THE PARIS AGREEMENT AND BEYOND:
INTERNATIONAL CLIMATE CHANGE POLICY POST-2020

Harvard Project on Climate Agreements

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The Paris Agreement and Beyond: International Climate Change Policy Post-2020

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PREFACE

The Paris Agreement is a breakthrough in multilateral efforts to address the threat of global climate change. For the first time, an international agreement to reduce greenhouse-gas emissions includes contributions from all of the major-emitting countries—and, indeed, a large majority of the countries of the world. In addition, the Agreement includes a dynamic feature through which mitigation commitments can be strengthened over time.

While the Agreement sets forth an innovative and potentially effective policy architecture, a great deal remains to be done to elaborate the accord—to formulate the many rules and guidelines required and to specify more precise means of implementation. Governments, other stakeholders, and researchers also need to think about constraints on the effectiveness of the Paris Agreement—and identify organizations and processes that could complement the Agreement and the UNFCCC process more broadly.

The Harvard Project on Climate Agreements hosted a research workshop at the Harvard Kennedy School on July 14-15, 2016, the purpose of which was to identify options for elaborating and implementing the Paris Agreement—and to identify policies and institutions that might complement or supplement the Paris-Agreement regime. Participants included twenty-three of the world's leading researchers focusing on climate-change policy, representing the disciplines of economics, political science, international relations, and legal scholarship. They are based in Argentina, Belgium, China, Germany, India, Italy, Norway, the United Kingdom, and the United States. An agenda and list of participants is included near the end of this report.

Participants subsequently prepared the briefs that are included in this document, based largely on their presentations at the workshop, addressing opportunities for—and challenges to—elaborating, implementing, and complementing the Paris Agreement. These briefs are organized in five sections: enhancing mitigation ambition, elaborating the Agreement's transparency mechanism, advancing market mechanisms (in and out of the Agreement), exploring complementary processes and institutions, and financing mitigation and adaptation. Each brief provides a summary in the form of several key points, and a compilation of the key points is provided after this preface. The briefs are designed to be readily accessible—and, it is hoped, useful—to negotiators and policy makers, as they consider how to elaborate the Paris Agreement in order to realize its potential to effectively address global climate change.[1]

The July 2016 workshop and this report build upon previous work by the Harvard Project on Climate Agreements, the mission of which is to identify—and effectively communicate—scientifically sound, economically sensible, and politically pragmatic public policy options

1 The editors are grateful to Samuel Stolper for research assistance and substantive support throughout the project; to Bryan Galcik for layout and design of the document; and to Marika Tatsutani for editing the briefs.

for addressing global climate change. Leading scholars from around the world have released 85 discussion papers through the Harvard Project.[2] Robert N. Stavins, Director, and Joseph E. Aldy, former Co-Director, also published three edited volumes of research, including a volume of briefs prior to COP-15 in Copenhagen, similar in some respects to this document.[3]

In addition, the Harvard Project on Climate Agreements has organized numerous research workshops and policy roundtables at Harvard and around the world—including at virtually every COP since COP-13 in Bali—intended to advance scholarship on and analysis of policy options for global climate change, and to facilitate communication with negotiators and policy makers about these options.[4]

The Harvard Project's research and communication initiatives have proved valuable to negotiators and analysts over the last decade. We hope the current volume may also stimulate new thinking during this crucial period when the Paris Agreement must be elaborated, implemented, and, perhaps, enhanced through complementary processes and institutions.

Robert N. Stavins
Director

Robert C. Stowe
Co-Director

2 See the Harvard Project web site: http://hks.harvard.edu/hpca.

3 Aldy, J. E. and R. N. Stavins, eds. *Architectures for Agreement: Addressing Global Climate Change in the Post-Kyoto World* (2007); *Post-Kyoto International Climate Policy: Summary for Policymakers* (2009); *Post-Kyoto International Climate Policy: Implementing Architectures for Agreement* (2010). All published by Cambridge University Press.

4 Research workshops have been held at Harvard University and internationally, in collaboration with leading research institutes focusing on environmental economics and policy: *Fondazione Eni Enrico Mattei* (Venice and Milan); the Mercator Research Institute on Global Commons and Climate Change (Berlin); the National Center for Climate Change Strategy and International Cooperation (Beijing); and Resources for the Future (Washington, D.C.) The Harvard Project has conducted numerous roundtables engaging researchers, policy makers, and stakeholders (advocates and leaders in business and non-governmental organizations), in Brussels, Washington, D.C., Canberra, Rome, London, Paris, Tokyo, Seoul, Mexico City, Beijing, and Doha—among other locations. The Harvard Project has conducted side events presenting the results of policy-oriented research at the Thirteenth (Bali, Indonesia), Fourteenth (Poznan, Poland), Fifteenth (Copenhagen, Denmark), Sixteenth (Cancun, Mexico), Eighteenth (Doha, Qatar), Nineteenth (Warsaw, Poland), Twentieth (Lima, Peru), and Twenty-First (Paris, France) COPs. At the COPs—and at intermediate UNFCCC negotiating sessions—Harvard Project leaders have also held meetings with individual negotiating teams from over 50 countries.

COMPILATION OF KEY POINTS

Framing

David G. Victor: ***Making the Promise of Paris a Reality***

- The flexibility of the NDCs is a key element of the success of the Paris Agreement.[1]
- Improving the quality of the NDCs is now a high priority—so that over time the NDCs better reveal what countries are willing and able to do.
- Better information about country preferences can lead to more effective "bottom-up" cooperation—beginning with small groups of countries, many of which are likely to form outside the formal UNFCCC process.
- It will be essential to enlist volunteer countries to demonstrate how to improve NDCs, prepare country reviews, and implement the global stocktaking.

Lavanya Rajamani: ***Differentiation and Equity in the Post-Paris Negotiations***

- The Paris Agreement is anchored in equity and the principle of common but differentiated responsibilities and respective capabilities, in light of different national circumstances, but the manner in which it operationalizes this principle is distinct from that in the FCCC and its Kyoto Protocol.
- Notwithstanding the truce on differentiation reached in Paris, many open issues remain, and the devil of differentiation will be in the detail of its operationalization in the post-Paris negotiations.
- There remain crosscutting issues such as how the terms "developed" and "developing" countries are to be applied, and thematic issues, such as how conditional nationally determined contributions (NDCs) from developing countries are to be treated, and how equity is to be operationalized in the global stocktake.

1 Decision 1/CP.21, including the Paris Agreement, may be accessed at: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

Daniel Bodansky: ***Elaborating the Paris Agreement's Rules***

- The Paris Agreement calls for the elaboration of many subjects through CMA decisions.
- In contrast to the Kyoto Protocol, the elaboration of additional rules, modalities, procedures, and guidance by the CMA is not essential to national implementation of the Paris Agreement, but will be necessary to operationalize the Agreement's new institutional arrangements, including the mitigation and sustainable development mechanism, the enhanced transparency framework, and the implementation and compliance mechanism.
- On a few issues, such as accounting, the CMA may adopt decisions governing the conduct of the Parties, but these will not be legally binding, unless the Paris Agreement makes them so.

Enhancing Mitigation Ambition in the Paris Agreement

Zou Ji: ***Enhancing Climate Mitigation Ambition Successively: The Drivers***

- There are two important new features, with regard to mitigation ambition, in the Paris Agreement: much broader participation, and provisions to enhance ambition over time under the UNFCCC.
- The drivers of enhanced mitigation ambition (as the context of the Paris Agreement) provide cause for optimism that the Agreement may be successful.
- The design and implementation of an international agreement on mitigating climate change (a global public good) must be consistent with countries' strategic interests.
- It is important to connect the Paris-Agreement process with the dynamic and real context of global trends, international interactions, multilateral and bilateral agendas, and major Parties' expectations about their development level and dynamic interests in the future.

Bård Harstad: ***Making Paris Sustainable***

- The Paris Agreement should permit, and in fact encourage, commitments that are reciprocally conditional. However, a five-year updating period is too brief, and the complexity of the bargaining environment makes it difficult to make conditional emissions-reduction offers.
- Solutions to these challenges may include countries pledging to a long-term emissions-reduction path, using formulas to help determine updated pledges, and employing trade measures to ensure compliance.
- Supply-side policies can complement demand-side policies. Funds for compensating avoided deforestation will be cost-effective and have an immediate impact on deforestation. Regulating fossil-fuel extraction will stabilize the global fossil fuel price, reduce the incentive to free ride, and work as an insurance policy if the Paris Agreement should succeed less well than intended.

Elaborating the Paris Agreement's Transparency Mechanism

Mariana Conte Grand: ***Transparency Framework and Strategic Choice of NDC Metrics***

- In theory, NDCs can be translated into any metric without affecting ambition, if detailed information is known and provided. However, despite theoretical equivalence, in practice the degree of transparency is associated with the target type.
- It seems important to distinguish between "narrow" and "broad" transparency. The first concept refers to how information under the GHG target is provided, and the second has to do with possible problems associated with asymmetric information.
- We might assume that diversity in INDC types is due only to strategic choice (i.e., choice based on hidden criteria other than emissions reduction)—and that if all governments acted transparently, they would use a common metric (ideally, the simplest—a quantified amount relative to a base year). However, countries may choose more flexible metrics for other reasons.

Joseph E. Aldy: ***The Role of Domestic Policy Surveillance in the Multilateral Climate Transparency Regime***

- Well-designed domestic policy surveillance can inform and enhance the effectiveness of multilateral climate policy transparency.
- Effective, rigorous ex post review of policies and regulations requires careful planning–including provisions for effectively collecting data about implementation and impacts.
- Domestic policy surveillance can promote policy learning and identify best policy practices.
- A robust domestic policy review framework can demonstrate a country's good-faith effort in delivering on its mitigation pledge, which can build trust in international climate policy.

Market Mechanisms in and out of the Paris Agreement

Andrei Marcu: ***Governance of Carbon Markets under Article 6 of the Paris Agreement***

- Article 6 of the Paris Agreement provides Parties with alternative governance models for transferring mitigation outcomes internationally. Internationally transferred mitigation outcomes (ITMOs) can be used towards countries' NDCs.
- Articles 6.2–6.3 and Articles 6.4–6.7 could be seen as competitive options, offering different products. They present different levels of intrusion and intervention by the CMA in providing a framework for the use of mitigation outcomes by Parties other than the ones where the mitigation outcomes were created, towards their NDCs.
- While they present different governance models, the alternatives offered by Article 6.2 and Article 6.4 need to be, and can only be, complementary and synergetic, and eventually converge. This is especially true for the metrics of quality and quantity of the mitigation outcomes being transferred between Parties. It also has a significant impact on the fungibility of the mitigation outcomes being transferred.

- To ensure complementarity and synergy, a process needs to be put in place to ensure that the different technical standards that emerge under 6.2, as well as the difference between what emerges under 6.2 and 6.4, are well understood, analyzed, and can be transmitted between the two options. This will be especially important for the modalities and procedures (M&P) to be defined under Article 6.4, which will be scrutinized by international stakeholders.

Robert N. Stavins: ***Market Mechanisms in the Paris Climate Agreement: International Linkage under Article 6.2***

- A key question regarding the Paris Agreement, with its NDCs anchored as they are in domestic political realities, is whether it can progressively lead to mitigation commitments with sufficient ambition.
- Linkage of regional, national, and sub-national policies can be part of the answer, and Article 6.2 of the Paris Agreement provides the needed foundation.
- Linkage among mitigation systems that are heterogeneous with regard to policy instruments, level of jurisdiction, and type of target—heterogeneity that will be prevalent under the global Paris-Agreement regime—will be feasible and wise in some cases, but not in others.
- Negotiators must now develop sound accounting mechanisms to fully enable Article 6.2 and "bottom-up" linkage. They must also determine the degree and types of oversight that might be required.

William A. Pizer: ***Government-to-Government Carbon Trading***

- Emissions trading between two jurisdictions can lower costs for both, making it easier to achieve current mitigation targets and to enhance future action.
- Yet, harmonizing and linking domestic carbon policies to enable international trading in a fully decentralized manner can be challenging and impractical in the near term.
- Government-to-government trading between jurisdictions with existing domestic emissions markets requires no such harmonization, yet achieves much of the same benefits and could encourage full policy linking in the future.
- Such trades might also occur between a jurisdiction with a carbon tax in place and a jurisdiction with a lower-price emission trading program, leading to reduced emissions.
- Next steps to facilitate government-to-government trades include creating a forum for discussion, developing a template for transactions, and piloting actual trades.

Nathaniel Keohane, Annie Petsonk, and Alex Hanafi: ***Building a Coalition of Carbon Markets to Spur Faster, Deeper Cuts in Climate Pollution***

- Emission trading programs, or carbon markets, can play a critical role in enabling countries to meet their nationally determined contributions (NDCs) and undertake more ambitious reductions in climate pollution over time.
- Article 6 of the Paris Agreement on climate change affirms the role of voluntary, bilateral transactions among sovereigns in meeting their NDCs.
- By developing common standards or guidelines to ensure the integrity of international emission trading, a coalition of carbon market jurisdictions (CCM) could promote coordination among carbon markets, ensure environmental integrity, and ultimately spur greater ambition in climate action.

Ottmar Edenhofer and Ulrike Kornek: ***Coordinated CO_2 Prices and Strategic Transfers***

- Mutual obligations with effective sanctions are needed in international climate policy.
- At the national level, a carbon price that increases over the long term would be a meaningful climate policy instrument.
- More effective forums are needed to negotiate ambitious carbon prices.
- Transfer payments should be made to developing countries, on the condition that they accept a minimum carbon price.
- The G20 could provide a meaningful forum to further coordinate climate policy discussions.

Processes and Institutions Complementary to the Paris Agreement

Carlo Carraro: ***Clubs, R&D, and Climate Finance: Incentives for Ambitious GHG Emission Reductions***

- Climate clubs, namely subgroups of countries implementing more ambitious and effective climate policies than others, may be the only practical approach to address the lack of incentives to reduce GHG emissions on the part of most, if not all, countries.
- In climate clubs, incentives to undertake ambitious GHG emission reduction efforts may come from adopting R&D and financial policies that provide benefits exclusively to club members.
- R&D and financial policies are beneficial because they provide innovation to reduce the costs of a unit of abated carbon and financial or insurance schemes to reduce the costs of investing in mitigation. These cost reductions can be designed to favor club members only.
- Unlike trade-related policies intended to favor club members, R&D and climate-finance policies do not have negative "side effects" for member countries. Indeed, they have positive co-benefits in addition to the primary environmental benefits—a "double dividend" for club members, and a single dividend (GHG emission reduction) for the world.

Scott Barrett: ***The Paris Agreement: We Can Do (and Have Done) Better***

- The Paris Agreement's assessment and review framework is unlikely to create strong incentives for countries to reduce their emissions relative to the levels that would have resulted without the Agreement.
- The Montreal Protocol creates very different incentives and has been more successful than any of the climate agreements in reducing greenhouse gas emissions.
- Montreal's success is due to its approach, which asks countries to coordinate their behavior.
- In addition to amending Montreal to phase down HFCs, negotiators should pursue other opportunities for coordination, including agreements on technical standards for airplanes and ocean shipping, and process standards for the manufacture of aluminum.

Kelly Sims Gallagher: ***Bilateral and Mini-multilateral Agreements after Paris***

- Bilateral and mini-multilateral agreements can and should be developed to complement and catalyze the UNFCCC process, because that process is insufficient and too slow.
- Where shared interests exist, agreements among smaller, like-minded sets of countries can be negotiated and implemented more quickly, achieve greater ambition, initiate a virtuous cycle for other countries, and generate momentum in global climate policy.
- Each new agreement must represent a measurable, additional improvement on the commitments in participating countries' INDCs.

Matthew Paterson: ***Networks and Coordination in Global Climate Governance***

- The UNFCCC is now accompanied by many other initiatives by non-state actors, business, cities, and others.
- Coordinating across these initiatives can increase ambition and catalyze action to meet the Paris Agreement goals.
- Social networks matter to climate governance, by building trust and spreading ideas across various initiatives.
- Understanding networks of actors in climate governance can help identify ways to improve coordination and thus raise ambition.

Financing Mitigation and Adaptation in the Paris Regime

Alexander Thompson: ***The Future of the Financial Mechanism: Analysis and Proposals***

- The decentralized and complex nature of the climate finance regime poses challenges—but also has advantages that can be enhanced with modest reforms.
- Setting uniform standards across climate finance institutions, especially the GEF, GCF, and AF could dramatically reduce the transaction costs of accessing funds and would facilitate information sharing and analysis.
- More active coordination across financing mechanisms would promote a more sensible division of labor and sharing of best practices.
- The financial mechanism should be a major focus of the "global stocktake" called for in the Paris Agreement.

Geoffrey Heal: ***Funding Climate Adaptation***

- Private finance should be attracted to some climate adaptation investments.
- This will require mitigation of country-specific risks, allowing private investors to focus on commercial risks.
- Investment deals can be structured to reduce or eliminate country-specific risks by involving appropriate third parties.

Henry Lee: ***Investing in Climate Adaptation***

- Climate adaptation investments face large uncertainties, moral-hazard threats, potential opportunity costs, and major equity concerns.
- Allocating international funds targeted towards adaptation will require major political trade-offs between the interests of developing countries and donors.
- Insistence on strict additionality requirements will result in underinvestment. Instead, investments that provide adaptation benefits and help meet infrastructure, development, and social needs should be encouraged.

Brian C. Murray: ***Forests, Finance, and the Paris Agreement***

- Article 5 of the Paris Agreement calls for the protection and enhancement of carbon sinks, including forests.
- These actions require economic incentives, because forests are often cleared for higher returns.
- Carbon markets were once the primary means proposed to create incentives, but their use has met resistance. The Paris Agreement and separate international aviation policies may create conditions for market-based finance, but will likely be complemented by other means and sources of finance.
- Research can inform decisions on how to structure transactions to achieve cost-effective reductions at the national and local levels.

Making the Promise of Paris a Reality

David G. Victor
University of California at San Diego
The Brookings Institution

Key Points

- The flexibility of the NDCs is a key element of the success of the Paris Agreement.
- Improving the quality of the NDCs is now a high priority—so that over time the NDCs better reveal what countries are willing and able to do.
- Better information about country preferences can lead to more effective "bottom-up" cooperation—beginning with small groups of countries, many of which are likely to form outside the formal UNFCCC process.
- It will be essential to enlist volunteer countries to demonstrate how to improve NDCs, prepare country reviews, and implement the global stocktaking.

What is new in the Paris Agreement?

The striking success in reaching universal agreement on a new global climate regime last December has inspired many answers to this question. Mine focuses on flexibility. Getting serious about climate change requires solving a very difficult problem of international bargaining. There are nearly 200 countries involved, with varied preferences and capabilities, and the decision rules for agreement require consensus. Paris solved this problem in part by papering over disagreements with clever legal language. But the main solution involved giving countries much more control over their own mitigation commitments, by letting them set their own nationally determined contributions (NDCs)—but with the stipulation that the NDCs will be updated and reviewed periodically. Enabling countries to define their own commitments has greatly reduced the extent to which long-standing political disagreements can undermine collective efforts to lay the foundation for long-term cooperation. A flexible agreement should be more durable.

Flexibility has two major implications for diplomats and policy-makers who are now working to put the Paris Agreement into full effect:

First, it is essential to improve the quality of the NDCs—beyond the "intended" NDCs that were submitted during the run-up to Paris. One of the most difficult tasks in creating truly deep and effective international cooperation is obtaining reliable information about country preferences and capabilities. The NDCs can help address that problem because they offer a

way for countries to reveal what they want and what they are willing and able to implement. The first round of NDCs is highly uneven in quality; some involve magical thinking while others are quite realistic about what countries can achieve. Nonetheless, looking across all the NDCs, they suggest that countries are willing to do quite a lot.

This probably surprises many bargaining theorists, because we have tended to view the climate change problem as one that will require strict monitoring and enforcement procedures. Such procedures would be needed, according to this view, because countries would not be willing to adopt costly mitigation policies unless their economic competitors do the same. That insight might be true later on—as the screws are really tightened on emissions—but right now flexibility is making it easier for countries to make promises about national policies. And those promises, on their own, are getting the ball rolling on the process of building more serious and demanding international cooperation.

For the next few NDC-updating periods—a decade or more, perhaps—I suspect the problem of cooperation is less about creating strict incentives and enforcement schemes. Instead, what really matters is obtaining a reliable supply of information about the costs of mitigation and about the actions that countries are actually implementing. The genius of the system adopted in Paris is that it could radically increase the supply of this information. An effective information regime will lower the transaction costs for crafting collective agreements among small groups of countries—"clubs"; make it easier for countries to negotiate the side-payments that are needed to get other countries to join and honor cooperative agreements; and could lay the foundation for a much more serious surveillance system, so that verifying compliance and learning from policy experiments in various countries becomes easier with time. All of these impacts of an effective information regime could make international cooperation deeper and more effective in the future—long before strict monitoring and enforcement systems are in place.

The top priority over the next few years is to identify countries that are willing to show how to improve their NDCs. We will also need volunteers to help perform the global stocktaking required under the Paris Agreement, first in 2018 and then again in 2023. Of course, there are formal procedures for NDC review and stocktaking, and the Paris Agreement outlines a process for putting those procedures into place. However, I doubt that the official UN-based process will achieve much in this regard. It will be hard to get consensus on the rules for national review and global stocktaking. Countries will be wary about providing information that can be used for strict UN reviews. That is why it is important to encourage volunteer countries to undertake additional efforts that are compatible with the spirit of the UN-based approach, but also formally removed and distinct from the UN process.

The analyst community can further help by articulating some standards and strategies so that future NDCs can include information not just on policies and emissions, but also on how

countries will make their NDCs amenable to review. In all the discussions about "after Paris," we have tended to focus on what governments can and should do. Equally important will be for the NGO and analyst communities to build up their capabilities, so that they can operate in parallel to, and in support of, the more formal intergovernmental national reviews and global stocktaking.

It is also important not to place too much emphasis on topics that will prove highly distracting in the NDC reviews and global stocktaking. At the top of my list of distractions is the attention that is being focused on whether the world as a whole is on track to stop warming at 1.5 or 2 degrees above pre-industrial levels. Pretending that these temperature goals are achievable was (and is) essential to the diplomatic process of holding together the coalition of countries that signed the Paris Agreement. It was politically feasible to agree on such bold, aspirational collective goals—even if they are largely unachievable—because no individual country needed to take responsibility for delivering. Sometime soon the diplomatic community will have to face the reality that we need new, achievable, and more useful long-term goals. For now, however, it is crucial not to let preoccupation with temperature goals interfere with the most important functions of improving the nationally pledged NDCs and the stocktaking—to elicit more useful information about what countries are doing to reduce emissions, which policies are working, and what their abatement efforts are really costing.

Second, taking flexibility seriously also requires paying closer attention to *how* cooperation will emerge. The Paris Agreement was designed to allow cooperation in other forums as well—in small groups and in forums outside the Framework Convention. Many think that "clubs" are the best way to get started with serious cooperation. A number of such clubs have been created, including the Asia Pacific Partnership, the MEF, the G20, the Climate and Clean Air Coalition, the producers' club for palm oil, and the Norway-led funding mechanism for forest protection. The record so far is mixed as to whether these clubs actually work. My sense is that there is still a lot of talking in clubs and not a lot of doing, with some notable positive exceptions—such as in palm oil and with Norway's funding of policy improvements in the Amazon. These are hopeful beginnings.

Based on the core logic of international cooperation, I fully subscribe to the view that serious cooperation will probably emerge "bottom up" from clubs rather than through global agreements—as has been done, often, in trade through plurlilateral agreements. The transaction costs for bargaining among large numbers of countries on demanding topics are daunting; working in smaller groups is easier.

Making it possible for cooperation to emerge through small groups requires much more attention to incentives and strategies for building global cooperation through bottom-up clubs. Which incentives matter most? Some analysts have pointed to the role of international trading and market access—including border measures that penalize countries that do not

join clubs. Still others look at the role of conditional commitments. It is crucial for analysts and diplomats to begin articulating answers to these questions.

My view is that bottom-up cooperation will be easier to catalyze than widely thought, because the first steps of cooperation are already being taken—the NDCs are revealing that countries are already willing to do a lot, without any reciprocal actions and incentives from other countries. But once cooperation begins, border measures will prove very important to create incentives for small groups to expand. And conditional commitments, if structured properly, can offer strong positive incentives for countries to deepen cooperation.

To close, I note that for much of my career I have been skeptical that formal intergovernmental cooperation on climate change would achieve much. I predicted and observed the failures of Kyoto and Copenhagen. It was easy to anticipate failure because, until recently, intergovernmental diplomacy has been designed to fail. There was too much emphasis on inflexible formulas and dividing countries into categories. Expectations that global forums would make much progress have been too rosy; despite nearly 25 years of diplomatic efforts, there is little evidence those efforts have had much impact on global emissions.

Paris is different—because its design is more flexible it can be more effective. Despite that optimism, however, we in the analyst community should also start thinking about what can go wrong. I see three areas where analysts can help articulate pitfalls and identify opportunities to avoid them:

1. **Incentives for ambition.** Paris worked, in part, because countries faced a conspicuous deadline and because systems for accountability were not in place. Nearly infinite flexibility made it easier for governments to make pledges, thereby allowing their leaders to show up in Paris without playing the role of spoiler in the eyes of the international community. But what are the incentives for countries to do more, now that Paris is over? I expect there will be a big slowdown in the ratcheting of ambition as those charged with implementing the Agreement turn to the drudgery of detail and process—all without facing many credible, costly deadlines. It is important to anticipate this slowdown and not let it blow off course the process of elaborating and implementing the promising elements of the Paris Agreement.

2. **The role of non-UNFCCC institutions.** Over the last decade there has been extensive research documenting the proliferation of international institutions on climate change and showing that much of the progress that has been achieved has happened outside the UNFCCC. Recent efforts to address industrial gases in the Montreal Protocol are a good example of progress outside the UNFCC. The Paris Agreement (especially Article 6)

was designed to allow more of this proliferation, but I am not convinced that Parties to the Agreement have fully appreciated the consequences of cooperation moving outside the forums they control. It is important for policy makers to stay the course here—and to recognize how the proliferation of institutions, on balance, adds value rather than undermines the goals of the UNFCCC and the Paris Agreement.

3. **Preserving global consensus.** In many respects, the Paris Agreement is probably quite fragile. It reflects the heroic efforts of diplomats at a particular moment in time when the diverse interests of nearly 200 countries could be glued together with an artful combination of language and strict deadlines. It is almost certain that parts of that consensus will come unglued. In finance, perhaps especially, there are complex yet vague agreements between developed and developing countries; terms have been left conspicuously undefined, as have the exact roles of the many institutions involved, the amounts of funds to be delivered, and the purposes to which these funds will be put. Perhaps one of the greatest challenges for the diplomatic community will be to hold together this consensus—by focusing on the long-term benefits of the Paris framework, even as countries realize that over the shorter term they often have quite divergent preferences.

What is new and interesting in the Paris Agreement is that it creates a process that can help countries and other stakeholders learn about what is actually happening to control emissions. By itself, Paris does not reflect much real cooperation—most countries are promising and doing what makes sense largely with regard to their own national interest. (Some Parties are exceptions, such as the EU.) Put differently, what has been created in Paris is an experimentalist regime—it is based on the idea that many countries know they want to adopt policies and start cooperating. But they need to learn what works.

The task now is to focus on making this auspicious beginning succeed. Doing that requires concentrating on the areas where serious diplomatic, policy, and analytical attention will add the greatest value. In my opinion, that means focusing on two things: (1) how to make the pledging process reveal useful information and (2) how to use this information to help catalyze "bottom-up" cooperation, both through small groups of countries and through complementary efforts by other institutions. There is a lot to do. I do not see how the formal UN-based system will be able to deliver on its own, but with help from countries that want this process to succeed, along with help from the NGOs and analysts that have built much of the needed capacity, I believe it is possible to fill in some of the crucial gaps.

Differentiation and Equity in the Post-Paris Negotiations

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Key Points:

- The Paris Agreement is anchored in equity and the principle of common but differentiated responsibilities and respective capabilities, in light of different national circumstances, but the manner in which it operationalizes this principle is distinct from that in the FCCC and its Kyoto Protocol.
- Notwithstanding the truce on differentiation reached in Paris, many open issues remain, and the devil of differentiation will be in the detail of its operationalization in the post-Paris negotiations.
- There remain crosscutting issues such as how the terms "developed" and "developing" countries are to be applied, and thematic issues, such as how conditional nationally determined contributions (NDCs) from developing countries are to be treated, and how equity is to be operationalized in the global stocktake.

Introduction

The Paris Agreement is anchored in equity and the principle of "common but differentiated responsibilities and respective capabilities, in light of different national circumstances" (CBDRRC-NC).[1] The Paris Agreement operationalizes this principle through differentiation tailored to the demands of each issue area—mitigation, adaptation, finance, capacity building, technology, and transparency.[2] The nature and extent of differentiation in the Paris Agreement, however, is distinct from that in the 1992 Framework Convention on Climate Change (FCCC) and its 1997 Kyoto Protocol. The Paris Agreement also, implicitly and silently, transports the climate regime into a post-Annex-I-&-II world. There are nevertheless several key crosscutting and thematic issues in relation to differentiation and equity that remain open and that need to be addressed in the post-Paris negotiations. This brief identifies these issues in an illustrative fashion.

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1 See e.g. Adoption of the Paris Agreement, UNFCCC Conference of the Parties, Decision 1/CP.21, Report of the Conference of the Parties on its twenty-first session (30 November to 13 December 2015), Addendum, Part two: Action taken by the Conference of the Parties at its twenty-first session, FCCC/CP/2015/10/Add.1, 29 January 2016, preambular recital 3, and Articles 2.2, 3, 4.3 and 4.19. http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

2 For full details of differentiation in each area, see Lavanya Rajamani, "Ambition and Differentiation in the 2015 Paris Agreement: Interpretative Possibilities and Underlying Politics" (2016) 65 International & Comparative Law Quarterly 493, http://dx.doi.org/10.1017/S0020589316000130; and, Daniel Bodansky, "The Paris Climate Agreement: A New Hope?" (2016) American Journal of International Law (forthcoming); earlier version at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2773895.

Illustrative Crosscutting Issues

Applying the terms "developed" and "developing": The terms "developed" and "developing" countries used in the Paris Agreement[3] have not been defined. In Paris, countries with "economies in transition" as well as those whose "special circumstances are recognized" by the COP (Turkey) sought to ensure that they would be included in the category of "developing countries" and thus entitled to any benefits that might flow thereon. This proved contentious until the end, but the terms "developed" and "developing" countries were eventually left undefined. The use of such terms in the Paris Agreement raises the specter of the Convention's Annexes. It remains to be seen if some developing countries will seek to engage the embattled Annexes to provide concrete content to these terms.

Operationalizing Developed Country Leadership: The Paris Agreement recommends that developed countries take the lead by undertaking economy-wide absolute emissions reduction targets. This recommendation is in relation to the "form" of their contribution alone. However, the FCCC notion of developed country leadership is a crosscutting and overarching one. Some developing countries may wish to bring wider notions of leadership back on the table, for instance, in relation to ambition and the balance of responsibilities between developed and developing countries.

Identifying countries with "special circumstances": In Paris, the Least Developed Countries (LDCs), Small Island Developing States (SIDS), and African countries, among others, argued that their special circumstances merited special treatment, in particular in the preamble, and in provisions on mitigation, adaptation, finance, capacity building, and transparency. This proved contentious even within the G-77/China.

Special consideration for the African states proved particularly problematic, since Africa contains high-income countries, such as South Africa, as well as members of OPEC. Some were also concerned that special consideration for a geographical region, an imperfect measure for vulnerability or capability, would open the floodgates for special pleading by other regions. The Paris Agreement recognizes the special circumstances and specific needs of the LDCs and SIDS,[4] but not of African States. The Presidency promised the African Group that they would conduct consultations through 2016 to address their concerns. This task needs to be carried out.

Illustrative Thematic Issues

Support and Conditional NDCs: Many intended nationally determined contributions (INDCs) from developing countries are expressly conditional on the provision of support (or

3 See e.g. Paris Agreement (n 1), Articles 4.4, 9.1 and 9.3.

4 Ibid, Preambular recitals 5 and 6 and Articles 4.6, 9.4, 9.9, 11.1, 13.3.

on other factors).[5] Although Parties discussed "conditional" NDCs in the ADP negotiation process, no resolution was possible. The post-Paris negotiations have been tasked with developing guidance on "features" of NDCs.[6] Parties will need to consider in this context issues including: whether Parties should be required to submit, even if only in part, unconditional NDCs; how conditional NDCs should be dealt with in relation to support; whether there should be a process for conditional NDCs to graduate to unconditional ones; how the transparency framework should account for conditional NDCs, given that Parties are required to provide information necessary to track progress in "implementing and achieving"[7] their NDCs; and whether conditional NDCs should be limited or circumscribed in some respect.

Long-term low GHG emission development strategies: The Paris Agreement requires all Parties to "strive" to formulate and communicate long-term low GHG emission-development strategies, taking into account CBDRRC-NC. Developing countries' contributions cover the range from sectoral NDCs to deviations from BAU to reductions in emissions intensity of GDP. Formulating long-term low GHG emission development strategies will catalyze longer-term strategic thinking on integrating development and low-GHG objectives, and a clearer understanding of how particular short-term actions and decisions, including in investments, fit in the longer-term pathway towards decarbonization. Although the provision that Parties formulate and submit such plans is phrased in recommendatory terms ("should strive to"), there is mounting political pressure, in particular on larger developing countries, to submit such strategies. It remains to be seen what form these strategies will take, how long-term development and low-GHG pathways will be integrated, how CBDRRC-NC will be deployed in these strategies, and how conditional or unconditional they will be.

Balancing flexibility and rigor in the transparency framework: The Paris Agreement laid down the broad template for a transparency framework, but its modalities, procedures and guidelines have to be fleshed out.[8] The Paris template envisages flexibility for those developing countries "that need it in light of their capacities."[9] Parties will need to consider in this context issues including: how and on what basis some developing countries will be deemed to need flexibility and thus offered it; and what kind of flexibility such countries will be provided,[10] and for how long. More broadly, since the transparency framework is to build on existing

5 See e.g. INDCs of India, South Africa, Philippines, Saudi Arabia, available on the UNFCCC web site at: "INDCs as Communicated by the Parties," http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx.

6 Decision 1/CP.21 (n 1), para 26; Revised Provisional Agenda, *Ad Hoc* Working Group on the Paris Agreement, FCCC/APA/2016/L.1, 20 May 2016, http://unfccc.int/resource/docs/2016/apa/eng/l01.pdf, Item 3(a).

7 Paris Agreement (n 1), Article 13.7.

8 Revised Provisional Agenda (n 7), Item 5.

9 Paris Agreement (n 1), Article 13.2.

10 Decision 1/CP.21 (n 1), para 89 specifies flexibility in "scope, frequency, and level of detail of reporting, and in the scope of review."

transparency arrangements,[11] Parties will need to decide the nature and extent of differentiation in the transparency framework, and balance it with the required rigor.

Building equity into the global stocktake: The Paris Agreement provides that the global stock take that assesses "collective progress" towards the purpose of the Paris Agreement and its long term goals is to be undertaken "in the light of equity."[12] Parties need to consider how equity can be operationalized, and in particular how the collective effort required to meet the purpose of the Paris Agreement can be fairly distributed; how any such distribution of effort will be represented in the outcome of the stocktake; and what influence it will have on future rounds of NDCs from Parties.

Conclusion

Parties arrived at a "truce" on differentiation in Paris, but many open issues remain, including the ones identified in this brief. The post-Paris negotiations will need to address these lingering and legitimate issues of differentiation and equity, albeit within the new framing of CBDRRC-NC.

11 Paris Agreement (n 1), Articles 13.3 and 13.4.

12 Paris Agreement (n 1), Article 14.

Elaborating the Paris Agreement's Rules

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Key Points

- The Paris Agreement[1] calls for the elaboration of many subjects through CMA decisions.
- In contrast to the Kyoto Protocol, the elaboration of additional rules, modalities, procedures, and guidance by the CMA is not essential to national implementation of the Paris Agreement, but will be necessary to operationalize the Agreement's new institutional arrangements, including the mitigation and sustainable development mechanism, the enhanced transparency framework, and the implementation and compliance mechanism.
- On a few issues, such as accounting, the CMA may adopt decisions governing the conduct of the Parties, but these will not be legally binding, unless the Paris Agreement makes them so.

Like most multilateral environmental agreements, the Paris Agreement establishes general norms, leaving many details to be filled in through decisions of the Parties. For example, the Paris Agreement does not specify:

- Time frames and features of future NDCs, leaving these elements to national determination.
- The up-front information that parties must provide when submitting their NDCs. Instead, the list of up-front information specified in Decision 1/CP.21 is non-binding, leaving Parties with discretion as to how they satisfy their obligation under Article 4.8 to ensure clarity, transparency, and understanding.
- Accounting guidance for NDCs under Article 4.13.
- Rules, modalities, and procedures for the new mitigation and sustainable development mechanism established by Article 6.4.
- Modalities for recognizing adaptation efforts pursuant to Article 7.3.

1 Decision 1/CP.21, including the Paris Agreement, may be accessed at: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

- Common modalities, procedures, and guidelines for the transparency of action and support under Article 13.
- Modalities for the global stocktake established by Article 14.
- The modalities and procedures of the new implementation and compliance mechanism established by Article 15.

Elaborating rules, modalities, procedures, and guidelines (referred to, collectively, as "norms") on these and other subjects raises a number of issues, which call for further research:

1. What is the legal basis for CMA action to elaborate additional norms?

- The Paris Agreement mandates that the CMA "shall adopt" additional norms on a number of subjects, including rules, modalities, and procedures for the new sustainable development mechanism (Article 6.7), institutional arrangements for capacity building (Article 11.5), and common modalities, procedures, and guidelines for the enhanced transparency framework (Article 13.13).
- Several provisions of the Paris Agreement specify decisions "to be adopted" by the CMA—for example, elaborating modalities, procedures, and guidelines for the provision of information on support (Article 9.7)—creating a strong expectation of CMA action.
- Some provisions authorize but do not require the CMA to adopt decisions—for example, regarding common time frames for future NDCs (Article 4.10) or to provide guidance to the Warsaw Institutional Mechanism on Loss and Damage (Article 8.2).[2]
- Even when the Paris Agreement is silent regarding the elaboration of additional norms, the CMA has general authority to make "decisions necessary to promote [the Agreement's] effective implementation" (Article 16.4). Pursuant to this residual authority, the CMA might adopt guidance on "features" of future NDCs, as contemplated by Decision 1/CP.21 (paragraph 26), which adopted the Paris Agreement.

2. When are additional norms to be elaborated?

- The process of elaborating the Paris Agreement began at COP-21, in the decision adopting the Agreement.

2 The Warsaw Institutional Mechanism on Loss and Damage (Decision 2/CP.19) may be accessed at: http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf.

- The Paris Agreement calls for the adoption of norms on many subjects at CMA-1, whenever that might be—for example, the rules, modalities, and procedures for the new market mechanism (Article 6.7); the modalities for recognizing adaptation efforts by developing countries (Article 7.3); the rules for providing information on support for developing countries (Article 9.7); and the modalities, procedures, and guidelines for the enhanced transparency framework (Article 13.13).

- The Paris decision specifies a particular date (2018) in some instances—for example, regarding consideration of modalities for the accounting of financial resources (Decision 1/CP.21, paragraph 57) and for completion of work by the APA on modalities, procedures and guidelines for the enhanced transparency framework (paragraph 96).

- Some provisions of the Paris Agreement do not specify any time frame—for example, the provisions providing for the CMA to adopt accounting guidance (Article 4.13) and guidance on internationally transferred mitigation outcomes (ITMOs) (Article 6.2).

3. By whom are norms to be elaborated?

- The rules, modalities, procedures, and guidelines elaborating the Paris Agreement are to be adopted by the CMA, but a variety of other institutions are also given roles in developing these norms, including the APA, the SBSTA and SBI, and the COP.

4. To whom are rules addressed?

- Some of the norms to be elaborated will govern the conduct of parties—for example, the rules on accounting of NDCs (Article 4.3) and financial support (Article 9.7).

- But many norms concern institutional arrangements—they are directed at the UN climate regime's institutions, such as the newly created mitigation and sustainable development mechanism (Article 6.7), rather than at the Parties directly. In general, the CMA has authority over institutions created by the Paris Agreement. But the CMA's formal authority over institutions created pursuant to other agreements (such as the Green Climate Fund, which was created under the auspices of the UNFCCC) will depend on whether the parties to the other agreement recognize the CMA's authority, although this is unlikely to be an issue in practice.

5. What is the default if norms are not adopted?

- Given the difficultly of adopting COP (and presumably CMA) decisions, which in the absence of agreed rules of procedure requires consensus, it may not be possible for the CMA to adopt decisions on some subjects, even when the Paris Agreement mandates it to do so.
- If the CMA fails to adopt a decision, the default situation will depend on the language of the Paris Agreement.
- The Paris Agreement was generally drafted to allow parties to implement their obligations even in the absence of additional CMA decisions. For example, if the CMA fails to adopt decisions specifying the up-front information that Parties must provide pursuant to Article 4.8, elaborating accounting guidance pursuant to Article 4.13, or providing guidance to avoid the double counting of ITMOs under Article 6.2, then each Party will be left to interpret and implement their obligations under these provisions on their own.
- In contrast, if the CMA were unable to adopt rules, modalities, and procedures for the new mitigation and sustainable development mechanism established by Article 6.7, then the mechanism would not be able to begin operating.

6. What is the legal character of CMA decisions? Are they legally binding?

- The Paris Agreement determines the legal force, if any, of CMA decisions.
- In general, the Paris Agreement does not authorize the CMA to adopt legally binding decisions with respect to Parties. Instead, CMA decisions have the status of recommendations.
- However, several provisions of the Paris Agreement appear to authorize the CMA to adopt decisions with legal force, by requiring Parties to act "in accordance with" or "consistent with" those decisions. Examples include Article 4.9, which requires Parties to communicate an NDC every five years in accordance with relevant CMA decisions, and Article 6.2, which requires Parties to account for ITMOs consistent with guidance adopted by the CMA.

- Whether a CMA decision adopted pursuant to these provisions has legal force also depends on whether it is formulated in mandatory terms. For example, Article 4.8 allows the CMA to adopt binding decisions, by requiring Parties, when communicating their NDCs, to provide information in accordance with Decision 1/CP.21 and any relevant CMA decisions. But Decision 1/CP.1 merely lists information that Parties "may" provide (paragraph 27), rather than requiring the provision of any particular information, so it does not establish any legal obligation for states beyond the general obligation in Article 4.8 to ensure clarity, transparency, and understanding.

- Conversely, even when a CMA decision is characterized as "guidance" (for example, in Article 6.2), this does not appear to preclude the decision from having legal force if the guidance is phrased in mandatory terms and the Paris Agreement requires Parties to act in accordance with or consistent with it. Use of the term "guidance" in this context appears to connote that the decision establishes general norms that leave states with some discretion, rather than that the decision lacks legal force.

Enhancing Climate Mitigation Ambition Successively: The Drivers

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Key Points

- There are two important new features, with regard to mitigation ambition, in the Paris Agreement: much broader participation, and provisions to enhance ambition over time under the UNFCCC.
- The drivers of enhanced mitigation ambition (as the context of the Paris Agreement) provide cause for optimism that the Agreement may be successful.
- The design and implementation of an international agreement on mitigating climate change (a global public good) must be consistent with countries' strategic interests.
- It is important to connect the Paris-Agreement process with the dynamic and real context of global trends, international interactions, multilateral and bilateral agendas, and major Parties' expectations about their development level and dynamic interests in the future.

National commitments on mitigation ambition have been the core of negotiating international agreements on climate change in the history of global climate governance since the Berlin Mandate—including the Kyoto Protocol, through Copenhagen/Cancun, and, recently, towards the Paris Agreement. There are two new features with regard to ambition-setting in the Paris Agreement, though these continue to be based on the same—or similar—political principles and party groupings as under the UNFCCC.[1] One is much broader participation, with 162 Parties, including both developed and developing countries, submitting their Intended Nationally Determined Contributions (INDCs). Another is that a no-backsliding and enhancing mechanism has been established for increasing mitigation ambition over time, by communicating nationally determined contributions every five years in the context of regular global stocktaking, according to Article 4 of the Paris Agreement.

One might question the effectiveness and feasibility of this mechanism to enhance mitigation ambition periodically, on a multilateral basis, and to set mitigation targets on the basis of both

1 Especially with recent political agreement between developed and developing country parties on a new description of "Common but differentiated responsibilities and respective capabilities."

science and socioeconomic considerations.[2] There are two responses to these concerns: one is to look at the drivers for Parties deciding how—and how much—to update and strengthen their INDC targets; the other is to examine the mechanism or institutional arrangement for updating, in terms of defining responsibilities and rights for Parties to ensure "successive" and "progressive" commitments on targets.

Understanding and correctly managing the drivers that determine Parties' decisions on enhancing their INDC targets seems to be more fundamental for both global and national interests. Several major drivers have been identified as follows:

The first driver is the recognition and dissemination, by political and business decision makers, of the latest scientific and technological findings/messages on global climate change, including those concerning climate-change impacts on the environment and human society (in the form of adverse changes in water resources, agriculture productivity, sea level rise and related coastal management challenges, biodiversity, public health, and infrastructure) and findings/messages concerning the latest progress in optimizing mitigation and adaptation measures in the context of technologies, engineering, sectors, markets, and culture and values.

In past decades, we have seen that many decision makers and opinion leaders in today's generation are constrained—by their interests or their understanding—in considering and responding to the impacts of climate change, especially when these impacts and effectiveness of response measures are expected to occur over several decades or even several hundreds of years—well beyond the physical, business, and political lifespans of today's decision makers. To overcome the gap between their current understanding and near-term interests and the much larger spatial and temporal scale of climate-related externalities requires continuous education, communication, and other efforts to improve awareness and re-shape values. This will be an enduring challenge. Some mechanisms that respond to this challenge have been practiced and are worth improving and enhancing.[3]

Second, in the past two decades, real technological changes in, for example, renewables, other non-fossil fuels, energy efficiency and materials technologies, and artificial intelligence have

2 For example, there have been two major concerns in the UNFCCC negotiation process pertaining to the bottom-up approach, reflected in the INDCs, to determine global and national mitigation targets. One is if the agreed global target based on the INDCs could be able to meet the requirement of limiting temperature rise to 1.5–2°C; the other is if this approach could ensure that Parties could implement their commitments fully, in terms of mitigation, adaptation, transparency, and means of implementation.

3 A relevant mechanism to convey research-based insights from the scientific community (e.g., through the IPCC process) to international negotiators was established in Cancun in 2010. These scientist-negotiator interactions, which were known as the Structured Expert Dialogue (SED) and were established in the context of the 2013-2015 Review on long-term global goals, proved to be useful in supporting the negotiations that led to the Paris Agreement. See: http://unfccc.int/science/workstreams/the_2013-2015_review/items/7521.php.

enhanced understanding of abatement costs and the availability and feasibility of technologies for mitigation and adaptation, which have been and will continue to be the major basis of decision making in enhancing INDC targets. Furthermore, technological innovation might also change the definition of costs and benefits in the process of reviewing and updating INDC targets.

Third, changes in relevant markets—for example, in demand, supply, and price trends for fossil fuels, electricity, and inputs and outputs for energy intensive industries and economic activities—might be another substantive driver of decision making with respect to enhancing mitigation ambition. This driver will also interact with the evolution of the policy environment related to carbon pricing via tax reforms or progress in emissions trading systems.

Fourth, for some key Parties among emerging economies, such as China, India, Brazil, and some Parties in Southeast Asia, expectations about their development level in the future might be another important driver in terms of influencing decision making on enhancing mitigation ambition. These countries are industrializing rapidly and can expect to see significant changes in income level, economic structure, sources of growth, infrastructure development, the size and role of the middle class, and socioeconomic governance.

Finally, given that climate change has emerged as a prominent issue in international political and economic agendas and global governance, experience with the Paris Agreement has shown that the design/negotiation and implementation of an international agreement on mitigating climate change—as a global public good—must be consistent with countries' strategic interests. Strategic considerations or factors, such as diplomatic or political relationships with major countries, domestic political circumstances, and interest in objectives such as upgrading the domestic economy via efficiency improvements and technological innovation, ensuring energy security through increased use of renewables, and improving local air quality by adopting cleaner energy technologies, seem to be more crucial than so-called Prisoner's Dilemma considerations. This especially applies to the decision making of large countries like China and the U.S. as they determine their respective INDC targets. In other words, if we want to continue applying the Prisoner's Dilemma conceptual framework, we need to redefine the pay-off function when gaming is analyzed and addressed.

Connecting the above drivers with real decision-making processes and results will be nonlinear and indirect, depending on the real decision-making environment and on dynamic interactions between Parties on both a multilateral and bilateral basis. This means it will be necessary to explore and intervene in the process of enhancing INDC targets in the dynamic and real context of global trends, international interactions, multilateral and bilateral agendas, and major Parties' changing future circumstances.

Making Paris Sustainable

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Key Points

- The Paris Agreement should permit, and in fact encourage, commitments that are reciprocally conditional. However, a five-year updating period is too brief, and the complexity of the bargaining environment makes it difficult to make conditional emissions-reduction offers.
- Solutions to these challenges may include countries pledging to a long-term emissions-reduction path, using formulas to help determine updated pledges, and employing trade measures to ensure compliance.
- Supply-side policies can complement demand-side policies. Funds for compensating avoided deforestation will be cost-effective and have an immediate impact on deforestation. Regulating fossil-fuel extraction will stabilize the global fossil fuel price, reduce the incentive to free ride, and work as an insurance policy if the Paris Agreement should succeed less well than intended.

This brief explains *why* a pledge-and-review mechanism—as in the Paris Agreement regime—leads to two difficult challenges related to negotiation and *how* these obstacles may be overcome by five solutions that would strengthen the process going forward. The brief builds on elementary logic and game theory, and also on the author's recent research, as listed in the references.

Advantages of the Paris Agreement

Conditional offers. Reducing emissions is a global public good. Thus, a country "X" is willing to cut emissions more if the cut is instrumental in securing larger cuts in another country "Y". If country "Y" makes its emission cuts conditional on how much "X" is willing to cut, more is achieved in total. This logic implies that the largest cuts are achieved if countries' cuts and pledges are conditioned on the offers made by other countries. The Paris process should permit, and in fact encourage, such conditionality going forward.

Pledge and review. The Paris Agreement requires reviews every five years, when countries ought to review and strengthen their commitments. Such updating is necessary, since it is politically difficult and scientifically undesirable (due to incomplete and uncertain scientific knowledge) to make longer-term commitments today.

Challenges

There are two major challenges to elaborating and implementing the Paris Agreement:

Five years is too brief. Unfortunately, a five-year commitment period gives insufficient incentives to commit to the process and invest in necessary technology and infrastructure—partly because a country will be expected to cut more after such investments have been made (Harstad 2016a; Beccherle and Tirole 2011).

Offers are not comparable. Furthermore, combining conditional offers with five-year reviews leads to a highly complex bargaining situation in which the different offers may be difficult to compare and match. The "transaction costs" of such a repeated bargaining situation are likely to be large.

Solutions

1. **Pledging to a *path*.** To motivate countries to have the distant future in mind, while allowing them flexibility in the near term, countries should be requested to announce ambitious long-run paths for how cuts will be gradually deepened, with the five-year reviews being used to fine-tune and revise these planned paths (Harstad 2012a, 2016a).

2. **Using formulas.** To reduce the transaction costs of achieving agreements, discussed above, it is recommended to discuss in advance formulas for how the cuts and pledges are to be improved over time for all countries. As an example, the formula could indicate how any country's cuts are to deepen over time as a function of the country's historic emission levels, the extent to which it has complied, and its level of economic/population growth. Formulas have been used successfully in trade liberalization talks and they have also been analyzed in the climate context (Bosetti and Frankel 2012).

3. **Trade measures.** The logic of "conditional offers" implies that a country is willing to contribute more if it is credible that *other* countries will honor *their* commitments. Such credibility can be ensured by permitting trade sanctions on countries that violate their commitments. Thus, trade sanctions may support the agreement, even if they will never actually be used. Trade sanctions may also be necessary to secure sufficient participation in future climate treaties (Nordhaus 2015). While "sanction" has a negative connotation, the same constructive effects are achieved if countries that participate and comply are granted a "most-favored nations" status (with no/low border measures), as this is defined by the WTO.

4. **Include forests.** Deforestation contributes a large fraction of greenhouse gas emissions and also leads to irreversible losses of biodiversity (IPCC 2007; 2013). It is thus urgent to provide incentives for conserving forests. Countries will be incentivized to conserve today if they expect compensation for the forests in the future. Thus, the international community must signal its intention to financially compensate countries that conserve their forests (Harstad 2016b). This can be achieved by giving credit for conservation and/or by establishing large funds to be used to compensate countries that conserve forests.

5. **Keeping fossil fuels in the ground.** If Paris succeeds and countries cut emissions, demand for fossil fuels will decline and so will suppliers' extraction levels. Thus, agreements on keeping fossil fuels in the ground seem redundant if Paris is set to succeed. In reality, however, agreements on reducing fossil fuel extraction levels by key producers may be both beneficial and necessary for a number of reasons: A one-sided focus on reducing consumption and demand for fossil fuels will lower the global fossil fuel price dramatically. A lower price will increase the benefits from non-participation and non-compliance; it will also make it difficult to secure the participation of fossil fuel exporters, and it will not sufficiently motivate investments in alternative green technology. If we add a focus on reducing extraction levels, the price will increase or remain unchanged, and these problems will be overcome (Harstad 2012b). Furthermore, an agreement on reducing extraction levels will limit the world's emissions in the event that the Paris Agreement does not succeed to the extent that we hope. Thus, regulating extraction levels is an "insurance" type of agreement that will generate no harm if Paris succeeds well, and large gains if Paris succeeds less well. The best approach to regulating fossil fuel extraction levels may be to concentrate on geographical regions that are claimed/owned by multiple wealthy nations and where the exploitation risk and/or extraction costs are large. One should investigate whether the Arctic deserves an extraction moratorium based on these criteria. There is an analogy (although certainly important differences) between compensating countries to keep fossil fuels in the ground and the policy of paying countries to conserve tropical forests, discussed above.

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Transparency Framework and Strategic Choice of NDC Metrics

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Key Points

- In theory, NDCs can be translated into any metric without affecting ambition, if detailed information is *known* and *provided*. However, despite theoretical equivalence, in practice the degree of transparency is associated with the target type.
- It seems important to distinguish between "narrow" and "broad" transparency. The first concept refers to how information under the GHG target is provided, and the second has to do with possible problems associated with asymmetric information.
- We might assume that diversity in INDC types is due only to strategic choice (i.e., choice based on hidden criteria other than emissions reduction)—and that if all governments acted transparently, they would use a common metric (ideally, the simplest—a quantified amount relative to a base year). However, countries may choose more flexible metrics for other reasons.

Background

The Intended Nationally Determined Contributions (INDCs) presented at Paris include three main types of GHG emissions-reduction targets: *base year emissions target (BYT*: reduce emissions by a quantified amount relative to a base year); *baseline scenario target (BST*: reduce emissions by a quantified amount relative to a projected BAU scenario); and *base year emissions Intensity target (BYIT*: reduce emissions intensity by a specified amount with respect to a base year, so that allowed emissions depend on GDP).[1]

According to a compilation of INDCs by the World Resources Institute,[2] approximately 150 economies proposed quantified GHG targets before Paris. Among those, 50% chose a *BST*, while 38% related their INDC to a *BYT*, and only 4% to *BYIT*. And, the lower the income category of countries (as classified by the World Bank), the more they preferred a *BST*, while nations for which emissions have increased over the period 2000 to 2012 are those that most often adopted *BST* (see Figure 1).

1 Some countries also presented Fixed Level target (absolute level of reduction or carbon neutrality), Trajectory target (emission reduction in multiple year targets or a period, often with peak targets), or a combination of metrics.

2 http://cait.wri.org/indc

At the same time, an increasing number of directives on transparency have been introduced in COP documents: COP-19 in Warsaw called for INDCs that facilitate clarity and transparency; COP-20 in Lima reiterated the same message and added more concrete specifications regarding what information should be included in INDCs (for example, time frames and gases covered); while, COP-21 established a "transparency framework for action and support." Transparency has to do with making available to the UNFCCC all information required for cooperation, and implies that there should be no hidden agendas in the way information is submitted.

This brief addresses how transparency is related to the various types of GHG targets, and discusses if addressing it is sufficient to avoid strategic choice of INDCs metrics (i.e., choice based on hidden criteria other than emissions reduction):

Discussion

1. **In theory, NDCs can be translated into any metric without affecting ambition, if detailed information is *known* and *provided* (see Damassa *et al.* 2015). However, despite theoretical equivalence, the degree of transparency is associated with the target type.** There is an *a priori* "transparency ranking" for GHG targets: *BST*, *BYIT*, and *BYT* (from low to high). On the one hand, while it is difficult to make base year targets opaque, because past emissions are reported in national inventories, it is feasible to reduce the transparency of other metrics. There has been documented lack of clarity in the GDP measurement of several countries, which affects intensity targets. And an even higher risk of ambiguity exists for the models and assumptions used to project baseline scenarios.

2. **It seems important to distinguish between "narrow" and "broad" transparency. The first concept refers to how information under the GHG target is provided and the second definition has to do with possible problems associated with asymmetric information.** Contributions can be made transparent in the narrow sense by providing transparency guidance on what should be reported. For example, it is crucial to define whether GDP under *FYIT* would be measured in current or constant terms—or whether in national or international units—since future emissions depend on this distinction, as shown by Aldy and Pizer (2015).

   To address transparency in the broad sense, it is not enough to define what information has to be provided by each country, but it is also necessary to generate incentives so that the data reported are accurate (for example, that there is no overestimation of BAU scenarios in *BST*). Governments might be incentivized to be transparent from a strengthening of *screening* mechanisms (such as technical expert reviews), but also if countries discover

there are material gains from being transparent (for example, more climate funding). The latter would be a *signaling* mechanism. Nations would find it in their interest in those cases to send a signal of transparency.

3. **We might assume that diversity in INDC metrics is due only to strategic choice (i.e., choice based on hidden criteria other than emissions reduction) and that if all governments acted transparently, they would use a common metric (ideally, the simplest: *BYT*). However, this assumption is incorrect.** Other target types could still exist, because countries may argue that they choose *non-BYT*—not to strategically avoid being clear—but because such targets are more flexible and so accommodate countries' need for economic growth. As shown by numerous studies, base year targets are ideal for stable countries. But, when GDP is higher than expected, allowed emissions under that type of target would be too low and imply excessive effort and cost for the nation that adopted it.

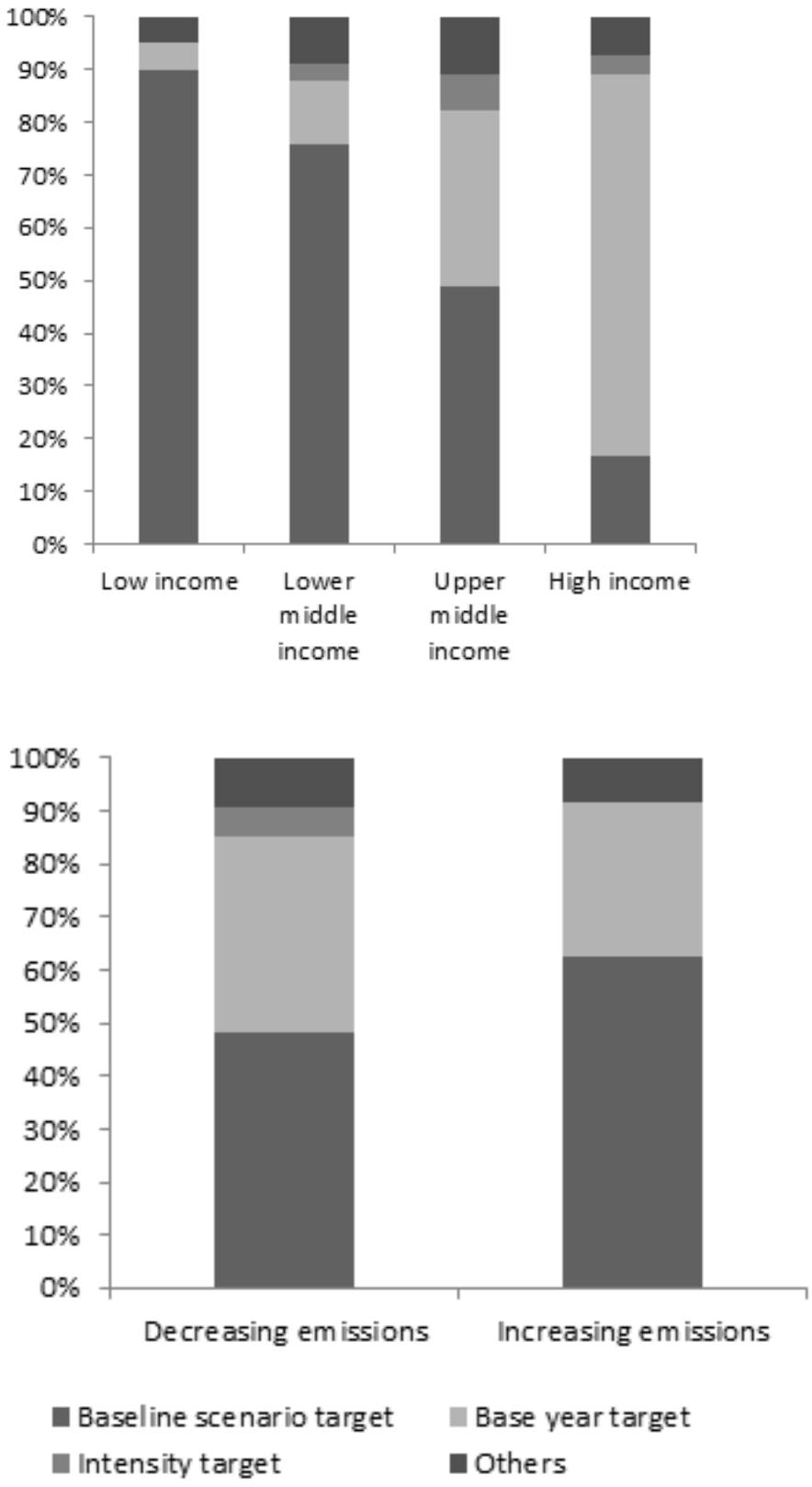
Conclusion

The *a priori* less transparent target type (*BST*) was adopted by 50% of countries that submitted INDCs under the Paris Agreement (and more by countries with lower income and increasing emissions). So a move towards transparency is not evident in actual national climate change policies, despite successive COP decisions encouraging transparency.

It would appear that a solution is to implement the Paris Agreement's transparency framework in a rigorous manner, so that all Parties reframe their targets and converge to the *BYT* type. However, things are not that simple. The question is, "What leads countries to choose opaque targets?" Less transparent targets are also the more flexible ones, and flexibility, as noted, is often desirable in itself.

Are there ways to preclude opaque practices in the choice of NDC metrics? Yes—by making procedures for reporting more strict and by favoring screening and signaling mechanisms within the post-Paris negotiations. Are there ways to preclude types of metrics that are also flexible? This is more difficult. Compensation may be needed for countries to forego flexibility. There is much work to be done to better understand the tradeoffs between flexibility and transparency. What is evident now is that transparency rules, while very important, are only part of the story.

Figure 1. INDCs by Income and Emissions' Dynamics



Source: Author's calculations based on GHG targets as classified in WRI INDC's compilation combined with data from the World Bank Development Indicators Database.

Note: n= 130. Six countries do not have GDP estimation for 2012 (constant $US 2005), and emissions data are lacking for seven nations (kCO_2e). Others are in WRI database, but not included in the WB list. Cumulative annual growth rates are for the 2000–2012 period.

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The Role of Domestic Policy Surveillance in the Multilateral Climate Transparency Regime

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Key Points

- Well-designed domestic policy surveillance can inform and enhance the effectiveness of multilateral climate policy transparency.
- Effective, rigorous *ex post* review of policies and regulations requires careful planning—including provisions for effectively collecting data about implementation and impacts.
- Domestic policy surveillance can promote policy learning and identify best policy practices.
- A robust domestic policy review framework can demonstrate a country's good-faith effort in delivering on its mitigation pledge, which can build trust in international climate policy.

The 2015 Paris Agreement represents the culmination of a transition toward a pledge-and-review international climate-policy architecture that began at the 2009 Copenhagen talks. The review of mitigation pledges will play a critical role in the success and durability of this new pledge-and-review regime. Transparency of countries' mitigation actions can address several objectives: (1) determining if a country has met its pledge; (2) building trust among countries in repeated rounds of pledging over time; and (3) promoting learning about policy efficacy. These benefits of transparency can be realized through effective policy surveillance, which the Paris Agreement calls for and which is to be elaborated in subsequent negotiations.

A key element of, and the primary input to, a multilateral transparency mechanism will be domestic policy surveillance. While simply reporting national emissions inventories could address the primary objective of transparency—did a country meet its mitigation pledge?—a more rigorous assessment of domestic policy performance could facilitate trust-building and policy learning. Such an approach to domestic policy surveillance could draw from existing experience with *ex post* review of regulations, often referred to as retrospective review and regulatory look-back.

U.S. Experience with Retrospective Review of Regulations

The United States has undertaken periodic *ex post*, or retrospective, reviews of regulations, at least once under each president dating back to the Carter Administration in 1978. These regulatory look-backs have identified ineffective regulatory interventions and motivated reforms that have enhanced the efficacy and the economic efficiency of regulatory policy. The Obama Administration has undertaken a concerted effort to institutionalize retrospective review of regulations, including semi-annual reporting of retrospective-review efforts by regulatory agencies. Aldy (2014) provides an extensive review of *ex post* review efforts across administrations, details the lessons learned under the Obama Administration, and makes recommendations for improving the implementation of retrospective review of regulations, most of which were adopted by the Administrative Conference of the United States (2014). Likewise, the OECD Council on Regulatory Policy and Governance (2012) has issued recommendations on *ex post* review of regulations.

These recommendations focus on the importance of creating a culture and norm for conducting *ex post* reviews, encourage planning for *ex post* review in the development of regulations, and emphasize the value of rigorous statistical approaches to enable policy learning.

Planning for Rigorous *Ex Post* Review of Domestic Climate Policy

Effective, rigorous *ex post* review of policies and regulations requires careful planning; waiting until after a policy is in place may be too late. A well-functioning domestic climate-policy-review framework should support the design of policies that incorporate means for collecting data to be used for *ex post* analysis. Policy-makers should identify the outcomes that they want to learn about—program efficacy, aggregate benefits and costs (and their distribution), innovation, trade, and other impacts—and ensure that data are collected to inform analyses of these outcomes.

Moreover, policy development should explicitly account for a research design that can enable rigorous statistical analysis of the causal impacts of the policy (as opposed to simply statistical associations), improve the calibration of models used to evaluate the policy in question—or both. Consistent with the spirit of transparency, providing opportunities for third-party access to these data can permit replication—to assure users of reviews that the results of domestic policy surveillance are robust and credible—and extensions of analyses that can advance policy learning. Leveraging expertise outside of governments may be especially important for countries with limited resources.

What Policies Work and Why

The status quo approach to transparency emphasizes an inventory of national emissions, which has a limited relationship to a country's mitigation policies. A well-designed domestic

policy-surveillance framework can focus explicitly on policy interventions. In doing so, it would highlight the nature and extent of a country's mitigation effort—thereby building trust with other countries—and enable learning about policy efficacy so that a country can continually improve its domestic policy performance. There may be opportunities for multi-country evaluations in cases where a set of countries employs similar mitigation policies. Such joint assessments and review may also serve as a foundation for linking these countries' mitigation programs.

Trust building and policy learning can benefit international negotiations along two dimensions. First, if a country delivers on its mitigation pledge, domestic policy surveillance can show how its domestic mitigation policies contributed to this success. A country could highlight this policy effectiveness, pledge more ambitious mitigation efforts in subsequent negotiations on the basis of ramping up implementation of this successful policy, and leverage more ambitious mitigation pledges by others. If a country simply met its pledge for reasons unrelated to domestic mitigation policy—e.g., slow economic growth—then other countries will know that there is no value in learning from this country.

Second, if a country fails to deliver on its mitigation pledge, the results of domestic policy surveillance could indicate whether the country made a good faith effort. For example, suppose that a country makes substantial efforts to mitigate its emissions but suffers a Fukushima-like disaster that requires it to shut down all of its nuclear power plants. Well-designed domestic policy surveillance could permit this country to demonstrate a good-faith effort, even if its emissions exceeded its pledge. This would likely have different implications for future negotiations than if the country made no mitigation efforts and failed to meet its pledge.

Challenges and Needs

For a domestic policy surveillance framework to be effective and to inform the multilateral climate-policy transparency mechanism, governments will need to plan for *ex post* reviews in their development of new emission mitigation policies. They will need to undertake data collection. These efforts require financial and technical resources, and some countries may lack both.

The experience of policy surveillance by the International Monetary Fund—which has made investments in data collection, analytic tools, and human resources in many developing countries—highlights how such challenges can be overcome. It will require donor countries to focus resources to support targeted capacity-building for domestic policy surveillance. In addition, some donors could consider conditioning climate finance on a country meeting minimum standards of domestic transparency and review. Indeed, this framework could also be applied to the evaluation of climate finance for mitigation and adaptation efforts.

The prospect of learning what works—especially through supplementary efforts that identify and publicize best policy practices from countries around the world—could create an additional incentive for countries to invest in such domestic policy surveillance. Moreover, this approach to evaluation is not unique to climate policy. By training in-country experts to conduct *ex post* analyses of domestic climate policy, these tools and expertise could spill over to non-climate public policies and enable governments to become more effective in their design and implementation of policy.

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Governance of Carbon Markets under Article 6 of the Paris Agreement

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Key Points

- Article 6 of the Paris Agreement provides Parties with alternative governance models for transferring mitigation outcomes internationally. Internationally transferred mitigation outcomes (ITMOs) can be used towards countries' NDCs.
- Articles 6.2–6.3 and Articles 6.4–6.7 could be seen as competitive options, offering different products. They present different levels of intrusion and intervention by the CMA in providing a framework for the use of mitigation outcomes by Parties other than the ones where the mitigation outcomes were created, towards their NDCs.
- While they present different governance models, the alternatives offered by Article 6.2 and Article 6.4 need to be, and can only be, complementary and synergetic, and eventually converge. This is especially true for the metrics of quality and quantity of the mitigation outcomes being transferred between Parties. It also has a significant impact on the fungibility of the mitigation outcomes being transferred.
- To ensure complementarity and synergy, a process needs to be put in place to ensure that the different technical standards that emerge under 6.2, as well as the difference between what emerges under 6.2 and 6.4, are well understood, analyzed, and can be transmitted between the two options. This will be especially important for the modalities and procedures (M&P) to be defined under Article 6.4, which will be scrutinized by international stakeholders.

The Paris Agreement contains in Article 6 a surprisingly extensive reference to what is termed "cooperative approaches," and includes provisions that are seen as creating a framework for an international carbon market for use towards NDCs.[1]

1 See also Andrei Marcu, "Carbon Market Provisions in the Paris Agreement (Article 6)," Special Report, Centre for European Policy Studies, January 2016, www.ceps.eu/publications/carbon-market-provisions-paris-agreement-article-6.

Under Article 6 significant amounts of mitigation outcomes could be transferred between Parties, and may account for a large portion of some countries' overall progress toward their NDCs. Since the Paris Agreement is a framework for building trust between Parties, Article 6 has to provide for good and transparent governance, which will assure that the environmental integrity of the Agreement—and that of a future carbon market—is maintained, while also re-assuring Parties, and allowing them to increase their ambition over time. Article 6 is important not only through the flexibility that it may provide Parties, but also through the impact it can have on the environmental integrity of the Paris Agreement.

Article 6 Provisions

Article 6 can be seen as containing four provisions:

1. Article 6.1 contains a general provision for international cooperation towards NDCs. It is very broad, and covers both mitigation and adaptation.

2. Articles 6.2–6.3 contain provisions for Parties to cooperate in the special case when there are mitigation outcomes transferred internationally (ITMOs), a generic term. These articles specify what Parties "shall" have to do to use ITMOs towards NDCs. The formal intrusion by the CMA specified by these articles is limited to developing and providing guidance for how to account for transfers between Parties. There are other "shall" provisions—referring to promoting sustainable development and ensuring environmental integrity.

3. Articles 6.4–6.7 contain provisions which outline a mechanism, with multiple scopes (i.e. more than one mechanism or approach), that would allow Parties, under the authority and guidance of the CMA, to create mitigation outcomes and transfer them to other Parties for use towards NDCs.

4. Articles 6.8 and 6.9 address non-market approaches and are not within the scope of this paper.

Governance Options for International Transfers of Mitigation Outcomes

The two "market buckets" in Article 6, under 6.2 and 6.4, were initially spelled out in the Brazilian submission of October 2014 on "Economic Mechanisms."[2] They were meant to create a space for a CDM+—that is, a new and improved Kyoto-type Clean Development

2 "Views of Brazil on the elements of the new agreement under the convention applicable to all parties," November 6, 2015, pp. 11-12, http://www4.unfccc.int/submissions/Lists/OSPSubmissionUpload/73_99_130602104651393682-BRAZIL%20ADP%20Elements.pdf.

mechanism (CDM), under 6.4, and to allow for emissions trading (as under Kyoto Protocol Article 17), under 6.2. Therefore, these two buckets were initially intended to meet two different needs.

The Paris negotiations produced an outcome that is different from what Brazil's initial submission had envisaged, with the main difference being in the governance of 6.2 and 6.4, and especially with respect to the role of the CMA.

Paragraphs 6.2–6.3 give Parties a significant amount of freedom in what they can do, and provide the CMA with little ability, and mandate, to intervene and interfere. In terms of standard setting, the only mandated role for the CMA under 6.2 is to develop accounting standards that any Parties engaged in ITMOs would have to observe.

However, 6.2–6.3 also contain two other "shall" clauses. These clauses, taken together with the fact that Article 6 cannot be seen in isolation from the rest of the Paris Agreement, would suggest that a reasonable interpretation could be that the CMA will also develop standards, according to Article 13 (Transparency) and Article 15 (Compliance), which shall also apply to Article 6.

As a result, the quality or characteristics of what Parties transfer through bilateral or small multilateral agreements, including through the creation of so-called clubs, will be visible and transparent, and can be subject to scrutiny under Article 15, using a number of possible mechanisms, including peer review, as well as review and scrutiny by civil society. However, as we learned from other exercises, including the EU ETS, that is only possible if the information systems are in place, and if data are collected and made available to all stakeholders.

In contrast to 6.2, in the new mechanism that is created through Article 6.4, the CMA has the standard setting role in all aspects, including approval processes, technical aspects for quality and quantity of what is being transferred, and avoidance of double counting.

Also, Paragraph 37 of Decision 1/CP.21 mandates that lessons learned from existing Kyoto Protocol mechanisms must be applied in developing M&Ps for the new mechanism. Considering that Article 6.4 now applies equally to all Parties, in all provisions, the new mechanisms will have to meld CDM and JI, introduce improvements to what has been learned from their operation (some of which have been under discussions in SBI and SBSTA), as well as possibly totally new provisions.

It is assumed that the M&P developed for Article 6.4 will maintain what will be considered a high level of "environmental integrity," one that can be associated with the "blue flag" of the UNFCCC. Past M&P, especially in the case of CDM, were seen as infuriatingly complicated and complex.

However, in their complexity, these mechanisms, and their M&P, offered two important characteristics. First, the product had a UN stamp of approval. Second, through their avoidance of the unpredictability of the approval and delivery processes of some national regulatory systems, they offered reassurance to investors and compliance users.

It is assumed that the new mechanism, with many scopes that will emerge under Article 6.4, will offer similar advantages and drawbacks.

Paragraphs 6.2 and 6.4: Competitors, but Complementary and Synergetic

As Parties start using international transfers towards NDCs, they will have, in many cases, the option of using the provisions of Article 6.2 or 6.4. Parties will use the provisions under these options for different reasons.

Some Parties will use Article 6.4, as it will provide the "blue stamp" of the UN, which some constituencies will see as a guarantee of environmental integrity, and of a transparent process, which the multilateral system is seen to offer.

Other Parties will prefer to develop what they may see as potentially stricter environmental standards, over which they have direct control, coupled with the what they may hope is a less complex regulatory process. The so-called "club" option may play a role, as it adds other potential benefits, including addressing competitive pressures.

Given the transparency that will be demanded of the standards used to apply Article 6.2, it is only natural that these standards will be subject, not only to some level of scrutiny by the CMA (even if they do not require formal CMA approval), but especially to intensive scrutiny by civil society. In this process, the M&P developed and used in Article 6.4 are likely to become a floor, against which everything in 6.2 will be judged.

At the same time, it is likely that those Parties using Article 6.2 will develop new and innovative approaches. Parties will want these new approaches to be able to sustain high levels of scrutiny, while at the same time provide less complex and bureaucratic approaches.

Given the experience of CDM and JI, the CMA will also be under pressure to learn from the approaches Parties developed under Article 6.2, and apply the lessons learned to continuously improve the M&P of Article 6.4. Unless it stays competitive and up-to-date with new ideas and approaches, Article 6.4 risks becoming irrelevant.

While Article 6.2 and 6.4 will be seen as competing for the attention of Parties in their choice of regulatory framework, they can be also seen as benefiting from each other. Article 6.4 will provide a solid, but possibly more complex approach, while Article 6.2 may be a framework where new ideas are developed. These two avenues can, and should learn, from each other.

The learning can be done on an *ad hoc* basis, informally. A better solution, however, would be to have formal procedures in place that will require that information systems be put in place to collect data, and monitor the different approaches. In addition, a formal evaluation should be mandated, to ensure that lessons learned can be applied, especially when it comes to the M&P of Article 6.4.

Market Mechanisms in the Paris Climate Agreement: International Linkage under Article 6.2

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Key Points

- A key question regarding the Paris Agreement, with its NDCs anchored as they are in domestic political realities, is whether it can progressively lead to mitigation commitments with sufficient ambition.
- Linkage of regional, national, and sub-national policies can be part of the answer, and Article 6.2 of the Paris Agreement provides the needed foundation.
- Linkage among mitigation systems that are heterogeneous with regard to policy instruments, level of jurisdiction, and type of target—heterogeneity that will be prevalent under the global Paris-Agreement regime—will be feasible and wise in some cases, but not in others.
- Negotiators must now develop sound accounting mechanisms to fully enable Article 6.2 and "bottom-up" linkage. They must also determine the degree and types of oversight that might be required.

A Key Challenge for Sustained Success of the Paris Agreement

For sustained success of the international climate regime, a key question is whether the Paris Agreement with its Nationally Determined Contributions (NDCs), anchored as they are in domestic political realities, can progressively lead to mitigation commitments with sufficient ambition. Are there ways to enable and facilitate increased ambition over time?

Linkage of regional, national, and sub-national policies can be part of the answer. By "linkage," I mean connections among policy systems that allow for emission reduction efforts to be redistributed across systems. Such linkage is typically framed as being between two (or more) cap-and-trade systems, but national policies will surely be highly heterogeneous under the Paris climate regime. Fortunately, research indicates that linkage between pairings of various types of domestic policy instruments may be feasible (Metcalf and Weisbach 2012).

Linkage and the Paris Agreement

Experience indicates that linkage frequently has both advantages and disadvantages (Ranson and Stavins 2015). To begin with the good news, linkage can reduce compliance costs, if marginal abatement costs are heterogeneous across jurisdictions, which they surely will be

across the globe under the Paris-Agreement regime. In addition, linkage can improve the functioning of individual markets by reducing market power and price volatility (although linkage will also transmit price volatility from one jurisdiction to another). Finally, linkage can help realize in practice the principle of common but differentiated responsibilities—an important component of the Convention—but do so without sacrificing cost-effectiveness.

The possibility of linkage also raises concerns, including that there will be distributional impacts within jurisdictions—that is, there will be both winners and losers. Also, linkage can automatically propagate some design elements, in particular cost-containment mechanisms, from one jurisdiction to another. In this and other ways, linkage raises concerns about decreased national autonomy.

Linkage under Article 6.2 of the Paris Agreement

It was by no means pre-ordained that the Paris Agreement would allow, let alone encourage, international linkage (Bodansky *et al.* 2015). Fortunately, the negotiations that took place in December 2015 produced the Paris Agreement, which includes in its Article 6.2 the necessary building blocks for linkages to occur.

Under Article 6.2, emissions reductions occurring outside the jurisdiction of a Party to the Agreement can be counted toward achieving that Party's NDC via internationally transferred mitigation outcomes (ITMOs). This enables both the formation of "clubs" or other types of coalitions, as well as bottom-up heterogeneous linkage. Such linkage among Parties to the Agreement would provide for exchanges between compliance entities within the jurisdiction of two different Parties, not simply government-to-government trading (of Assigned Amount Units or AAUs), as was the case with the Kyoto Protocol's Article 17.

Linkage among Heterogeneous Nationally Determined Contributions

There are three types of heterogeneity that are important in regard to linkage under Article 6.2 of the Paris Agreement. The first is heterogeneity among policy instruments. As demonstrated by Metcalf and Weisbach (2012), not only can one cap-and-trade system be linked with another cap-and-trade system, but it is also possible to link a cap-and-trade system with a carbon tax system. In addition, either a cap-and-trade system or a tax system can be linked (via appropriate offsets) with a performance standard in another jurisdiction. (Linkage with systems employing technology standards are not feasible, however, because such systems are not output-based.)

A second form of heterogeneity that affects linkage and is potentially very important under the Paris Agreement is heterogeneity regarding the level of government action of the relevant jurisdictions. Although the Paris Agreement will have as Parties both regional jurisdictions (in the case of the European Union) and national jurisdictions, sub-national jurisdictions are

also taking action in some parts of the world. In fact, linkage has already been established between the state of California in the United States and the provinces of Québec and Ontario in Canada.

A third form of relevant heterogeneity concerns the NDC targets themselves. Some take the form of hard (mass–based) emissions caps, while others are expressed as rate-based emissions caps, either emissions per unit of economic activity, or emissions per unit of output (such as per unit of electricity production). There are also relative mass-based emissions caps in the set of existing NDCs, such as those that are relative to business-as-usual emissions in a specific future year. Beyond these, there are other Parties that have put forward NDCs that do not involve emission caps at all, but rather targets in terms of some other metric, such as the degree of penetration of renewable energy sources.

The types of potential linkages may then be thought of as the cells of a three-dimensional matrix. Not all of these cells, however, represent linkages that are feasible, let alone desirable.

The Path Ahead—Key Issues and Questions

There are a substantial number of issues that negotiators will eventually need to address, and likewise, there are a set of questions that researchers can begin to address now. Among the key issues for negotiators will be the necessity to develop accounting procedures and mechanisms. Also, it will be important to identify means for tracking ITMOs so as to avoid double-counting emissions reductions. And a broader question is whether and how the UNFCCC Secretariat or some other designated institution will provide any oversight that may be required.

For research, three questions stand out. First, among pairings from the set (3-D matrix) of instrument–jurisdiction–target combinations that emerge from the three types of heterogeneity identified above, which linkages are actually feasible? Second, within this feasible set, are some types of linkages feasible but not desirable? And third, what accounting treatments and tracking mechanisms will be necessary for these various types of linkages? Future research will need to focus on these and related questions in order to achieve the potential benefits of Article 6.2 of the Paris Agreement.

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Government-to-Government Carbon Trading

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Key Points

- Emissions trading between two jurisdictions can lower costs for both, making it easier to achieve current mitigation targets and to enhance future action.
- Yet, harmonizing and linking domestic carbon policies to enable international trading *in a fully decentralized manner* can be challenging and impractical in the near term.
- *Government-to-government* trading between jurisdictions with existing domestic emissions markets requires no such harmonization, yet achieves much of the same benefits and could encourage full policy linking in the future.
- Such trades might also occur between a jurisdiction with a carbon tax in place and a jurisdiction with a lower-price emission trading program, leading to reduced emissions.
- Next steps to facilitate government-to-government trades include creating a forum for discussion, developing a template for transactions, and piloting actual trades.

In order to facilitate successful implementation and increased national ambition under the Paris Agreement, it will be valuable to lower the national costs of current and future mitigation commitments as much as possible. Emissions trading between jurisdictions has been shown repeatedly—both in theory and practice—to significantly reduce such costs. International emissions trading allows a nation facing high-cost mitigation options to under-comply with their target and pay a nation facing low-cost mitigation options to correspondingly over-comply. Such a possibility is explicitly permitted under Article 6 of the Paris Agreement, in the form of internationally transferred mitigation outcomes.

Complete linkage between domestic trading programs is one way to achieve these benefits, and several existing linkages provide examples. However, governments that are not ready or willing to create formal linkages can still achieve many of the same benefits. When one jurisdiction finds itself facing higher-than-expected prices, while another faces lower prices, these governments can then choose to execute a fixed-volume trade. The high-price jurisdiction

can buy a negotiated volume of allowances from the low-price jurisdiction in order to alleviate some or all of the price difference while generating revenue that can be shared. These sorts of transactions need only be pursued when unexpected and undesired price outcomes arise, lowering costs while continuing to achieve domestic emission targets, and making continued strengthening of commitments more likely.

This mechanism could also be appealing for a jurisdiction that, after implementing a carbon tax, finds its emissions (and revenue) higher than expected. Such a jurisdiction could arrange a block purchase from a lower-price jurisdiction implementing a cap-and-trade program. This could bring the carbon-tax jurisdiction back in line with its expectations without having to adjust the tax.

The Challenge of Full Bilateral Linking

Ranson and Stavins (2015) provide a full discussion of this topic; here I summarize the main points. There are already a handful of examples of governments that have linked emission trading programs across national boundaries. Both the EU-ETS and the California–Quebec trading program are examples; a number of others have been considered or are under consideration. This experience, along with researchers who have examined it, provides a number of insights into the challenges.

First, there are a number of technical elements that must be aligned at a practical level for such linkages to make sense. This includes the unit of account, legal framework, and various market rules. Programs that have more stringent monitoring and enforcement may be wary of those that are less stringent. Programs designed as tradable performance standards, or programs that utilize offsets and linkages from yet other jurisdictions, may similarly be less appealing partners with a traditional cap-and-trade or more stringent jurisdiction. Similarly, features like price ceilings and floors may be crucial for one country's implementation but unacceptable to another.

Second, programs need infrastructure to accommodate cross-border trading—typically, a shared trading platform. This ensures the integrity of the systems; otherwise, it is possible that an allowance created in one jurisdiction is inadvertently (or subversively) used for compliance in both.

Finally, there must be agreement and mutual acceptance of each other's current and prospective future contribution to the joint program, as well as the harmonized price. This is perhaps the trickiest feature, as two jurisdictions may have differing overall ambition and, even if they have the same ambition, different goals for carbon pricing. Jurisdictions including the EU, RGGI, and California have implemented a suite of complementary policies that lead to lower carbon prices. Moreover, the kind of carbon price they want can be quite different. RGGI, for example, has established a price ceiling that is below the price floor in California.

What Government-to-Government Trades Might Achieve

Unlike full bilateral linking, government-to-government trades need no harmonization of design elements, infrastructure, or acceptance of a common carbon price. Suppose the EU ETS finds it is experiencing unexpectedly low costs and prices while, say, the California–Quebec program has high costs and prices. The governments of these jurisdictions could execute a limited trade of, say, 100 million tons from the EU ETS to California–Quebec. This would lower prices in California–Quebec and raise prices in the EU-ETS, reducing compliance costs for both. Even if the trading systems differ in many design features, a fixed-volume trade means those features need not be harmonized.

Indeed, such trades do not even require common domestic policies or an upfront decision that trades will necessarily take place. Instead, two governments can decide if, when, and how much to trade based on emerging policy outcomes. The only real requirement is that the low-price jurisdiction have a cap-and-trade program in place, and that the high price jurisdiction have some form of carbon pricing. The existence of a cap-and-trade system in the selling jurisdiction ensures there are real reductions. Some form of carbon pricing in the high-price jurisdiction provides clarity that an arbitrage opportunity exists that both indicates cost savings and finances the trade.

The direct motivation and outcome of these transactions is that they help jurisdictions maintain emission commitments in the wake of compliance costs that differ from what was expected. These trades can reduce pressure to adjust or abandon unexpectedly expensive targets, or maintain confidence in markets that have lower than expected prices. And they are self-financing. While trades could take place outside the framework of carbon pricing, with jurisdictions paying each other in exchange for a target adjustment, they would not necessarily have all of the advantages just noted.

How Government-to-Government Trades Might Work and Possible Near-term Steps

In practice, a government-to-government trade would look like a series of events that includes a purchase of allowances in the low-price jurisdiction, a possible equal-volume sale of allowances in the high-price jurisdiction, and a distribution of the "profit" associated with buying low and selling high. Whether there is a specific sale in the high-price jurisdiction depends on whether that jurisdiction is a cap-and-trade program seeking to lower prices (yes) or a carbon tax program seeking to achieve greater emission integrity (no).

It would be important to understand how each of these steps would occur, what kind of agreement would need to be reached between the parties in advance, and what kind of reporting would need to occur *ex post*. In order to facilitate such activities, it would make sense to try to pilot a few transactions at a small scale, and/or create a platform for promotion and

education about the idea. One possibility would be to engage the World Bank's Networked Carbon Markets initiative (World Bank 2015). Another possibility would be for two pro-active jurisdictions to pilot such a trade on their own.

Ultimately, the question of whether or not to take advantage of this type of mechanism is a national one. Like the choice to establish a full bilateral link, or to take on a particular target or to implement a particular policy, it hinges on both the resolve and political commitment of individual countries. Such a national-level focus will need to be maintained for any initiative in this area to be successful.

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Building a Coalition of Carbon Markets to Spur Faster, Deeper Cuts in Climate Pollution

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Key Points

- Emission trading programs, or carbon markets, can play a critical role in enabling countries to meet their nationally determined contributions (NDCs) and undertake more ambitious reductions in climate pollution over time.
- Article 6 of the Paris Agreement on climate change affirms the role of voluntary, bilateral transactions among sovereigns in meeting their NDCs.
- By developing common standards or guidelines to ensure the integrity of international emission trading, a coalition of carbon market jurisdictions (CCM) could promote coordination among carbon markets, ensure environmental integrity, and ultimately spur greater ambition in climate action.

Emission trading programs that cap and cut climate pollution are now underway in over fifty jurisdictions around the world that are home to over one billion people. Also known as carbon markets, these systems are working to reduce climate pollution in the European Union and four other European countries; in Korea, New Zealand, and Tokyo; in seven cities and provinces in China (soon to be expanded to a national carbon trading system); and in nine northeastern U.S. states, California, and Quebec.

As carbon markets continue to expand, coordination among programs will be increasingly important to ensure environmental integrity and maximize benefits. By supporting the development, harmonization, and increased ambition of domestic carbon markets—including in fast-growing economies—coordination could also help broaden participation in climate action and enable deeper reductions in greenhouse gas emissions. Much as the General Agreement on Tariffs and Trade helped galvanize participation and ambition in trade, a voluntary coalition of carbon market jurisdictions (CCM) (Keohane *et al.* 2015) could expand the scope and maximize the cost-effectiveness of ambitious climate action around the globe.

Benefits for Coalition Members

The primary focus of a CCM would be the development of common standards or guidelines to ensure the integrity of carbon emission units traded internationally, including standards for transparent monitoring, reporting, and verification (MRV), market oversight, and environmental performance.

Member jurisdictions would enjoy a range of benefits, including:

- assurance that other leading carbon market jurisdictions will apply similarly stringent standards and guidelines;
- increased confidence in the environmental integrity of emission units, particularly those developed and transferred consistent with the coalition's standards and guidelines;
- enhanced transparency, including in MRV systems;
- information exchange, institutional capacity-building, and policy coordination;
- reputational benefits; and
- flexibility to consider closer cooperation—and potential future linkage.

Over time, the standards and guidelines developed by the CCM could provide the foundation for the development of common trading platforms, enabling jurisdictions to link their carbon markets if they chose to do so. Indeed, CCM member jurisdictions would enjoy an "inside track" on potential future linkages, with a range of additional benefits, including access to a shared market infrastructure; reduced barriers to policy adoption; greater price stability and predictability, especially for small jurisdictions; and enhanced access to low-carbon investment capital.

Benefits for the Climate: Accelerating Action under the UNFCCC

The Paris Agreement affirmed that countries can use internationally transferred mitigation outcomes (ITMOs) toward their NDCs. In particular, paragraphs 2 and 3 of Article 6 provide broad recognition of the prerogative of sovereigns to cooperate in reducing emissions through voluntary bilateral transactions among sovereigns. Article 6 recognizes that systems for exchanging ITMOs will be decentralized. The Paris Agreement's governing body (known as the "CMA") is charged with developing guidance for "robust accounting," with a focus on ensuring the avoidance of double-counting (i.e., ensuring that the same ton of emissions reductions is not counted twice). It is up to each Party, however, to determine whom to transact with and what emission units to accept. This *decentralized* approach contrasts sharply

with the *centralized* crediting mechanism established in paragraph 4 of Article 6, which is put under the "authority and guidance" of the CMA.

The acknowledgement in paragraphs 2 and 3 of Parties' own criteria for ITMO transactions is critical to ensuring that Parties have the flexibility to meet their emissions reductions as cost-effectively as possible. But it does not eliminate the importance of common standards and guidelines to ensure the environmental integrity of carbon markets: It simply places the responsibility for developing such standards and guidelines on the Parties themselves, rather than on the CMA.

That critical feature of the Paris Agreement creates a need for the CCM. By moving ahead with the development of standards and guidelines for environmental and market integrity, a coalition of leading carbon market jurisdictions could boost global confidence in ITMOs, including by demonstrating, as a practical matter, how to ensure that emission reductions are not claimed toward more than one mitigation pledge.

In addition, by continuing and expanding emission trading programs through a CCM, jurisdictions could accelerate emission cuts called for under the Paris Agreement, and consolidate experience that could usefully inform the multilateral development of accounting guidelines under the Agreement.

A CCM could thus help ensure that as international trading expands, it does so in a way that enhances ambition and secures real, permanent, additional, and verifiable emission reductions. Moreover, the standards and guidelines agreed by the CCM could pave the way for greater cooperation on markets in the UNFCCC, much as the technical advances made by countries in the Forest Carbon Partnership Facility contributed to progress in the UNFCCC on rules governing reducing emissions from deforestation and forest degradation (REDD+).

Learning from Existing Initiatives—and New Requirements

A coalition of carbon markets would complement, without duplicating, existing efforts like the Partnership for Market Readiness (PMR), International Carbon Action Partnership (ICAP), and the Asia-Pacific Carbon Markets Roundtable (APCMR). These have provided, and are providing, valuable technical assistance to countries interested in developing domestic programs, as well as information exchange and learning among countries with diverse experiences. A CCM would take important next steps by establishing commonly accepted standards and guidelines, in the context of the Paris Agreement, to ensure high-integrity international emission trading.

Catalyzing the CCM: Next Steps

The CCM could be catalyzed by two to three diverse global leaders from jurisdictions with carbon markets already in place. Additional membership could be drawn from countries and jurisdictions that have expressed an interest in using carbon markets to meet their NDCs or that otherwise have an interest and relevant experience in market integrity. The coalition could grow over time to include other interested jurisdictions.

The initial focus would be on mutual exchange of information and experience, specifically focused on emission trading, in order to build common understanding and identify areas for greater coordination to assure environmental integrity. Exploratory meetings scheduled for the fall of 2016 could lay the groundwork for an official launch in the next year or two. New Zealand's Ministerial Declaration on Carbon Markets, or the G7 Carbon Market Platform, could provide a possible forum; or another suitable host jurisdiction could be identified; or the initial discussions could be hosted by an NGO or intergovernmental institution.

With over 50 jurisdictions already having implemented carbon markets, and with the urgency of climate action becoming more and more evident, now is the time to start building a coalition of carbon markets that complements the Paris Agreement and helps deliver the ambitious greenhouse gas emission reductions that climate science demands.

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Coordinated CO_2 Prices and Strategic Transfers

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Key Points

- Mutual obligations with effective sanctions are needed in international climate policy.
- At the national level, a carbon price that increases over the long term would be a meaningful climate policy instrument.
- More effective forums are needed to negotiate ambitious carbon prices.
- Transfer payments should be made to developing countries, on the condition that they accept a minimum carbon price.
- The G20 could provide a meaningful forum to further coordinate climate policy discussions.

Overview

At the Paris climate summit in December 2015, the global community demonstrated a strong will to cooperate. The global temperature goals of the Paris Agreement are ambitious, and hence severely challenged by free-riding incentives, inadequate credibility of the voluntary commitments, increasing concerns about national competitiveness, and the renaissance of cheap and abundant coal. If the agreement made in Paris is to be successful, strategic and intelligent design of international climate policy instruments is essential. National carbon price floors in combination with conditional climate transfer payments could provide the stability that is necessary to achieve the Paris Agreement's global temperature targets.

Background

The UNFCCC's agreement in Paris is a milestone in international climate diplomacy. Nonetheless, instead of imposing binding national emissions targets, the Paris Agreement relies on voluntary commitments in a system laden with accountability and credibility issues.

The agreement obliges all parties to submit their own nationally determined contributions (NDCs). However, these pledges are not based on a national allocation of the global carbon budget that would enable the 2° C target to be reached. Rather, the intended NDCs that have been proposed lack transparency and are not comparable, which impedes global cooperation

between states. Most notably, the pledged policies shift the brunt of emission reductions required to meet the 2° C target to the period after 2030. They embody promises that are not reflected in the actual economic policies of most governments. Hence, concerns about national competitiveness, differences in the costs of emission reduction, and the wide availability of cheap coal threaten both the implementation of proposed actions and the necessary increase of future NDCs. Alone, NDCs are incapable of overcoming international free-riding incentives—an appropriate institutional design is needed to complement the NDCs.

Key Points Elaborated

1. **Mutual obligations with effective sanctions are needed in international climate policy.** An effective international agreement must mitigate free-riding incentives. Insights from experimental game theory show that successful cooperation requires credible mutual commitments and stable incentive structures—any single country's efforts must be reciprocated with corresponding climate policies in other countries.

2. **At the national level, a carbon price that increases over the long term would be a meaningful climate policy instrument.** Carbon prices are easily comparable and offer an observable indicator of climate policy ambition across countries. They drive up the cost of CO_2 emissions, and thereby that of high-emission energy carriers, which counteracts the renaissance of coal. The additional revenue from carbon pricing could be used to lower other distortionary taxes, reduce government debt, invest in public infrastructure, or to achieve other societal goals.

3. **More effective forums are needed to negotiate ambitious carbon prices.** In such forums, individual countries would pledge to introduce national carbon prices either through an emissions trading scheme with a permit price floor or as an emissions tax. In the framework of the forum, the pledged prices would only come into effect if other countries were implementing similarly high prices. A country would incur additional costs if it were to lower its national carbon price, as all other countries would lower their prices in response. Such a system would work as a sanctioning mechanism.

4. **Transfer payments should be made to developing countries, on the condition that they accept a minimum carbon price.** Conditional transfers mitigate the incentive problem, as a reduction in climate policy ambition would lead to the loss of international support. The US$100 billion of climate funding mobilized through the Paris Agreement could be a primary pillar of this strategy. Such a system would succeed only if developing countries build the capacity and expertise to introduce carbon taxes.

5. **The G20 could provide a meaningful forum to further coordinate climate policy discussions.** The countries in the G20 account for 76% of current global emissions, and a number of G20 countries have already implemented or considered carbon pricing policies. The G20 has also initiated a process to eliminate fossil fuel subsidies (negative carbon prices).

Conclusions

Institutional mechanisms must be created that stabilize cooperation at the global level. Such mechanisms would (1) simplify the coordination of national climate policies and (2) reward ambitious NDCs at the global level. Discussions over coordinated carbon price floors and conditional climate financing should focus on generating opportunities for international cooperation and on elevating the ambition of NDCs to a level that would enable the achievement of the long-term temperature target. The forthcoming G20 joint presidency of China and Germany could advance negotiations for coordinated carbon prices in connection with global climate transfer payments.

Clubs, R&D, and Climate Finance: Incentives for Ambitious GHG Emission Reductions

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Key Points

- Climate clubs, namely subgroups of countries implementing more ambitious and effective climate policies than others, may be the only practical approach to address the lack of incentives to reduce GHG emissions on the part of most, if not all, countries.
- In climate clubs, incentives to undertake ambitious GHG emission reduction efforts may come from adopting R&D and financial policies that provide benefits exclusively to club members.
- R&D and financial policies are beneficial because they provide innovation to reduce the costs of a unit of abated carbon and financial or insurance schemes to reduce the costs of investing in mitigation. These cost reductions can be designed to favor club members only.
- Unlike trade-related policies intended to favor club members, R&D and climate-finance policies do not have negative "side effects" for member countries. Indeed, they have positive co-benefits in addition to the primary environmental benefits—a "double dividend" for club members, and a single dividend (GHG emission reduction) for the world.

The Lack of Incentives for Ambitious Emission Reductions

Climate change mitigation is a global public good. Indeed, the mitigation actions of any jurisdiction or entity benefit all countries in the world. In this context, the theory of global public good provision provides a clear message: an effective and global agreement on climate change mitigation is very unlikely (Carraro and Siniscalco 1993; Barrett 1994). In other words, the formation of a global coalition where all world countries cooperate to reduce GHG emissions is difficult to achieve and unlikely to emerge. Large coalitions may form, but the resulting emissions reduction level remains close to business as usual (Barrett 1994). This is why the possibility of a subgroup of countries—a climate club—unilaterally deciding to reduce emissions to effectively tackle climate change has been explored for more than 20 years by climate and environmental economists (Carraro and Siniscalco 1993; Barrett 1997; Carraro 1999; Nordhaus 2015; are just some examples).

However, even the formation of **climate clubs** is very unlikely unless: (1) countries joining the club receive benefits that do not accrue to non-members (namely countries that do not reduce their GHG emissions or whose reductions are insufficient) and/or (2) non-members are sanctioned by club members. The primary example of the latter condition is **trade sanctions**, often advocated to support the emergence of climate clubs (Barrett 1997, 1999; Nordhaus 2015). However, effective and non-self-punishing (credible) trade sanctions are unlikely to be implemented (Barrett 1997, 1999). By inviting retaliation and reducing trade volume, they damage club members as well as non-members. Therefore, they do not provide the economic incentive necessary to support the formation of a global coalition and/or of a club of climate-concerned countries that effectively reduce GHG emissions.

Beyond the Paris Agreement

Given the generalized lack of incentives to reduce emissions and the difficulties of forming clubs of ambitious countries, the Paris Agreement is probably one of the best outcomes one can envisage. If the commitments adopted at COP 21 are actually implemented, emissions will stop growing for the first time in the last 40 years. The level of emissions in 2030 will be approximately the same as the level in 2015, which would certainly be a great achievement, though insufficient by almost any measure.

We need even more effective and ambitious actions, if the objective is to keep the temperature increase below or around 2°C. In particular, **massive investments in the development of new technologies**, including (1) technologies to remove large amounts of CO_2 from the atmosphere and (2) technologies to store large amounts of energy at low cost. The first set of technologies is crucial to reduce the stock of past GHG emissions. The second set is crucial to increase penetration of renewables well above 40%–50% of total energy demand, thus bringing the flow of GHG emissions close to zero.

R&D, Finance and Climate Clubs

Resources to support R&D and investments in new low-carbon or carbon-removing technologies are therefore necessary. A global collaboration program to develop and fund these technologies is sometimes advocated (see King *et al*. 2015). Why not couple the benefits of R&D on (and diffusion of) emission reducing technologies with incentives to form a club of emission reducing countries? In this way, the incentive to free-ride on the benefit of a cleaner environment (which is a public good fully appropriable by all countries) could be offset by the incentive to appropriate the benefit stemming from the positive R&D externality (which is a club good fully or partly appropriable only by club members). In addition, R&D cooperation would not only provide incentives to form a club, it would also increase profitability, because club members could reap both the benefits from R&D cooperation (the technologies that are crucial to achieve large reductions of both the stock and flow of GHG emissions) and the environmental benefit from reducing GHG emissions (lower damages from climate change).

Two possible objections can be raised. First, non-members cannot be fully excluded from benefits stemming from R&D cooperation. R&D and knowledge spillovers, and lack of protections for patents and copyrights, may reduce the benefits that accrue to club members only. Nevertheless, Carraro and Marchiori (2004) show that there exists a non-zero level of R&D spillovers below which the climate club forms and it is profitable and stable. It is therefore an empirical and regulatory matter to design patent schemes and disclosure rules enabling club members to exclude non-members, at least partly, from R&D cooperation benefits.

The second objection to the feasibility of an R&D climate club is that the decision to form the club, prompted by economic incentives stemming from R&D cooperation, is itself a strategic decision subject to free-riding. The crucial question is: do countries have an incentive to link R&D cooperation and GHG emission reduction instead of developing R&D cooperation and innovation diffusion independently of the climate club? Or to cooperate with a different (likely larger) number of countries if they cooperate only on innovation? Again, the answer to this question is provided in Carraro and Marchiori (2004), who show that: (1) if the degree of excludability of R&D cooperation benefits is sufficiently high and (2) if damages from climate change avoided by actions undertaken by club members are sufficiently large, then there is the incentive to form a climate club in which members invest in R&D and cooperate to reduce GHG emissions.

A similar argument holds for climate finance. It is clear that a large and increasing amount of investment in mitigation and adaptation is necessary to address climate change. In the last two years, climate-related investments reached 394 billion euros—mostly for mitigation (OECD 2015). Nevertheless, the resources required to maintain temperature increase at about 2°C are much larger (IPCC 2014). Several financial and insurance schemes can be designed to reduce the costs and/or the risks of investing in mitigation or adaptation. These schemes often require regulatory interventions to provide public guarantees and/or financial benefits.

Given that these kinds of actions are profitable and useful to reduce emissions, why not use them also to provide incentives to form a climate club? It is sufficient to decide that access to these schemes—often backed by international organizations, multilateral banks, or sovereign funds—is given only to club members, namely only to countries adopting ambitious measures to reduce GHG emissions. Similar to R&D cooperation, this would provide benefits to club members that do not accrue to non-members, thus creating the conditions for the emergence of a climate club.

Conclusions

Both R&D cooperation and climate finance can play an important role in future agreements to support the formation of climate clubs. Indeed, the emergence of climate clubs crucially

depends on the existence of excludable benefits for members, or sanctions to non-members. Given the low likelihood of trade sanctions to non-members, R&D investments and climate finance are two important sources of excludable benefits. An R&D club or a finance club can indeed provide important benefits to club members, benefits from which non-members can be excluded.

In addition to providing incentives for the formation of climate clubs, which otherwise would not emerge, R&D investments and climate finance can also provide other important and obvious benefits, such as (1) technological innovations without which the 2°C target would not be feasible and (2) new financial resources to support the transition to a low-carbon economy.

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The Paris Agreement: We Can Do (and Have Done) Better

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Key Points

- The Paris Agreement's assessment and review framework is unlikely to create strong incentives for countries to reduce their emissions relative to the levels that would have resulted without the Agreement.
- The Montreal Protocol creates very different incentives and has been more successful than any of the climate agreements in reducing greenhouse gas emissions.
- Montreal's success is due to its approach, which asks countries to coordinate their behavior.
- In addition to amending Montreal to phase down HFCs, negotiators should pursue other opportunities for coordination, including agreements on technical standards for airplanes and ocean shipping, and process standards for the manufacture of aluminum.

The Paris Agreement is a consensus agreement. Above all, Paris "succeeded" diplomatically because it is a voluntary agreement.

Unfortunately, purely voluntary approaches to supplying a public good, like limiting climate change, tend not to be very effective. How to do better? It turns out that we have done better already. Another agreement, designed differently than Paris and the climate agreements that came before it, has been more successful in reducing greenhouse gas emissions. Analysis of this agreement, the Montreal Protocol, suggests that, rather than rely exclusively on Paris, we should adopt complementary agreements that focus on individual gases and sectors. These agreements should create *incentives* for countries to act, rather than simply ask and encourage countries to act.

Why the Paris Agreement Will Do Too Little

According to an analysis by the UNFCCC Secretariat (2016) of the pledges made in Paris, global emissions will continue to increase through 2030. It is impossible to stabilize concentrations of greenhouse gases so long as emissions keep increasing. To stabilize concentrations—and therefore global average temperature—(net) emissions must fall to zero.

The UNFCCC's analysis assumes that countries will meet their pledges. But will they? As most of the targets are for 2025 or 2030, it will take at least a decade before we know. Even

then, however, we will not really know whether Paris has achieved anything, since we will never be able to observe the counterfactual—what countries would have done in the absence of the Paris Agreement.

The main novelty of Paris, compared to previous efforts, is that it establishes a process for following up on past pledges, producing verified reports of actual emissions, and creating a framework for assessing, reviewing, and—it is hoped—increasing both pledges and actual contributions over time. What we really want to know, therefore, is whether *this* arrangement will change behavior.

Though we will never have a counterfactual in the real world, we can "construct" one in a laboratory setting by putting individuals in a situation very similar to the one countries face when playing this "climate change game." Results of such an experiment, performed recently by Barrett and Dannenberg (2016), suggest that the Paris review process will have very modest effects on behavior. Assessment and review, the experiment predicts, will cause countries to increase the group target for contributions (analogous to the goal of keeping global mean temperature change "well below" 2 °C) directly and increase individual pledges indirectly, but it will not increase actual contributions. That is, the agreement is more likely to change what players say than what they do. Bearing in mind that the UNFCCC Secretariat predicts that emissions will continue to increase even if countries fulfill their pledges, this is additional evidence that the Paris Agreement will not, on its own, fundamentally alter the historic trends that have caused greenhouse gas concentrations to increase every year since international climate negotiations first began.

The Montreal Protocol

Though the Montreal Protocol was adopted to protect the stratospheric ozone layer, CFCs are also an important greenhouse gas. And—it turns out—the Montreal Protocol has reduced greenhouse gas emissions four to five times as much as the Kyoto Protocol tried, but failed, to achieve (Velders *et al*. 2007).

How did the Montreal Protocol do this?

Montreal succeeded because its approach is very different from the climate agreements. Montreal not only limits the consumption of CFCs (equivalent to limiting emissions of greenhouse gases by individual countries); it also limits the *production* of CFCs (equivalent to limiting fossil fuel production, something the climate agreements have not done) and it *bans trade* in CFCs and products containing CFCs between parties and non-parties.

Limiting both consumption and production creates mutually reinforcing incentives. As more countries reduce their demand for CFCs, the returns to producing CFCs fall and the returns to supplying CFC substitutes increase. Similarly, as more countries reduce their supply of

CFCs and as substitutes become more widely available, consuming countries have greater incentives to move away from CFCs and to adopt these substitutes.

Montreal's trade measure turns out to be especially important. Though a country can "free ride" on the behavior of other countries by staying out of the agreement, Montreal makes such countries pay a heavy price—they lose the gains from trading with parties to the agreement.

This is why the Montreal Protocol has enjoyed full participation and compliance. Montreal changed incentives—international climate agreements have not done this. As a consequence, all the main ozone-destroying chemicals have been, or are in the process of being, phased out, whereas greenhouse gas emissions keep increasing.

Complementary Treaties

One reason climate negotiators have eschewed a similarly coordinated approach to climate change is that they have wanted to address climate change in its entirety, limiting emissions of all gases in all sectors. Montreal's approach probably would not work at this level. However, Montreal's approach, or one like it, will likely work if applied to selected gases and sectors.

Indeed, this is already happening, outside of the UNFCCC process. Most importantly, the Montreal Protocol is now in the process of being amended to phase down HFCs, a chemical that does not deplete the ozone layer but that is a potent greenhouse gas. The Kyoto Protocol, which aimed to address climate change in its entirety, failed to limit HFCs. An amendment to the Montreal Protocol, by contrast, can be expected to succeed, because Montreal is designed to coordinate behavior.

Also outside the UNFCCC process, the ICAO recently proposed a CO_2 standard for new aircraft. One reason this approach could succeed is that airplane manufacture is highly concentrated. Coordination will also be helped if countries restrict landing rights to planes that meet the new standard.

Similar agreements should be developed for other gases and sectors. For example, the IMO could propose a standard that all international shipping be fueled by liquefied natural gas (in the longer term, perhaps by hydrogen). Similarly, a new agreement could be negotiated (perhaps in association with the International Aluminum Institute) for replacing the standard carbon anode for producing aluminum with an inert anode that would eliminate PFC emissions (another potent greenhouse gas) and reduce CO_2 emissions significantly.

These are just a few examples. A full program of research is needed to identify and develop more opportunities for achieving coordination.

Conclusion

The Paris Agreement reflects global solidarity in addressing a collective action problem that is without precedent. But it should be supplemented by other agreements that can more effectively change incentives. As these other agreements will only help Paris, and can be negotiated in non-UNFCCC settings, they should be pursued with all haste.

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Bilateral and Mini-multilateral Agreements after Paris

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Key Points

- Bilateral and mini-multilateral agreements can and should be developed to complement and catalyze the UNFCCC process, because that process is insufficient and too slow.
- Where shared interests exist, agreements among smaller, like-minded sets of countries can be negotiated and implemented more quickly, achieve greater ambition, initiate a virtuous cycle for other countries, and generate momentum in global climate policy.
- Each new agreement must represent a measurable, additional improvement on the commitments in participating countries' INDCs.

Introduction

In the coming years, international climate policy should focus on creating dynamic and ambitious bilateral and "mini-multilateral" agreements that will stimulate new national climate policies above and beyond what is required in the Paris Agreement. These agreements should be flexible, progressive, and aimed not only at reduced emissions but also enhanced resiliency to climatic change.

The Paris Agreement will lead to much lower emissions than "business as usual" but it will not avoid substantial climate disruption with which many vulnerable countries cannot cope. The UN process that led to 196 countries agreeing to limit emissions of greenhouse gases last December will continue to be an important foundation that can be built upon, but it has proven to be too slow, inadequate, and cumbersome to be the primary vehicle for international climate policy.

The Slow Road to Paris

The UN Framework Convention on Climate Change (UNFCCC) was adopted in 1992, and it took twenty-three long years to get from Rio to Paris. The loss of momentum in the UN process began when the U.S. Senate refused to ratify the Kyoto Protocol in 1998 and President George W. Bush subsequently refused to honor the treaty. The Kyoto Protocol took until 2005 to enter into force, and the subsequent withdrawal of Canada in 2012 further retarded momentum.

The nadir of the negotiations occurred in Copenhagen in 2009, when leaders from around the world found themselves literally trying to salvage a negotiating text that was rife with many long-standing disagreements: the extent of historic responsibility for causing the problem; the respective future roles of industrialized and developing countries; the obligations of wealthier countries to help poor countries pay for emissions reductions and adaptation to climate change; and technology transfer, transparency, monitoring, and verification—among many issues.

Alternative Approaches are Working

After Copenhagen, new approaches were obviously needed. The first innovation was the bottom-up approach of Intended Nationally Determined Contributions (INDCs), which allowed countries to choose their own levels of ambition, appropriate to the unique circumstances of each country. This provided a crucial means for moving away from bifurcated, differentiated commitments between developing and industrialized countries.

The second innovation was to experiment with a bilateral or mini-multilateral approach. Norway and Brazil pioneered the bilateral agreement just prior to Copenhagen when they announced in 2008 that Norway would pay into an environmental fund if Brazil reduced its GHG emissions from forestry below the average rate of the 1996–2005 period. This performance-based payment system was later replicated in other countries, and contributed to the Reducing Emissions from Deforestation and Forest Degradation (REDD+) approach embraced by the UNFCCC.

In November 2014, President Obama and President Xi Jinping surprised the world with their historic joint announcement to reduce GHGs after 2020. These former adversaries accounted for 43 percent of global emissions of carbon dioxide as of 2013 (CDIAC 2016). As the two largest emitters, their agreement was intrinsically important in terms of addressing the climate challenge, but it was equally important symbolically. They initiated a virtuous cycle where countries around the world accelerated their plans to announce INDCs in advance of Paris.

The United States reached a second agreement with Mexico in early 2015 where Mexico announced it would peak its emissions even earlier than China. Not to be outdone, Gabon and Russia submitted their INDCs just one day after Mexico and the United States. By November 2015, just before the negotiations commenced in Paris, more than 150 countries had submitted INDCs.

The Roles for Bilateral and Mini-multilateral Agreements

The Paris Agreement does not ensure that the world can avoid dangerous climate change, so it must be used as a foundation for additional agreements. The United States and China showed that it is possible for just two countries to create a virtuous cycle and generate momentum

in international diplomacy. The U.S.-China agreements demonstrate that it is possible to create complementary agreements among smaller sets of countries without supplanting the UNFCCC process, and that such agreements can even be catalytic for UN agreements.

Where shared interests exist, devising agreements among smaller, like-minded sets of countries is the new imperative. With fewer parties, such agreements can be more ambitious, creative, nimble, and flexible. Certain issues that have been nearly impossible to effectively address in the UNFCCC context could be tackled through complementary agreements. Surprising, exciting new agreements among countries, especially between unusual partners, can catalyze others to act. Smaller agreements also permit experimentation with new approaches because of greater willingness to depart from conventional norms and also because the risks of "failure" are smaller.

Resilience or adaptation agreements would work well in a bilateral or mini-multilateral context since different sets of countries share different types of vulnerabilities to climate change. Creative agreements to boost the resilience of countries could clarify which policies work against what threats (and which don't) in leading countries, which could be emulated by followers. Early movers on resilience, like Ethiopia and Bangladesh, may discover new practices or technologies that could be marketed around the world.

Similarly, for countries that face similar difficulties related to mitigation, perhaps a heavy reliance on coal or a large proportion of transportation-sector emissions, there may be interest in working together to experiment and better understand which policies are most effective to tackle certain shared challenges. Imagine Germany and Japan working together to identify pathways for shifting away from nuclear energy to other low-carbon alternatives.

Countries like India and Brazil that are interested in being at the vanguard of the low-carbon economy could share costs and pool resources to establish innovation agreements to spur advancements in new climate technologies (both for mitigation and adaptation). If these same countries also worked together to establish common market-formation policies, then greater market forces would be brought to bear to "push" and "pull" cleaner and more resilient technologies into the marketplace through a systemic approach to innovation. Indeed, like-minded countries could even pursue harmonized policies to create a more standardized market for clean energy technologies, which would in turn boost trade with each other. (Conversely, advocates of such "clubs" have noted that these countries could punish non-members with border carbon tax adjustments.) Regional agreements on market-formation policies would create deeper demand for climate technologies and stimulate interest from providers of advanced technology.

When *Not* to Pursue Bilateral and Mini-multilateral Agreements

Nice-sounding, "feel good" agreements will not suffice. Each new agreement must represent a measurable, additional improvement above what already exists in the countries' INDCs. If the agreements are not clearly better than what already exists, then they should not be embraced by the UNFCCC process. The virtuous cycle that these new commitments must sustain could easily slip into a vicious cycle if they take steps backwards or in any way undermine existing INDCs. All of the smaller agreements that are clear improvements upon the Paris Agreement should be gathered and enshrined in the UNFCCC each year at the Conference of Parties so that their cumulative impact is recognized and understood, and factored into stocktaking exercises.

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CDIAC (Carbon Dioxide Information Analysis Center). 2016. Oak Ridge National Laboratory, Oak Ridge, TN, http://cdiac.ornl.gov/trends/emis/meth_reg.html.

Networks and Coordination in Global Climate Governance

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Key Points

- The UNFCCC is now accompanied by many other initiatives by non-state actors, business, cities, and others.
- Coordinating across these initiatives can increase ambition and catalyze action to meet the Paris Agreement goals.
- Social networks matter to climate governance, by building trust and spreading ideas across various initiatives.
- Understanding networks of actors in climate governance can help identify ways to improve coordination and thus raise ambition.

Climate negotiators and academic researchers have both come to realize that the UNFCCC is now accompanied by a dizzying array of initiatives to govern climate change—by smaller groups of states, subnational actors, cities, the private sector, and NGOs, often acting in hybrid groups of various types of actors. These are usually called "transnational climate change governance" initiatives (Bulkeley *et al.* 2014). Climate change is no longer governed simply via a single interstate institution, but rather through what some academics call a regime complex or a global climate-governance landscape (Keohane and Victor 2011; Betsill *et al.* 2015).

The global response to climate change is now shaped by all of these institutions, not only by the UNFCCC. Perhaps more importantly, that response may reflect interactions among these institutions, raising the question of whether trying to coordinate, or "orchestrate" (Hale and Roger 2014), those interactions might improve the global response as a whole. While the growth of transnational governance initiatives dates back to the late 1990s, actors within the UNFCCC have only relatively recently started to try to create connections with many of the initiatives in a coordinated way, as most recently in the Non-State Actor Zone for Climate Action activities.

We are only just coming to grips with how this coordination might work. For those attached to the multilateralism embodied in the UNFCCC, there is an insistence that the UNFCCC is central, and these other initiatives are subordinate to it. But there is no particular reason, for example, why the mayors of the world's largest cities, coming together in C40 Cities, or the institutional investors involved in the CDP, should see their own action on climate change as accountable to the UNFCCC. There is therefore a more complicated set of interactions between different actors and institutions that cannot be coordinated in a hierarchical manner.

"Networks" is the term used to refer to these sorts of self-organized, horizontal interactions. In climate governance, the word is used frequently—for example, the Climate Technology Centre and Network, the Climate Action Network, and the Investor Network on Climate Risk. Negotiators also know that networking is critical to effective action, even within the UNFCCC. Personal connections over time build up trust within negotiations and can enable deals to be struck more readily. Many also recognize particular individuals or organizations who have played key roles in climate politics and policy, pushing particular initiatives, bringing disparate actors together, and making connections that might not otherwise have occurred.

Academically, we know that network structures and processes are important in particular for the:

- Flow of information and ideas;
- Generation of authority for particular actors and organizations; and
- Building of trust.

But while we know anecdotally that networks are important, we have relatively little systematic knowledge about the networked character of the climate change "regime complex."

One way to learn more about this is to use a method called Social Network Analysis, which is designed to study systematically the ways in which a particular network is structured. In formal terms, a network is defined in terms of nodes and ties. In climate governance, nodes might be specific individuals, organizations, countries, or other entities of research interest, while ties can be anything that connects them—for example, shared membership in an organization, joint participation in a meeting, friendship, reputation, or formal relationship of authority. The particular pattern of ties between nodes is what constitutes the network structure as a whole.

Social Network Analysis enables us to identify key actors or organizations within the network who may play important roles in the flow of information and ideas, as well as to characterize the density or fragmentation of the network, which will help us learn about the possibilities for coordination across the network.

We have some research that shows the value of tracing these networks and their effects. Research has shown, for example, that:

- A transnational network of carbon market proponents and experts has played a key role in spreading emissions trading systems round the world (Paterson *et al*. 2014).

- Carbon accounting tools have been spread both by particular coalitions of environmentalists and accountants (Thistlethwaite and Paterson 2015), as well as because of the spread of carbon-offset certification systems and the accounting tools they rely on (Green 2013).
- Mapping the overlapping memberships in various international climate governance initiatives helps show the potential for coordination between them (Widerberg 2016).
- The social connections and concentrations of specific world regions and academic disciplines are important in shaping the production of authoritative climate knowledge in the IPCC (Corbera *et al*. 2016).

Two conclusions from this research are worth emphasizing. One is that the design of international agreements creates important opportunities for the activities of cities, companies, NGOs, and others. In particular, NGOs and business groups have created over 30 systems for certifying carbon offset projects. Some of these, like the well-known Gold Standard, were designed in part to shape the CDM in specific ways, but all were effectively stimulated by the explosion in offset-market activity, both in the CDM and the voluntary carbon markets, generated in the wake of the Kyoto Protocol (Green 2013). These then had further spin-offs into the design of newer-generation carbon markets and the broader phenomenon of carbon-accounting initiatives.

So out of this insight an important question is, "How does the Paris Agreement shape incentives for NGOs and others to develop their own initiatives they think will heighten ambition?" If market mechanisms under Article 6 develop as some hope they will, then NGO and business initiatives already exist to support that. But there are almost certainly other effects of the Paris Agreement that will create novel initiatives by various actors.

The second conclusion to emphasize is that small groups of key individuals and organizations can play extremely important roles in generating connections between various initiatives and sites of climate policy and governance. The spread of emissions-trading systems reveals a relatively small number of people and organizations that participated in policy processes across the EU ETS, Kyoto, Western Climate Initiative, RGGI, and others, and that acted as conduits for learning and the spread of ideas (Paterson *et al*. 2014). Similarly thin connections constitute the links between organizations involved in carbon accounting (Thistlethwaite and Paterson 2015). In other words, it is not necessary in many situations to have huge efforts to promote the spread of ideas in climate policy, just well-judged deployment of existing connections.

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The Future of the Financial Mechanism: Analysis and Proposals

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Key Points

- The decentralized and complex nature of the climate finance regime poses challenges—but also has advantages that can be enhanced with modest reforms.
- Setting uniform standards across climate finance institutions, especially the GEF, GCF, and AF could dramatically reduce the transaction costs of accessing funds and would facilitate information sharing and analysis.
- More active coordination across financing mechanisms would promote a more sensible division of labor and sharing of best practices.
- The financial mechanism should be a major focus of the "global stocktake" called for in the Paris Agreement.

The long-term success of the climate change regime will hinge on the adequate provision of resources to the developing world. These resources are needed to promote mitigation where emissions are increasing most rapidly and to promote adaptation where communities are most vulnerable. There is also a political imperative: As a matter of justice and necessity, political leaders in the South are reluctant to participate in global initiatives without adequate financing from their wealthier counterparts.

Reflecting its importance, negotiators in Paris devoted considerable time to North–South financing. However, the Paris Agreement itself has little new to say about the precise rules and institutions that should govern these financial flows. This is unfortunate given the state of the finance regime, which is fragmented and difficult to navigate. Relatively modest improvements could produce a more efficient set of institutions that better serve the needs of donors and recipients alike.

Institutions for Finance: From the Framework Convention to the Paris Agreement

Beginning with the Framework Convention on Climate Change, the COP has repeatedly affirmed the need for financial resources to promote mitigation and adaptation in the developing world. The FCCC designated the Global Environment Facility (GEF) to operate its financial mechanism. The COP later created the Least Developed Countries Fund and the

Special Climate Change Fund, both managed by the GEF, and more recently added the Green Climate Fund (GCF) as a second operating entity. These are complemented by the Adaptation Fund (AF) under the Kyoto Protocol. Climate financing is also channeled through bilateral aid and regional and multilateral mechanisms that lie outside of the UNFCCC process, such as the World Bank's Climate Investment Funds. The result is a decentralized set of institutions and mechanisms that together constitute the climate finance regime.

The Paris Agreement and related COP Decision reiterate the collective goal of mobilizing $100 billion per year in financing, with a more ambitious goal to be established after 2025. They call on developed countries to increase levels of support over time and to report biennially on their efforts, while encouraging other Parties to participate on a voluntary basis. Beyond recognizing that the GEF funds and GCF shall "serve" the Agreement, the Paris outcome does not address the institutional architecture of the financial mechanism, deferring vital questions of implementation to other forums. Given the growing political importance of finance and the need for more widespread participation, an efficient and "user-friendly" finance regime is more important than ever.

Priorities for Standard-Setting and Information Provision

The decentralized and complex nature of the finance regime is not likely to change in the near term. Even in this context, however, Parties can reduce the costs of participation and improve assessment by setting uniform standards and supplying valuable information.

The first priority is to define what counts as climate finance and to establish accounting and reporting rules that are uniform across channels of financing. Efforts toward this goal are already under way, both within and outside of the UNFCCC process (see Bodnar *et al*. 2015). Setting these standards has obvious benefits. First, it will help the international community assess progress toward collective goals for financial mobilization. Second, it will facilitate comparison of effort by individual countries, possibly toward a "pledge-and-review" process for financial support. Beyond these relatively direct benefits, standardized reporting on finance flows, combined with compilation and basic analysis of the resulting information, would produce a clearer picture of who is receiving resources and for what purposes. This information could be used to steer resource flows to underserved needs and to avoid duplication.

The GCF, GEF, and AF should also seek opportunities to set uniform standards for (a) accreditation of implementing agencies, (b) procedures and approval criteria for project proposals, and (c) requirements and indicators for monitoring and performance evaluation. Capacity issues plague many smaller and least developed countries that are unable to navigate the onerous process of accessing funds and of gaining approval for direct access through national agencies. If experiences and bureaucratic investments could be applied across institutions, this would accelerate learning and reduce transaction costs dramatically. In the

area of monitoring and evaluation, uniform standards will become increasingly important for developing countries in light of the Paris Agreement's emphasis on the transparency of implementation. As the GCF develops its own modalities in these areas, when appropriate it should adopt relevant standards employed—and refined over time—by the GEF and AF and by experienced project agencies such as the World Bank and UNDP.

Promoting Institutional Coherence and Synergies

Despite the complexity, there are potential benefits to having a variety of institutions, with somewhat distinct approaches and advantages, to maximize experimentation and serve the varied interests of donors and recipients. Fully capturing these benefits requires more active coordination across institutions and a broad perspective on their relationship and performance.

The GCF Governing Instrument (UNFCCC 2011, paragraphs 33-34) recognizes the need to enhance complementarity and coherence among the various funding mechanisms and institutions. This vital task should be a priority of the COP and the Standing Committee on Finance. First, the Parties should clarify the division of labor among the various funds and should actively seek to steer funding needs to appropriate mechanisms and implementing agencies. Second, the key institutions should do more to share information and lessons learned about the distribution of funding and the success of projects (a process that would be especially productive in the context of the more uniform standards and reporting discussed above).

Both goals require a regime-wide perspective on performance and effectiveness that goes beyond assessment of individual institutions, which in turn suggests a need for much greater cooperation among governing boards, secretariat staff, and evaluation offices—in other words, some top-down management of a relatively decentralized and *ad hoc* system. The GEF's Independent Evaluation Office supplies high-quality reports that typically focus on sets of projects involving more than one implementing agency, providing a model that could be scaled up to draw comparisons and lessons across funding mechanisms.[1] Ultimately, the goal should be a more coherent finance regime that is capable of learning and adjusting.

Toward Global Stocktaking for Climate Finance

Financial resources to tackle climate change are growing but far from adequate (Buchner *et al*. 2015). The financial mechanism should be an important focus of the global stocktaking exercise envisioned in the Paris Agreement. The reforms suggested here would improve the financial mechanism directly and would also lay a foundation for a more thorough and accurate assessment of its strengths and weaknesses, based on more comparable data, lessons derived from a wider range of conditions, and more robust mechanisms for evaluating performance.

1 GEF performance evaluations are available at https://www.thegef.org/gef/eo_office.

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Funding Climate Adaptation

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Key Points

- Private finance should be attracted to some climate adaptation investments.
- This will require mitigation of country-specific risks, allowing private investors to focus on commercial risks.
- Investment deals can be structured to reduce or eliminate country-specific risks by involving appropriate third parties.

Background on Climate-Adaptation Finance

Even if the global community is successful in reducing greenhouse gas emissions more than it has so far promised, the climate will change—in many places significantly. In high northern latitudes, temperatures may rise as much as 5 or 6 °C, melting permafrost and drastically altering ecosystems. In lower latitudes, heat waves, droughts and floods may become more common. Oceans will rise everywhere, reducing the habitability of coastal environments. Humanity will have to adapt to these changes, and adaptation will require financial resources. This brief explores a possible mechanism for generating these resources—focusing on catalyzing private-sector investment in climate adaptation.

There is still considerable uncertainty about how—and how much—the climate will change, and therefore about adaption needs and costs. The IPCC, in its Fifth Assessment Report, suggested, with low confidence, that adaptation to a business-as-usual climate-change scenario would cost at least $100 billion annually. This funding is in addition to that needed for mitigation.

It seems clear that governments cannot provide funding on this scale. One of the goals of the Green Climate Fund (GCF) is to fund adaptation.[1] However, the GCF's goal for 2016 is to provide $2.5 billion in project funding, and it is currently far from attaining even this goal. It is therefore important to investigate whether private funding can be accessed to support climate adaptation.

Adaptation will involve a mix of projects: some investments in public goods, such as sea walls and coastal protection systems; some in private goods, such as air conditioning and strengthened buildings; and some acquisition of intellectual property, such as crop varieties

1 "GCF was established by 194 governments to limit or reduce greenhouse gas emissions in developing countries, and to help adapt vulnerable societies to the unavoidable impacts of climate change." www.greenclimate.fund/the-fund/behind-the-fund.

better adapted to the altered environment. Some of these projects, especially those providing private goods, may be able generate a commercial rate of return for their investors. Consider, for example, protecting airports, docks, and railway lines against sea-level rise or more intense storms. Docks and airports, in particular, often handle imports and exports and serve the international community as much as the domestic market—and so have clients who are able to pay for adapting them to climate change. Many of these projects will generate cash flows that could be used to make payments to investors or lenders, and therefore private capital markets may find such investments attractive. In developing countries there is often a shortage of capital; in developed countries, in contrast, there is a savings glut and a shortage of opportunities for profitable investments. So there is clearly potential for mutually beneficial transactions between capital markets in rich countries and developing countries seeking funding for adaptation.

Obstacles to Investment in Climate Adaptation

Two structural impediments are holding this development back. One is a lack of information on both sides of the market, and the other is a perception by institutional investors that many investment opportunities in less developed countries are too risky to be attractive.

Lack of information arises because most institutional investors are not familiar with the investment opportunities in adapting infrastructure to climate change in poor countries. They may be familiar with investment opportunities in public equity markets and government bond markets in these regions, as these are well documented by the financial press and analysts, but their knowledge does not extend beyond these. On the demand side, project managers in poor developing countries are not well versed in structuring projects to appeal to global investors, nor are they knowledgeable about how to approach these investors.

Large investment funds are generally familiar with the commercial risks associated with infrastructure investments, such as docks and airports, but may perceive similar investments in less developed countries as bringing an array of additional, distinctive risks. One is investing in a thinly traded currency whose movements cannot be hedged. Another is a suite of political risks associated with developing-country investments: macroeconomic risks, risks of government intervention in contracts, and risks of enforced renegotiation. Funds may be happy to take the commercial risks but not to take the extra risks. (This is a point that is not unique to climate adaptation: it applies to mitigation too, and in general to investment in poor countries.)

These structural impediments can be resolved. Informational shortcomings could be dealt with by an agency whose function is to act as a broker between investment opportunities and investors, bringing each to the attention of the other and charging a fee or commission for introductions. This is a very traditional brokerage role. But this would serve no purpose unless the projects were appealing to investors, which requires that the risk issues be addressed.

Approaches to Managing Non-Commercial Risk

There are two ways of tackling the extra risks. One is to bring in less commercially-oriented co-investors who are willing to take these risks. This is the "blended fund" strategy:[2] the co-investors are typically international financial institutions, such as the development banks, or public funds or impact investors, who are willing to accept a less-than-commercial return in exchange for an assurance of having contributed to the solution of a social or environmental problem. The deal is structured so that these co-investors take the risks that the commercial money finds unacceptable. As an example, in a $100 million investment, $85 million might be commercial and the remaining $15 million from non-commercial sources. Losses arising from identified risks would be charged first to the non-commercial investors. In effect the commercial investors would be senior.

An alternative approach is to separate out the currency risks and political risks and place these with other agents. Political risk insurance is available, as is insurance against unfavorable currency movements, in both cases at a price.

A climate adaptation fund could play all these roles: act as a broker between those needing funds and those needing investment opportunities, bring in co-investors and structure deals appropriately, and pay third parties to take risks unacceptable to the commercial investors. Such a role would require investment expertise and initial funding, though once established it could fund itself through the fees it charges.

2 See the World Bank blog at http://blogs.worldbank.org/climatechange/stirred-not-shaken-blended-finance-climate-action.

Investing in Climate Adaptation

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Key Points

- Climate adaptation investments face large uncertainties, moral-hazard threats, potential opportunity costs, and major equity concerns.
- Allocating international funds targeted towards adaptation will require major political trade-offs between the interests of developing countries and donors.
- Insistence on strict additionality requirements will result in underinvestment. Instead, investments that provide adaptation benefits and help meet infrastructure, development, and social needs should be encouraged.

One of the most prominent features of the Intended Nationally Determined Contributions (INDCs) submitted in advance of the Paris climate conference was the prominence of climate adaptation as a priority in the negotiations. The Paris Agreement marked the culmination of a five-year effort by developing countries to gain political parity for climate adaptation.

The risks of climate disruption will grow over time as concentrations of global greenhouse-gas emissions increase. But recognizing that these risks will need to be managed and identifying the appropriate level of investment to manage them are two different exercises. The latter is likely to prove very difficult for several reasons.

First, climate risks are hard to define and will occur over a wide temporal and spatial range. For example, if future sea-level rise and storm surges threaten a city sufficiently to justify raising the land by three feet at a cost of many millions of dollars, but the actual surge is four feet, then the investment will prove of little value. But if the surge is only 1.5 feet, then the city will have paid too much and lost the opportunity to use those funds for other critical needs. Hence, climate adaptation comes replete with potentially large short-term opportunity costs in terms of public dollars diverted from other public priorities. The difference is that the opportunity costs are in today's dollars, while the benefits of adaptation may be multiples larger, but are calculated in discounted dollars.

Second, climate impacts depend on many variables—such as temperature increases, storm intensity, natural feedback effects, the ability of oceans to absorb both carbon and heat, and the effectiveness of future mitigation efforts. There are uncertainties around each of these, making it difficult to determine the future costs of damages. If one avoids discrete estimates and offers a range, the spread between the high estimate and the low can be huge.

Third, impacts will differ across geographic regions and socio-economic strata. Some regions will be impacted worse than others—not only across countries, but within countries and subnational jurisdictions. Many of the world's poorest countries will not have the financial ability to make the investments needed to adapt to the climate impacts that they may incur.

Fourth, unlike mitigation investments, such as renewable power systems, it is difficult for private developers to make a profit from investments in adaptation. This leads to the question: Are climate adaptation investments a public good? The answer is not simple. Should individual property owners be incentivized to take actions to reduce their climate risk or to purchase insurance? If all adaptation is perceived as a public good, property owners will leave it to the public sector to make all the investments.

In summary, climate adaptation investments may be critical to protect the economies and social fabric of many regions of the world, but they come replete with large uncertainties, potential opportunity costs, major equity issues, and looming moral hazard concerns. Thus, it is not surprising that most adaptation initiatives take the form of planning exercises, as opposed to hard investments.

Economic theory might suggest that since most of the benefits of adaptation remain in a specific region, the costs should be borne by the beneficiaries. But if climate impacts were a result of emissions from other regions, then equity considerations suggest that the latter should bear an equivalent portion of the costs. Thus, it is consistent with equity principles for poorer developing countries to seek "continuous and enhanced international support"[1] for adaptation initiatives. Developed countries have pledged $100 billion per year to developing countries by 2020 onwards for both adaptation and mitigation, but there are emerging doubts as to the willingness and the ability of the developed countries to live up to this pledge.

Will developed countries, facing strong pressures from stakeholders to meet domestic priorities, be willing to divert significant money to various internationally controlled funds? Will these monies be incremental or will they stem from reductions in other forms of international assistance? Finally, if private investments in developing countries are counted as part of the $100 billion pledge, what private investments will be considered additional?

In parallel, there will be another set of questions about the allocation of funds from the Green Climate Fund, established to assist the developing world. How much discretion will developing countries be allowed in the expenditure of global adaptation funding within their borders? The donor countries might fear that funds will be diverted for projects that are neither additional nor essential. In response, developing countries will argue that they understand their needs better than international officials from Seoul or New York. Both arguments are reasonable.

1 Paris Agreement, Article 7.13, http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

In attempting to answer these questions, I would make two suggestions. First, divert a small portion of the funds to establish a professional institution focused on four objectives: (1) advise and assist developing counties, and sub-national units within those countries, to develop and implement climate adaptation plans; (2) help countries translate these plans into action; (3) build national capacity to incorporate climate change into future economic and financial planning; and finally (4) assess and evaluate the success (or failure) of specific programs or initiatives. If the world is going to spend billions of dollars per year on adaptation, it stands to reason that some effort be made to determine lessons from these projects, so that they can be transferred to other countries.

Second, for all the uncertainties and opportunity-cost arguments cited at the beginning of this article, it will be difficult to ask a poor developing country to divert its fiscal resources from immediate needs, such as food, housing, jobs and education. On the other hand, there may be significant co-benefit opportunities that may not be entirely additional, but can be politically justified to a domestic audience. For example, developing countries might incorporate resilience into the design of new buildings in areas of potential flooding, link agricultural subsidies to investments in more efficient irrigation systems, or provide extra support for projects that address not only the adaptation targets set forth in the UN Sustainable Development goals, but additional targets linked to one or more non-climate sustainability goals. Projects that are limited to climate mitigation and adaptation will be difficult to sell in countries facing all the ills of poverty and under-development. Projects that have climate adaptation benefits, but that also help meet a nation's infrastructure, development, or social needs will have a much greater chance of political acceptance and support.

Forests, Finance, and the Paris Agreement

Brian C. Murray
Duke University

Key Points

- Article 5 of the Paris Agreement calls for the protection and enhancement of carbon sinks, including forests.
- These actions require economic incentives, because forests are often cleared for higher returns.
- Carbon markets were once the primary means proposed to create incentives, but their use has met resistance. The Paris Agreement and separate international aviation policies may create conditions for market-based finance, but will likely be complemented by other means and sources of finance.
- Research can inform decisions on how to structure transactions to achieve cost-effective reductions at the national and local levels.

Forests, Carbon, and GHG Mitigation

Although the primary focus of global emissions reduction efforts falls on the energy, industrial, and transportation sectors, land use accounts for one-quarter of greenhouse gas (GHG) emissions worldwide. Deforestation and forest degradation (D&D) account for about half of land use emissions, or 10%–15% of all emissions.[1] With forests, GHG mitigation includes reducing D&D emissions and increasing carbon sequestration through activities such as afforestation/reforestation and improved forest management. Most D&D emissions occur in tropical developing countries, while most net carbon sequestration accrues in developed country temperate forests. Natural disturbances such as fires, drought, and disease generate emissions, and post-disturbance recovery sequesters more carbon (Bellassen and Luyssaert 2014).

Forest carbon stocks have declined over time because of incomplete incentives. Forests are cleared primarily for agriculture, which often realizes higher economic returns. But realized returns typically only reflect benefits and costs that can be converted to financial flows for rights holders. Externalities, such as the effect of deforestation on atmospheric CO_2 and

1 One widely cited estimate is 12 percent of global emissions from D&D, from G.R. van der Werf, *et al.*, "CO_2 Emissions from Forest Loss," *Nature Geoscience*, vol. 2 (November 2009), pp. 737–738, http://dx.doi.org/10.1038/ngeo671. The percentage of D&D emissions of the global total varies over time due to deforestation varying, but has been trending downward of late, given the combination of policy efforts to reduce deforestation and the growth in emissions from other sectors.

climate change, are typically unpriced, which can lead to over-depletion of forests. A direct remedy would price the carbon externality and thereby reduce forest loss. The effectiveness of carbon price incentives, or any other policy to retain forest carbon, depends on the strength and enforcement of property rights, social norms, and other institutional factors.

Forests in the UNFCCC and Paris Agreement

The potential of forest carbon retention for climate mitigation was recognized in the original (1992) text of the UNFCCC (UNFCCC 1992). However, the 1997 Kyoto Protocol did little to encourage forests as a mitigation option. While the Protocol's Clean Development Mechanism created incentives for afforestation/reforestation at the project level, there were no incentives for national-scale reductions.

The COP-11 meeting in Montreal (2005) introduced discussion on compensated reduction of emissions from deforestation in developing countries. This concept has since been expanded to include forest degradation and conservation, sustainable management of forests, and enhancement of forest carbon stocks (REDD+). Despite controversies about monitoring, disenfranchisement of forest-dependent populations, and the proposed use of carbon markets allowing developed countries to purchase REDD+ credits for their own compliance, the principles underlying REDD+ are now imbedded in Article 5 of the Paris Agreement, which calls on Parties to create policies and incentives to conserve and enhance sinks and reservoirs of carbon, including forests (UNFCCC 2015). The developing countries with the highest rates of D&D all mentioned forest actions as part of their Intended Nationally Determined Contributions.[2] That forests would be even mentioned in the Paris Agreement was far from certain; so Article 5 is seen by many as a significant victory.

Financing Challenges

As encouraging as it may be that forests are included in the Paris Agreement, achieving the desired outcomes will not be easy. The Agreement lays the framework for action but does not provide the large-scale predictable finance for it. Article 5.2 encourages Parties to support these actions, which may flag them for potential financing through the Green Climate Fund mitigation and adaptation tracks, but it does not guarantee a certain level of funds. Article 5.2 references "results-based payments," which means they are conditional upon performance. Performance could be tied to international compliance flexibility, such as referenced in Article 6's internationally transferable mitigation outcomes, widely interpreted to allow for the use of carbon markets.[3]

2 This includes the INDCs of Brazil, Indonesia, Malaysia, Myanmar, Nigeria, DR Congo, Nigeria, India, Thailand, and Colombia, which roughly comprise the 10 countries with the highest deforestation rates (depending on the data source and time period). For texts of INDCS, see: http://www4.unfccc.int/submissions/indc.

3 Though often thought of interchangeably, results-based payments need not be tied to carbon markets and can simply be the performance conditions under which we now see bilateral exchanges between donor country(ies) (e.g., Norway) and recipient country(ies) (e.g., Brazil, Indonesia, and Guyana).

At one time, many observers, including this author, presumed that a global carbon market would be the key that unlocked billions of private sector dollars for forest carbon (Murray *et al*. 2009). That has not yet materialized, though perhaps the Paris Agreement will reboot momentum. Moreover, the International Civil Aviation Organization (ICAO) is now (mid-2016) finalizing a separate market-based measure to cut aviation emissions that could create substantial market-based demand for REDD+ activity—perhaps billions of tons per year in reductions by 2040 (Conservation International *et al*. 2016). But these efforts will still need to overcome the resistance that market-based REDD+ has met for the last decade.

Meanwhile, approximately $6 billion has been spent on REDD+ initiatives to date; most of this has been for capacity building, but performance-based payments for quantifiable results are beginning to emerge at both the national and subnational levels (Wolosin *et al*. 2016). Much has been in the form of bilateral and multilateral assistance from donor countries, especially Norway, but the role of the private sector has been largely untapped.

Research Needs to Inform Policy

- Explore pathways for private sector finance, including investments in agricultural productivity that improve food security and reduce deforestation, including partnerships where private capital seeks market returns, but the government provides de-risking support (Streck *et al*. 2015).
- Develop transparent means to separate reference emissions levels, internal targets based on a country's own actions, and the remaining performance that can be compensated by other parties.
- Examine transaction design questions—should international payments go through the government to disperse locally, or should payments from foreign entities flow directly to entities within the host country?

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Bård Harstad was a faculty member at Northwestern University for eight years and is now a Professor of Economics at the University of Oslo. He has written on international agreements, conservation, and political economy in journals such as the *American Economic Review, Quarterly Journal of Economics, Journal of Political Economy, Review of Economic Studies*, and *American Political Science Review*. His paper "Buy Coal" received the Erik Kempe Award in Environmental and Resource Economics from the European Association of Environmental and Resource Economists as the best paper in the field by a European author, 2011-2012.

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Andrei Marcu has been a pioneer with regard to climate change and greenhouse gas (GHG) markets. In the private sector, he has been Chief Executive Officer of BlueNext, the environmental exchange based in Paris, and Head of Regulatory Affairs, Environment and Climate Change for Mercuria Energy Trading (Geneva). Earlier in his career, Mr. Marcu had substantial experience in the electric power industry in Canada. He was the Founder and CEO of the International Emissions Trading Association (IETA), a business association dedicated to creating efficient and environmentally robust emissions markets for GHGs. He

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Brian Murray, director of the Environmental Economics Program at Duke University's Nicholas Institute for Environmental Policy Solutions and interim director of the Duke University Energy Initiative, is widely recognized for his work on the economics of climate change policy. This includes the design of cap-and-trade policy elements to address cost containment and inclusion of offsets from traditionally uncapped sectors such as agriculture and forestry. Murray is among the original designers of the allowance price reserve approach for containing prices in carbon markets that was adopted by California and the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade programs. He has produced many peer-reviewed publications on topics ranging from the design of market-based environmental policies and the effectiveness of renewable energy subsidies to the evaluation of programs to protect natural habitats such as forests, coastal, and marine ecosystems.

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David Victor is an internationally recognized leader in research on energy and climate change policy, as well as energy markets. His research focuses on regulated industries and how regulation affects the operation of major energy markets. He has a dual understanding of the science behind climate change and how international and domestic public policy work. Victor authored "Global Warming Gridlock," which explains why the world hasn't made much diplomatic progress on the problem of climate change, while also exploring new strategies that would be more effective. Victor is a leading contributor to the Intergovernmental Panel on Climate Change (IPCC), a United Nations-sanctioned international body with 195 country members. As a community volunteer, he also serves as Chairman of the Community Engagement Panel that was established as part of the decommissioning of the San Onofre Nuclear Generating Station.

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International Climate Change Policy after Paris

Research Workshop hosted by the Harvard Project on Climate Agreements[1]
July 14-15, 2016

Harvard Kennedy School
Allison Dining Room
Taubman Building, Fifth Floor

Agenda

Participants indicated in each session will give five-minute presentations, followed by discussion.

Thursday, July 14

8:00	Shuttle leaves Le Meridien Cambridge-MIT hotel for Harvard Kennedy School
8:00–9:00	Breakfast available at workshop venue
9:00–9:20	Welcome and introduction to the workshop: *Robert Stavins*
9:20–10:00	Framing remarks: *David Victor*
10:00–10:30	Legal dimensions of the elaboration and implementation of the Paris Agreement *Daniel Bodansky*
10:30–10:45	Break
10:45–11:15	Differentiation in the evolving Paris regime *Lavanya Rajamani*
11:15–12:15	Enhancing mitigation ambition in the Paris regime *Zou Ji, Bård Harstad*
12:15–1:15	Lunch
1:15–2:00	Elaborating the Paris Agreement's transparency mechanism *Mariana Conte Grand, Joseph Aldy*
2:00–2:30	Forestry and land use in the Paris Agreement *Brian Murray*
2:30–3:00	Break
3:00–3:30	The emerging climate finance regime *Alexander Thompson*

1 The Harvard Project on Climate Agreements gratefully acknowledges the Harvard University Climate Change Solutions Fund for major support for this workshop and a larger initiative of which it is part. Support was also provided by the Harvard University Center for the Environment and BP.

3:30–4:15 Adaptation in the Paris Agreement
Henry Lee, Geoffrey Heal

4:15–4:30 Review, closing remarks

4:45 Shuttle bus leaves HKS for Le Meridien Cambridge-MIT hotel

6:00–8:30 Reception and dinner, Le Meridien Cambridge-MIT hotel
Speaker: *Robert Orr*
Special Advisor to the UN Secretary-General on Climate Change
Dean, School of Public Policy, University of Maryland

Friday, July 15

8:00 Shuttle leaves Le Meridien Cambridge-MIT hotel for Harvard Kennedy School

8:00–9:00 Breakfast available at workshop venue

9:00–10:00 Market Mechanisms in (and out of) the Paris Agreement Regime
Andrei Marcu, Robert Stavins, William Pizer

10:00–10:15 Break

10:15–11:45 Complementary and supplementary institutions: clubs, minilaterals, and more
Nathaniel Keohane, Carlo Carraro, Scott Barrett, Kelly Sims Gallagher, Matthew Paterson

11:45–12:00 Closing remarks and next steps
Robert Stavins

International Climate Change Policy after Paris

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July 14-15, 2016

Participants

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