' capacities to implement development plans and create favorable policy environment for climate mitigation. Fiscal austerity has also led to social instability in some countries. For example, Brazil has been caught in the crossfire of economic recession and political unrest, with concerns being raised about its capability to host the 2016 Summer Olympics.¹⁵ Furthermore, political and socioeconomic instability is likely to discourage foreign investors from entering emerging markets.¹⁶

Due to political and socioeconomic uncertainties, the capacity and willingness of developed countries to take actions on global climate challenges have also been weakened. The European Union has invested huge political and financial resources to deal with the economic crisis in some of its member states.¹⁷ It is still grappling with the impact of refugee influx and the British decision to leave the EU.¹⁸ Among other major developed economies, Japan has adopted a negative interest rate policy to stimulate its economy. Canada and the United States have also experienced difficulties, though to different extents.¹⁹ It is notable that the policy orientation on

¹⁵Jim White, "How Brazil is in Crisis Mode just Four Months before Start of Rio Olympics," *Telegraph*, March 31, 2016, <http://www.telegraph.co.uk/sport/2016/03/31/rio-olympics-2016-how-brazil-is-in-crisis-mode-just-four-months/>.

¹⁶Elizabeth Asiedu, "Foreign Direct Investment in Africa: The Role of Natural Resources, Market Size, Government Policy, Institutions and Political Instability," *The World Economy*, Vol. 29, No. 1 (2006), pp. 63–77; and Laura Gómez-Mera and Gonzalo Varela, "Does Political Risk Deter FDI from Emerging Markets?," *The Trade Post*, March 25, 2015, <http://blogs.worldbank.org/trade/does-political-risk-deter-fdi-emerging-markets>.

¹⁷Leo McKinstry, "How the EU could Collapse in 2016," *Telegraph*, December 28, 2015, <http://www.telegraph.co.uk/news/newstopics/eureferendum/12071434/How-the-EU-could-collapse-in-2016.html>.

¹⁸IMF, "The Refugee Surge in Europe: Economic Challenges," January 2016, <https://www.imf.org/external/pubs/ft/sdn/2016/sdn1602.pdf>; and Heather Stewart and Anushka Asthana, "If Britain Voted to Leave the EU, What would Happen Next?," *Guardian*, February 28, 2016, <http://www.theguardian.com/politics/2016/feb/28/if-britain-voted-to-leave-the-eu-what-would-happen-next>.

¹⁹CBC, "Canadian Economy to Remain Sluggish Through 2016, But No Recession," The Conference Board of Canada, February 4, 2016, http://www.conferenceboard.ca/press/newsrelease/16-02-04/canadian_economy_to_remain_sluggish_through_2016_but_no_recession.aspx; and Daniel Alpert, "The US Economy is Showing Weakness in nearly Everything but Employment," *Business Insider*, January 12, 2016, <http://www.businessinsider.com/us-economy-weak-except-for-employment-2016-1>.

climate change of the next U.S. president still remains to be seen. For instance, Republicans generally take a skeptical view of the impact of climate change and are reluctant to admit the close linkage between climate change and human activities.²⁰

The changing dynamics of global political economy has undermined the world's collective efforts on climate mitigation.

The potentiality of “carbon leakage” among industrializing countries is yet another challenge for climate mitigation. “Carbon leakage” refers to the phenomenon that industries in one country gain competitive advantage and accordingly increase emissions due to the mitigation policies adopted in other countries.²¹ Major developed countries usually resort to “carbon leakage” to justify their policies of subsidizing relevant industries or imposing boarder tax adjust-

ments (BCA) such as carbon tariff.²² Since 2009, the EU has offered compensations to certain industries covered in the EU Emission Trading Scheme (EU ETS).²³ The cap-and-trade mechanism in California also stipulates measures to address “carbon leakage.”²⁴ In addition to “carbon leakage” policies incorporated into cap-and-trade systems, France and the United States proposed to directly adopt BCA measures against developing

²⁰Emily Schultheis, “Republican Debate: Candidates Talk Climate Change,” CBS News, March 11, 2016, <http://www.cbsnews.com/news/republican-debate-gop-candidates-talk-climate-change/>.

²¹Glen Peters and Edgar Hertwich, “CO₂ Embodied in International Trade with Implications for Global Climate Policy,” *Environmental Science & Technology*, Vol. 42, No. 5 (2008), pp. 1401–1407.

²²Clò Stefano, “Grandfathering, Auctioning and Carbon Leakage: Assessing the Inconsistencies of the New ETS Directive,” *Energy Policy*, Vol. 38, No. 5 (2010), pp. 2420–2430; and Branger Frédéric and Philippe Quirion, “Would Border Carbon Adjustments Prevent Carbon Leakage and Heavy Industry Competitiveness Losses? Insights from a Meta-analysis of Recent Economic Studies,” *Ecological Economics*, Vol. 99 (2014), pp. 29–39.

²³See the EU’s website on carbon leakage, http://ec.europa.eu/clima/policies/ets/cap/leakage/index_en.htm.

²⁴See California Air Resources Board’s website on regulation, <http://www.arb.ca.gov/regact/2014/capandtrade14/ctfro.pdf>.

countries. Such proposals are often perceived by major developing countries as disguised protectionism.²⁵

The actions and controversies over “carbon leakage” have reflected the deep concerns that mitigation policies may create some impacts on competitiveness. As major developing countries, especially China and India, are moving toward tough restrictions on industrial emissions, a similar problem is likely to emerge among industrializing countries. Compared with major developing countries represented by the BASIC (Brazil, South Africa, India, and China), smaller developing countries such as Vietnam are also in the process of rapid industrialization. However, they face much less international pressure in global climate negotiations. Carbon-intensive industries in smaller industrializing countries can gain competitive advantages because of the rising cost as a result of mitigation policies in major developing countries. In this light, the mitigation efforts made by major developing countries might be considerably undermined.

Finally, the overgrowth of climate financial institutions may present further challenges for climate mitigation. International institutions can play an important role in coordinating mitigation policies and channeling resources to developing countries.²⁶ Meanwhile, sovereign states as rational actors pursue their own interests within international institutions through exerting influence on institutional design and project management. To take the CDM as an example, the EU has been an influential actor in market regulation.²⁷

It is noteworthy that several climate financial institutions have been established as the outcomes of UN climate conferences. In a general sense, the Global Environmental Facility (GEF) is the first one designated by the

²⁵Alan Rappeport, “Chinese Official Warns US on Protectionism: Proposed Border Tax Could Spark Retaliation,” *Financial Times*, April 21, 2009, <https://next.ft.com/content/0318fd3c-2ea1-11de-b7d3-00144feabdc0>; and Gerard Wynn, “India Urges Rich Not to Use Green Protectionism,” Reuters, April 7, 2009, <http://www.reuters.com/article/us-climate-india-bonn-idUSTRE5365FJ20090407>.

²⁶Avidan Kent, “Implementing the Principle of Policy Integration: Institutional Interplay and the Role of International Organizations,” *International Environmental Agreements: Politics, Law and Economics*, Vol. 14, No. 3 (2014), pp. 203–224.

²⁷Raphael Trotignon, “Combining Cap-and-Trade with Offsets: Lessons from the EU-ETS,” *Climate Policy*, Vol. 12, No. 3 (2012), pp. 273–287.

UNFCCC to take charge of international climate finance.²⁸ Quite a few financial initiatives, including the Green Climate Fund (GCF), Climate Investment Fund (CIF), Least Developed Countries Fund (LDCF), and MDG Achievement Fund, have been launched to finance low-carbon development projects in the developing world. While these funds can potentially perform well in different areas to meet various needs, it is still possible that the efficiency of climate finance will be undermined by overlapping institutions and complicated procedures. What's more, small developing countries might not be well represented in those institutions, while developed countries are in a more favorable position to pursue their own interests in financial and technology transfer. Developed countries can exert their dominating influence via two approaches: to directly manage financial and technological resources as providers; and to indirectly get involved through international financial institutions, such as the World Bank and the Asian Development Bank, which are deeply involved in the operation of climate funds.²⁹ Thus, it would be necessary for the international community to coordinate the operation of climate funds in an efficient way.

Policy Options for Future Global Climate Governance

Undoubtedly, the *Paris Agreement* has made considerable achievements in breaking longstanding stalemate. Nevertheless, the agreement follows a sub-optimal approach and its key mitigation provisions are bottom-up compromises. The discrepancies in responsibility sharing and the transfer of financial and technological resources will continue to present challenges for effective global climate governance. Furthermore, there is no one-size-fits-all solution and emerging problems will add to existing difficulties in facilitating globally concerted mitigation efforts. Although it has been recognized that strong political will is the premise of international

²⁸For the relationship between the UNFCCC and the GEF, see UNFCCC, "Global Environmental Facility," http://unfccc.int/cooperation_support/financial_mechanism/guidance/items/3655.php.

²⁹Richard Lattanzio, *International Climate Change Financing: The Green Climate Fund* (Darby, PA: Diane Publishing, 2012); and Lawrence Susskind and Saleem Ali, *GEF Environmental Diplomacy: Negotiating More Effective Global Agreements* (New York: Oxford University Press, 2014).

collaboration on addressing climate challenges, a few options of policy and institutional innovation at the technical level should be explored to facilitate incremental progress.

First of all, technological collaboration among major emitters should be promoted. Development and large-scale application of low-carbon technologies is crucial to the pursuit of sustainable development and effective climate mitigation. Highlighting the importance of technological breakthroughs, some scholars have proposed to establish international technological standards or protocols.³⁰ There are two reasons to argue for strengthening R&D cooperation among the top 10 emitters plus the EU.³¹ One is that developed countries or emerging economies as major emitters are more eager to develop R&D capacities; the other is that it is relatively easier for a small group of major emitters to negotiate on and implement collaborative R&D projects.

Given concerns over competitiveness and strategic impacts of transferring technologies, it is necessary for major emitters to strengthen their mutual trust and establish common interests through policy coordination and institutional building.³² Actually, the collective climate mitigation could overcome distrust and concerns over competitiveness either when major emitters cooperate in areas at the same technological levels or when a technological breakthrough requires collaboration among emitters with different trump cards. Some major emitters have

Technological collaboration and policy coordination should be encouraged to overcome remaining obstacles for global climate mitigation.

³⁰Joseph Aldy and Robert Stavins, "Climate Policy Architectures for the post-Kyoto World," *Environment: Science and Policy for Sustainable Development*, Vol. 50, No. 3 (2010), pp. 6–17.

³¹"Top 10 Most Polluting Countries: Who Emits The Most CO₂?," *Huffington Post*, February 21, 2012, http://www.huffingtonpost.ca/2012/02/21/top-10-most-polluting-countries-co2-emissions_n_1291963.html.

³²Deborah Seligsohn, Robert Heilmayr, Tan Xiaomei, and Lutz Weischer, "China, the United States, and the Climate Change Challenge," World Resource Institute, October 2009, http://www.wri.org/sites/default/files/pdf/china_united_states_climate_change_challenge.pdf.

already jointly launched R&D initiatives. For instance, China and the United States co-established the Clean Energy Research Center in 2014 to strengthen cooperation on the clean use of coal, nuclear energy and other advanced technologies.³³

Second, mitigation policy coordination from the "Global Value Chains" (GVCs) perspective should be further enhanced. The GVCs have been used to depict "the sequence of all functional activities required in the process of value creation involving more than one country."³⁴ The WTO reported in 2015 that 49 percent of global trade in goods and services was completed through GVCs in 2011.³⁵ Accordingly, a considerable portion of GHG emissions is embodied in the operation of GVCs. It is estimated that export-related industrial activities contribute roughly one-fifth of China's total emissions.³⁶ As discussed above, to only target the emissions in a few major emitters may not be an effective way to curb the increase of overall GHG emissions due to the possibility of "carbon leakage." To deal with this challenge, it is useful for countries to set emission targets along GVCs, rather than simply identify emissions based on national boundaries. Through this approach, emissions in tradable sectors across the world can be effectively monitored and accurately calculated.

Third, the reform of international climate financial institutions should be optimized. Considering the close relations between climate financial institutions and traditional multilateral financial institutions that are dominated by major developed countries, this issue should be addressed in the broader context of international financial reforms. The establishment of the "South-South Climate Change Cooperation Fund" by China in 2015 might stimulate developed countries to compete for institutional

³³"China-U.S. Joint Announcement on Climate Change," *China Daily*, November 12, 2014, http://www.chinadaily.com.cn/china/2014-11/12/content_18902550_2.htm.

³⁴Rashmi Banga, "Measuring Value in Global Value Chains," United Nations Conference on Trade and Development Background Paper No. RVC-8, May 2013, p. 6, http://unctad.org/en/PublicationsLibrary/ecidc2013misc1_bp8.pdf.

³⁵WTO, *International Trade Statistics 2015*, World Trade Organization, 2015, https://www.wto.org/english/res_e/statis_e/its2015_e/its15.toc_e.htm.

³⁶Qi Tianyu, Niven Winchester, Valerie Karplus, and Zhang Xiliang, "Will Economic Restructuring in China Reduce Trade-embodied CO₂ Emissions?," *Energy Economics*, Vol. 42 (2014), pp. 204–212.

influence. A potential direction of the reform is to turn the GCF, CIF, and other climate funds into specialized mechanisms whose functions supplement rather than overlap with each other. The establishment of the LDCF could also be a viable option. Yet in the end, it is necessary to merge those funds and other institutions into one centralized mechanism, in order to enhance the effectiveness and representativeness of international climate finance.