

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 CO₂ 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 CO₂ 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 CO₂ 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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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/co_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 adaptation 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 countries, 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

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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 CO₂ and

1 One widely cited estimate is 12 percent of global emissions from D&D, from G.R. van der Werf, *et al.*, “CO₂ 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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