RAMPING UP GOVERNANCE OF THE GLOBAL ENVIRONMENTAL COMMONS: WHAT DO THEORY AND HISTORY TELL US?

DANIEL MORROW AND ANDREW LIGHT

EXECUTIVE SUMMARY

Highlights

- The history of efforts to create global agreements and governance mechanisms on the environment has been uneven. It includes some critical successes such as protecting the ozone layer through the Montreal Protocol and phasing down hydrofluorocarbons (HFCs)—one of the most potent classes of greenhouse gases (GHGs)—through its Kigali Amendment. The results of other efforts—reducing other chemical pollution, addressing climate change, slowing deforestation, protecting biodiversity, and managing ocean fisheries—have varied widely.

- This paper provides a selective review of this history through the lens of theories about the governance of public goods and offers a nontechnical account of the most prominent of these theories. Public goods theorists have varied in their views about what it takes to achieve collective action to produce these goods and the likelihood of success.

- Informed by the history and the theory, the paper puts forward a set of recommendations for improving governance of the global environment, including strengthening the “legitimating narrative” of sustainable development, building more robust national coalitions that underpin international agreements, strengthening the international architecture to support national movements, supporting technological innovation, and supporting better environmental policies and implementation capacity among developing countries.

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Background

For over half a century now the global community has been actively struggling with the question of how to collectively manage and protect our shared resources and common home, commensurate with a robust understanding of our obligations to each other, future generations, and other species.

The core theoretical problem in governing the global environmental commons (GEC) is how to encourage production of public goods (PGs)—such as an environment free from harmful pollutants—and to achieve sustainable use of common pool resources (CPRs)—such as intact, biodiverse tropical forests. PGs and CPRs are challenging to produce or manage because it is difficult, if not impossible, to exclude agents from benefiting from their existence. In both cases, a key challenge in terms of public policy is how to bring about some efficient and effective form of collective action, given that individual agents will have an incentive to free ride—meaning that they could rely on others to produce the PG or properly manage the CPR without contributing to produce the benefit.

Key academics who have contributed to this literature, such as Mancur Olson, Garrett Hardin, Russell Hardin, Elinor Ostrom, and Gunnar Trumbull, vary in their theories about the circumstances in which collective action is likely. Although none of their theories can be mapped cleanly to the complications of specific challenges of global environmental governance, they help to illuminate what has worked and how environmental governance might be improved.

Objective of the Paper

This paper uses these theories of collective action as a set of lenses to examine important cases in the history of efforts to improve environmental management. Finding lessons requires examining a range of environmental challenges—including some that have had some success in generating positive outcomes and some that have not. The paper does not try to examine all cases of attempted international environmental cooperation. Nonetheless, the cases considered are arguably diverse enough, in terms of degree of success and the scale and distribution of impacts, to generate useful insights into what works.

A Selective History of Global Environmental Governance

The Montreal Protocol to reduce the consumption and production of ozone-depleting substances stands out as a successful effort to reduce a threat to the global environment and was brought about by a unique combination of favorable factors. These included a science-based legitimizing narrative of the public good, a range of technical solutions that lowered the cost of compliance, and an agreed upon framework adaptable to the varying capacities of different countries. In the case of its Kigali Amendment on HFCs, an additional important factor was strong political leadership by heads of government determined to capitalize on the momentum to act on climate created by the Paris Agreement.

Efforts to control other forms of chemical pollution and the handling of chemical wastes have also had some success based on national legislation, the advocacy of nongovernmental organizations (NGOs), and supportive international institutions. Years of effort, in which the United Nations Environment Programme (UNEP) and international collaboration among environmental NGOs played important roles, led to several multilateral environmental agreements—in particular, the Basel and the Rotterdam Conventions.
Many factors have been at play over decades and have now brought about a promising agreement to address climate change. Following the 1992 United Nations Framework Convention on Climate Change (UNFCCC), the 1997 Kyoto Protocol took a top-down approach to allocating responsibility for emissions reductions among parties that did not enjoy the same supporting factors underpinning the Montreal Protocol. But a steadily strengthening set of national coalitions and the prolonged negotiations to create bottom-up collective action led to the 2010 Cancun Agreements and the 2015 Paris Agreement, which now provides a better foundation for addressing climate change.

Other efforts at global environmental governance—slowing deforestation, protecting endangered species and biodiversity, and managing the oceans—have had mixed results but nonetheless demonstrate the importance of national coalitions and legitimizing narratives promoted by advocacy NGOs and others. These factors have underpinned formal multilateral environmental agreements such as the 1973 Washington Convention on International Trade in Endangered Species (CITES), the United Nations Convention on Biodiversity (CBD), and the Moratorium on Whaling.

Recommendations

Taken together, this history and the theories show that collective action to improve global environmental governance, while not easily achieved, is often possible, and the common elements of successes suggest a way forward.

Ramping up governance of the global environmental commons requires a movement—a coalition of governments, advocacy groups, and, in most cases, some industry and private-sector groups built around a compelling, legitimizing narrative of the public good and usually facilitated by technological innovation that lowers the cost of provision of that public good. We provide a set of recommendations in the following categories:

- Strengthening the legitimizing narrative for sustainable development
- Grounding the legitimizing narrative in the latest science
- Building movements for better governance of the GEC from the national ground up
- Strengthening the international architecture to support national movements
- Bringing industry groups into the coalitions and supporting technological innovation
- Strengthening international cooperation through multilateral environmental agreements (MEAs)
- Complementing the existing MEAs through club arrangements
- Supporting better environmental policies and implementation capacity among developing countries

This history suggests that the foundations for ramping up environmental governance could be put in place if there is sufficient political will to do so. Nationally anchored coalitions of NGOs, political and other leaders, and, increasingly, industry that are mobilized around a legitimizing narrative of the public good, framed now in no small measure by the 2015 UN Sustainable Development Goals, have gained traction in almost all countries around the world. What is needed is a dramatic strengthening of these coalitions. Several important factors favor such strengthening. The continuing information and communication technologies (ICT) revolution dramatically accelerates mobilization of citizens; new technologies for measuring environmental impacts accelerate scientific knowledge as well as enhance public awareness; and technological innovation is rapidly lowering the costs of new pathways for sustainable development. Furthermore, environmental and climate concerns have dedicated champions in place determined to cement these issues on the international agenda.

Cutting against these favorable trends has been the rise of nationalist movements around the world, calling into question the very idea of global governance. Nevertheless, worsening environmental problems compel us to seek a better understanding of how global governance of the environmental commons has worked. This paper provides an analysis of where we have been with respect to governance of the global environmental commons to date and how that governance might be strengthened moving forward.
INTRODUCTION

The Twenty-Seventh Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer—held in Kigali, Rwanda, in October 2016—was the culmination of a long and complicated process. Building on a series of multilateral and bilateral meetings over a decade, it included participants representing over 190 countries, 7 agencies of the United Nations, and well over 100 intergovernmental, nongovernmental, industry, and academic groups. The Kigali Conference agreed on a well-defined program to limit the production and consumption of hydrofluorocarbons (HFCs), the most potent class of greenhouse gases (GHGs) (UNEP 2016).

It was an extraordinary demonstration of cooperation to contribute toward the global public good of reduced global warming. Although the commitments made at Kigali have yet to be fully implemented, the prior experience over almost 40 years of implementation of the underlying Montreal Protocol suggests that they will be.

Many political scientists and economists would have predicted that such international cooperation to provide a global public good could not be achieved. But in fact the Kigali Amendment is one of several examples of successful cooperation to improve global environmental governance. This paper reviews circumstances in which collective action to improve the environment has and has not been possible. Since a better environment is a public good, the paper starts with an overview of theories about how to achieve collective action to generate public goods. It then reviews the histories of selected efforts to do so in the domain of the environment—including efforts that have been reasonably successful, those that are promising, and those that now seem less so. Informed by both the theories and the history, the paper then puts forward some ideas about how to ramp up governance of the global environmental commons (GEC).

WAS MANCUR OLSON WRONG? THEORIES OF COLLECTIVE ACTION

The classic formulation of the problem of collective action was articulated by Mancur Olson (1965) in his book The Logic of Collective Action. Olson was generally pessimistic about the prospects for successful cooperation to produce public goods (PGs) since everyone hopes to be a free rider—letting others bear the costs while still sharing the benefits. Cooperation was especially unlikely when the benefits—for example, from reduced air pollution—would be diffused widely among the general public while the costs—say, of installing pollution control equipment—were concentrated among a few. In such a circumstance, those few who would potentially bear the costs could coordinate among themselves to block collective action while the many potential beneficiaries could not easily coordinate to promote their common interests. For that reason, Olson thought it likely that only a small group could successfully negotiate an arrangement to share the cost of the provision of PGs, especially if that group itself could capture most of the benefits.

Olson probably would have been very surprised by the agreement for international cooperation achieved in Kigali in 2016. There were many actors at the table. Many parties would need to share in the costs of reducing the use of HFCs. And the benefits of less global warming would be broadly shared across the world and even across future generations who would not directly bear the costs. In that circumstance, why would any country not choose to be a free rider?

Other academicians of Olson’s era would have been equally surprised by the Kigali agreement. In 1968 Garret Hardin penned the famous article “The Tragedy of the Commons,” and the cleverly named metaphor of too many cows on a town’s commonly owned pasture has been cited endlessly ever since (Hardin 1968). Hardin’s metaphor applied to a somewhat different problem in achieving collective action than Olson had in mind. The pasture owned in common by the townsfolk is a common pool resource (CPR). Like a public good, the townsfolk cannot be excluded from using it. However, unlike a public good, each user is a rival to the others for access to the limited supply of grass. Still the non-excludability aspect of both PGs and CPRs creates the incentive for free riding. Whether reducing production of a powerful GHG is viewed as providing the public good of less global warming or viewed as protecting the CPR of a less-polluted atmosphere, the problem is the same: how to get actors to contribute rather than to free ride?

Hardin thought that avoiding the tragedy of overusing a common pool resource such as the Earth’s atmosphere would require eliminating its “common-ness.” That could mean giving all rights to use the resource to a central authority—creating a benevolent Leviathan—or splitting up the resource into parcels to which individuals had exclusive rights—privatization. Either way, those who ini-
tially had some rights to the common pool resource would need to agree. Neither Olson nor Hardin would have been hopeful that 190 governments buffered by the diverse demands of hundreds of other parties, as in the case of the Kigali meeting, could ever reach an agreement.

So how did it happen? Were Mancur Olson and Garrett Hardin both wrong about the prospects for collective action to produce a public good or sustainably manage a common pool resource? Several scholars have since argued that, though not necessarily wrong, Olson and Hardin were overly pessimistic.

In his 1982 book *Collective Action*, Russell Hardin (no relation to Garrett) pointed out that Olson, Garrett Hardin, and many subsequent theorists tended to think about the challenges of achieving collective action as a one-time game. But he argued that such static analysis would likely lead to the wrong conclusion about the incentives for and the likelihood of cooperation. In fact, the process of seeking cooperation to achieve a public good or manage a common pool resource plays out over time, and through many interactions, including failures, it is more likely that all parties will eventually figure out that cooperation makes sense. His simple point is that “Since your cooperation tomorrow may depend on my cooperation today, I have incentive to cooperate today” (Hardin 1982, 3).

Nobel laureate Elinor Ostrom is undoubtedly the most well-known academician to argue that Olson and Hardin were overly pessimistic. She studied how communities around the world actually have managed common pool resources such as pastures, fisheries, and forests. In her book *Governing the Commons: The Evolution of Institutions for Collective Action* (Ostrom 1990), she described the usually one-of-a-kind arrangements by which small communities have often—but not always—managed common resources effectively without resort to a central authority or the establishment of private property rights. This happens most often, she observed, when a local community has intimate knowledge of a well-bounded resource, a reasonable degree of mutual trust, and the chance to design and enforce its own rules for resource management. In subsequent work, she defined a sort of checklist of the many factors that influence management of a CPR (Poteete et al. 2010). She didn’t discover any reliable formula or magic bullet for achieving collective action. But her work showed that successful cooperation requires both a shared understanding of the factors affecting a CPR and some degree of mutual trust among those seeking to manage it. And she found that most successful management arrangements involve some form of “polycentric governance”—meaning cooperation across levels of government—for example, local communities and municipal governments—as well as various private actors.

Another relative optimist is Gunnar Trumbull. Like Ostrom, Trumbull grounded his theories on actual case studies—mostly involving laws and regulations to protect the interests of consumers in the United States and Europe (Trumbull 2012). In his book *Strength in Numbers: The Political Power of Weak Interests*, Trumbull described many cases in which the broad public interest in consumer protection prevailed against the vested interests of business. Olson would have considered this unlikely because the general public—unlike the business interests—could not easily coordinate to promote their interests. But Trumbull found that the core challenge in influencing public policy is not coordination but the need to make that policy appear legitimate. In many of Trumbull’s case studies, a winning political coalition develops around a legitimizing narrative of the public good. Furthermore, he showed that such a legitimizing narrative is often designed and promoted by advocacy groups—serving their vision of the public interest as well as their own organizations’ interests. But success in creating public policy depends on creating a coalition among such advocacy groups and political or bureaucratic leaders who are willing to embrace and support that narrative. And, in the most successful cases, the coalition also attracts at least some support from business or industrial groups.

Of course, the theories of these scholars were more complex and nuanced than summarized here. Nonetheless, it is broadly correct, although a simplification, to characterize each as either relatively optimistic or relatively pessimistic, and this characterization provides a useful way in which to present their main ideas.

**THE APPROACH OF THIS PAPER**

This paper uses these theories as a set of lenses to examine important cases in the history of efforts to improve environmental management with a view toward extracting lessons about how to improve global environmental governance. We believe that finding lessons requires examining a range of environmental challenges, including some that have had some success in generating positive outcomes and some that have not. We have not tried to examine all cases of attempted international environmental cooperation but believe that the cases considered are sufficiently
diverse—in terms of degree of success and the scale and distribution of impacts—to generate useful insights into what works. We begin our history with a detailed review of the Montreal Protocol because it is widely regarded as the most successful international effort to reduce a threat to the global environment. We then review efforts to reduce other chemical pollution, address climate change, slow deforestation, protect endangered species and biodiversity, and manage the world’s oceans. In the second part of the paper, loosely informed by that history and the theories of collective action, we put forward a set of ideas about how to strengthen global environmental governance.

A SELECTED HISTORY OF GLOBAL ENVIRONMENTAL GOVERNANCE

Why Has the Montreal Protocol Succeeded?

The Kigali agreement is an amendment to the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. Together, they provide a fascinating case study in international cooperation to protect the global environment. By most accounts, the Montreal Protocol has been the most successful international environmental agreement: the global production of ozone depleting substances (ODSs) has been cut significantly, and, despite remaining challenges, the threatening loss of the stratosphere’s protective ozone layer has been halted (Benedick 1998; Weiss and Jacobson 1998; Downie 2015). How did this happen? What does it suggest about the relevance of the theories of Olson, Garrett Hardin, Russell Hardin, Ostrom, and Trumbull about how to achieve collective action to produce PGs?

The story starts with the work in the 1970s of a few scientists. First in 1974 Sherwood Rowland and Mario Molina argued that a class of chemicals called chlorofluorocarbons (CFCs)—widely used in air conditioners and aerosol spray cans—would rise into the stratosphere and break down the ozone molecules that absorb ultraviolet (UV) rays. If the ozone layer became seriously depleted, the increased exposure to UV rays would eventually cause a significant increase in skin cancers and other maladies among humans as well as serious ecological damage. Some of these scientists, especially Paul Crutzen, left their labs to promote public awareness of the threat, and environmental nongovernmental organizations (NGOs) as well as some governmental environmental agencies quickly became engaged. Perhaps because the basic story is simple—CFCs destroy a layer of the stratosphere that protects people from sunburn and cancer—these advocacy groups successfully promoted a compelling, legitimizing narrative about the public good.

The initial response came at several levels. Under public pressure in the late 1970s, U.S. industry voluntarily stopped using CFCs in aerosol cans. In 1977, the United Nations Environment Programme (UNEP) put forward a World Plan of Action on the Ozone Layer, which called for international research and monitoring. And, in 1981, its governing council authorized UNEP to draft a global framework convention on stratospheric ozone protection.

That initial framework convention—the 1985 Vienna Convention for the Protection of the Ozone Layer—required only cooperative research and information exchange, not collective action to reduce CFCs. But international action kicked into high gear when, in the same year in which the convention was adopted, scientists reported that a shockingly large hole in the ozone layer had developed over Antarctica. In September 1987, after only nine months of negotiations, agreement was reached on the Montreal Protocol to the Vienna Convention—and virtually all countries subsequently ratified both. That protocol set targets and timetables for the reduction in the production and consumption of ODSs as well as arrangements for adjusting those targets and timetables as new scientific information became available. In fact, the protocol has been amended several times to tighten the targets. Developing countries were granted a 10-year delay in compliance with targets and timetables, and subsequent amendments to the protocol created a multilateral fund to assist them with compliance costs. An implementation committee was established to review annual reports from countries and to develop measures to deal with any noncompliance. But to date, no country has been found in noncompliance.

This success story in international collective action to produce a global public good does not fit exactly any of the theories but has some elements of each. It best fits Trumbull’s model of a legitimizing narrative promoted by a coalition of advocacy groups, governments, and other political actors. But other enabling factors were crucially important. First, in 1987 production of ODSs was highly concentrated among relatively few companies in the United States, Europe, and Japan, and so, as Olson might have predicted, it was easier for this relatively small group to agree on their respective contributions. Second, largely because U.S. companies like Dupont had been developing chemical alternatives to ODSs during
the previous decade, relatively inexpensive substitutes were available. Because of this technological progress, no group faced “concentrated losses,” which Olson believed usually prevented collective action. In fact, Dupont, which at the time accounted for about one-fourth of global ODS production and had initially opposed any regulation, openly called for an international freeze in CFC emissions soon after discovery of the ozone hole. Once key industries were on board, the political coalition in support of reducing ODSs was sufficiently strong to work out the details of cooperation. And, third, consistent with Russell Hardin’s model for collective action, achieving cooperation, and then extending the agreement to other substances such as hydrochlorofluorocarbons (HCFCs) and eventually HFCs, has been a drawn-out, iterative process through which mutual understanding and trust has grown over several decades.

In a way, the Montreal Protocol did what Garrett Hardin considered necessary for effectively managing a common pool resource such as the atmosphere: It created an authority that imposed limits on otherwise independent governments. But that is not strictly correct because no country gave up any sovereign rights. Instead, the Montreal Protocol is more like the sort of agreement that Ostrom would expect—uniquely designed for the circumstances with inputs from all concerned, flexible to accommodate different needs and evolving challenges, and involving the cooperation of several levels of governance. Specifically, the establishment of the multilateral fund through which high-income countries could help finance the cost of participation and compliance among lower-income countries greatly facilitated globally cooperative action. Similarly, the Montreal Protocol’s implementation committee became a vehicle for adapting the agreement over time to changing circumstances and new knowledge about ODSs.

What about the Kigali Amendment to the protocol to phase down HFCs? That story is more complicated and can be understood only in the context of global efforts to address human-made climate change. We will come back to that.

Reducing Other Sorts of Chemical Pollution

Unfortunately, the Montreal Protocol is largely an outlier among efforts toward international cooperation to protect the environment. In his report to the UN General Assembly, Secretary General Kofi Annan called it “perhaps the most successful international environmental agreement to date” (United Nations General Assembly 2000). In the UNEP’s fifth Global Environment Outlook (2012), the protocol is the only international agreement that gets a solid A for progress. But, also in that UNEP assessment, efforts to control chemical pollution earned lots of Bs for some progress, and it is important to understand how those were achieved. To do so we need to look back to the early days of the environmental movement (Selin 2010).

Many attribute the birth of the modern environmental movement to the publication of Rachel Carson’s *Silent Spring* in 1962 (Carson 1962). The book documented the likely impact of widespread use of the pesticide DDT, especially on bird populations. Public reactions to a widely viewed television program about the book in the United States spurred a congressional review of pesticide hazards and the public release of a pesticide report in 1963 by the President’s Science Advisory Committee. The ensuing scrutiny of the environmental impacts of agricultural chemicals helped to give rise in the United States to the establishment of organizations like the Environmental Defense Fund in 1967—an advocacy NGO whose first campaign was directed toward limiting the use of DDT (Wurster 2015)—and also to the creation of the federal government’s Environmental Protection Agency (EPA) in 1970. Much of the EPA’s early work, such as enforcement of the 1972 Federal Insecticide, Fungicide, and Rodenticide Act, was directly related to Carson’s work. But broader efforts to protect against chemical pollution were propelled by highly publicized incidents such as the fire on the Cuyahoga River in Cleveland in 1969 and in the next decade by the leakage of toxic wastes from an old dump site at Love Canal, New York.

Carson’s book was published in German and French in 1963, and soon after elsewhere in Europe, and contributed significantly to the growth of concern about the environment in Europe. Reflecting that concern, in 1968 the government of Sweden proposed to the UN Economic and Social Council that it should convene an international conference on the environment. This led to the very influential 1972 United Nations Conference on the Human Environment, widely known as the Stockholm Conference, which devoted considerable attention to the threats of chemical

Japan similarly began to act in the early 1970s. Japan’s action was sparked by the discovery that a spill of polychlorinated biphenyls in Yusho in 1968 had caused significant health problems among those who ate contaminated rice (Selin 2010). The 1973 Chemical Substances Control Law was a direct response to the growing health concerns over persistent, bio-accumulative, and toxic chemicals. The law gave the government of Japan the power to conduct hazard assessment tests for all chemical substances prior to manufacturing or importation, making it the first premanufacturing evaluation system in the world (Japan Ministry of Economy, Trade and Industry 2018).

In retrospect, it is encouraging how quickly the environmental movement accelerated around the world. Carson’s book was published in 1962. In 1970, the first Earth Day—organized by a Harvard student named Denis Hayes—involved demonstrations by 20 million people around the United States. Following the Stockholm Conference in 1972, environmental protection agencies were set up not only among the developed countries but also in China, Brazil, and other developing countries, although this latter group would generally not be able to put in place and enforce significant regulations for some time.

Why did the governments of the major industrialized countries begin to regulate potentially hazardous chemicals? Olson would have predicted that the industries that would suffer concentrated losses from regulations to reduce the production and use of profitable chemicals would have prevailed politically over the interests of the general public. Although the details undoubtedly vary among countries, what actually happened was more consistent with Trumbull’s model (Hough 1998; Selin 2016). Nongovernmental advocacy groups, supported by expanding scientific information and growing public awareness of the immediate risks from certain chemicals, created a legitimizing narrative about the benefits of regulating harmful chemicals. That narrative was especially compelling because the potential damages from harmful chemicals are both local and near-term—not just diffused around the world and affecting future generations. These advocacy groups were then able to establish coalitions with political and bureaucratic actors in order to muster the political power to prevail over the interests of industry. In the U.S. case noted above, it was the Environmental Defense Fund, among others, building on the compelling narrative provided in part by Carson’s Silent Spring and strengthened by well-publicized incidents that allied with President Richard Nixon and some congressional leaders to create the EPA and launch U.S. efforts to limit chemical pollution.

By the 1980s, the regulation of hazardous chemicals, including the disposal of chemical wastes, was well established—although not always effective—in most developed countries. But similar regulation was not yet in place in most developing countries. This led to increasing concern among UN agencies, international NGOs, and developing-country governments about the export of hazardous chemicals such as pesticides and chemical waste products from developed to developing countries. The responses to those concerns played out over two decades.

Although the problem of illegal and unsafe waste disposal in developing countries had been recognized for some time, a particularly notorious case in 1986 put it squarely on the international agenda. The cargo ship Khian Sea went to sea from Philadelphia with 14,000 tons of toxic incinerator ash that had high levels of lead and cadmium. The ship spent two years searching for a country to take this cargo, attracting media attention along the way. It eventually dumped 4,000 tons of this toxic waste on a beach in Haiti and the rest somewhere in the Indian Ocean.

UNEP took up the issue, adopting the voluntary Cairo Guidelines for sound management of hazardous wastes in 1987. But a coalition of developing countries and advocacy groups, led by the Organization of African Unity and Greenpeace, lobbied for a complete ban on such trade. By 1989, UNEP successfully led the negotiations to create the Basel Convention, which was intended “to prevent developing countries from becoming repositories for improperly identified and improperly managed hazardous wastes.” The Basel Convention was the first in a series of multilateral environmental agreements (MEAs) dealing with chemicals and chemical wastes, which are listed in the appendix. The Basel Convention embodied a compromise between pro-trade advocates (mostly governments in developed countries that generated a lot of such waste) and the pro-ban coalition (mostly developing-country governments and international advocacy groups) that included a mandatory scheme for prior informed consent (PIC) by the governments of the
importing country. But that initial compromise did not satisfy many people, and the convention came into force with only 33 signatory governments. Nevertheless, the existence of the convention and continued research and advocacy by Greenpeace and others did spur actions at the national level: By 1994, more than 100 governments had domestic legislation banning the import of chemical wastes, although many did not have sufficient enforcement capacity.

The struggle between pro-trade and pro-ban coalitions has continued over more than two decades. As these pro-longed and difficult negotiations have clarified rules and tightened regulations, by 2015 almost all governments had signed the convention (not including the United States). But the Ban Amendment, pushed by major environmental NGOs such as the Basel Action Network and Greenpeace as well as some developing countries and the European Union (EU), is still not ratified. And it is unclear how effective the convention has been: In its Global Environment Outlook 5 (GEO5) assessment, UNEP stated that “data from national reporting to the Basel Convention Secretariat is sparse and difficult to interpret, and reporting by Parties is declining.”

This saga does not clearly vindicate the theories of either Olson or Trumbull. It certainly demonstrates the difficulty of reaching agreement among so many parties. But the persistent efforts of a Trumbull-like coalition of advocacy groups like the Basel Action Network, intergovernmental actors like UNEP, and political leaders in many governments has paid off to some extent in controlling the unsafe trade and disposal of hazardous wastes. However, UNEP’s GEO5 assessment claims that the weakest element of the implementation of these controls is the lack of administrative capacity and financial support to many developing countries.

The story of international regulation of trade in hazardous chemicals themselves has many parallels to this story about chemical wastes. Although the developed countries had banned domestic use of particularly dangerous chemicals, especially some pesticides, and had regulations to encourage safe handling of others, most developing countries had no such controls. Both international government organizations and NGOs took up the issue. The World Health Organization estimated that in the 1970s about 500,000 people in developing countries were annually poisoned by pesticides. In 1982, developed- and developing-country NGOs formed the Pesticide Action Network to press for action. In that same year, the UN General Assembly passed a resolution calling for a system of prior consent by importing countries to the sale of any chemicals banned by exporting countries for domestic use. The problem gained worldwide attention in 1984 when a massive leak from a Union Carbide chemical plant in Bhopal, India, caused the immediate death of almost 4,000 people and serious health impacts for many others. In the following years, the UN Food and Agriculture Organization (FAO) and then UNEP put forward voluntary codes of conduct and guidelines, which evolved into a voluntary system for PIC. Pushed by a coalition of developing countries, environmental NGOs, and some European governments, the Agenda 21 that was adopted at the 1992 Rio Earth Summit called on governments to create a mandatory PIC system. These actions finally led to the adoption of the Rotterdam Convention in 1998. The convention’s main provision is that certain pesticides and other chemicals that had been banned or severely restricted by the environmental authorities in developed countries could not be sold and used within developing countries without PIC by the governments within those countries.

What is striking about this story is how long it took to reach the stage of an international agreement. The Pesticide Action Network was created in 1982, but the Rotterdam Convention came into force only in 2004. The story of toxic chemical management certainly demonstrates Russell Hardin’s point that successfully achieving collective action usually requires an iterative, dynamic process and takes time.

An interesting element of the story behind the Rotterdam Convention is the evolving position of the chemical industry. As developed countries strengthened their domestic regulations during the 1970s, the international chemical companies faced a patchwork of overlapping and conflicting regulations. Working through the Organisation for Economic Co-operation and Development (OECD), these companies pushed for harmonization of domestic regulations; and, as part of that effort, in 1984 the OECD Council recommended that OECD states implement a collective notification system for trade among themselves. This proposal was acceptable to the U.S. chemicals industry since U.S. domestic law already required such a notification scheme. But it was not a full PIC system because it did not require official consent from the importing country. In subsequent years, the international chemical industry continued to oppose this kind of PIC system. Nonetheless, the U.S. chemicals industry finally agreed to support the
proposed Rotterdam Convention. This part of the story is consistent with Trumbull’s observation that coalitions in support of collective action can be more powerful when at least part of the relevant industry can be brought on board.

Some argue that the decades-long effort to control toxic chemicals and chemical wastes has made progress but still faces important challenges, such as dealing with new chemicals, limiting exemptions to use of known toxins, providing sufficient financial and technical assistance to build implementation and enforcement capacity within developing-country governments, and fully implementing the initiative to achieve synergies across the relevant conventions (Chasek et al. 2017, 161–62). Nevertheless, overall it shows that international cooperation to improve the global environmental commons has been possible even though imperfect.

Addressing Climate Change

Part of the explanation for this modest success of the international regime to control pollution from hazardous chemicals and chemical wastes is that this sort of pollution usually has local and immediate health impacts, which animated the coalitions for national regulation, and that national regulation in turn laid the foundations for international action.

Unfortunately, that is not true for what many regard as the Earth’s greatest environmental threat: human-caused climate change. GHG emissions have global impacts, and there is no relationship between the amount of emissions produced in a particular country and the impacts that country will experience directly from climatic change. Further, those impacts come after a long lag: Global climate-change impacts today are primarily the consequence of the accumulation of emissions over the past 150 years, and reductions in today’s emissions of carbon dioxide (CO2) will change the trajectory of impacts slowly over a long time horizon. Therefore, creating a powerful legitimizing narrative to drive a coalition demanding immediate action is particularly difficult. Nevertheless, the story of efforts to limit climate change, after three decades of effort, has been taking a more hopeful turn (Yergin 2011; Light 2016).

As was true for the global effort to control ozone-depleting substances, global awareness of the problem was propelled in the 1980s by scientists, activists, environmental NGOs, and a few political leaders. The quasi-governmen-
tal Intergovernmental Panel on Climate Change (IPCC) publicized the growing scientific knowledge of the risk in its first report in 1990, and coalitions involving NGOs, international agencies, and some political leaders began to form around the world. Relatively quickly, at the 1992 Rio Earth Summit, agreement was reached on a framework convention, the United Nations Framework Convention on Climate Change (UNFCCC). Although it was a critical first step, the convention itself did not create explicit quantified mitigation obligations on parties other than to collect and report data on GHG emissions. But it got the ball rolling toward the creation of a more explicit agreement on climate change, and it established the principle that developed countries must take the lead in addressing the problem. While the convention does not stipulate it, a claim among most parties is that this responsibility on developed countries emanates in part because they were the original historic source of GHG emissions up until then. Unlike the case with chemicals at the time of the Basel and Rotterdam Conventions, no countries—developed or developing—had any policies in place designed to curb GHG emissions (although of course work on improving energy efficiency in many parts of the world was reducing energy and carbon intensity). Given that Agenda 21 was adopted at the same time but said very little about climate change, the fact that the UNFCCC was created as early as 1992 was impressive in and of itself.

The UNFCCC set in motion annual meetings of the signatory governments (the Conference of the Parties, known as COPs), which attracted increasing participation from environmental NGOs and interested industry representatives. Discussions focused on achieving an agreement similar to the much-lauded Montreal Protocol, with specific targets and timetables to which countries would be legally committed. But the problem of reducing GHG emissions was much more difficult than that of reducing ozone-depleting substances. First, the vast majority of economic activity involved emissions of CO2—the primary GHG—as a byproduct of burning fossil fuels, and so reducing GHG emissions affected everybody, not just a relatively small segment of industry. Second, in the early 1990s, there were no relatively low-cost technological alternatives to fossil fuel energy that could quickly be deployed on a large scale. Therefore, unlike today, a transition to a low-carbon economy was almost uniformly seen as all pain and no gain except in the very long run. Third, the coalition for climate action had not yet acquired support from any significant segments of industry, and indeed the fossil fuel industries pushed with some success a competing
narrative about the importance of lower energy prices for economic well-being, and, eventually in some cases, skepticism about the problem altogether.

Despite all of that, the 1997 COP managed to agree on the Kyoto Protocol, which involved a modest program for reductions in GHG emissions for developed countries—an average of about a 6 percent decrease relative to 1990 levels—for the period 2008–2012. Some of those reductions could be offset through the use of a series of flexibility mechanisms designed to support mitigation measures in developing countries or economies in transition. Although most developed countries subsequently met their targets, the effectiveness of the deal was immediately undermined because U.S. President Bill Clinton and Vice President Al Gore could not sell the treaty to the U.S. Senate. The Senate unanimously insisted that the United States would not commit to any deal unless larger developing countries, especially China, would also accept some reductions in their own emissions. Opponents to the Kyoto Protocol in the United States argued that it would disadvantage the country vis-à-vis its largest economic competitors in developing countries and, in addition, since the largest growth in GHGs would be in large emerging economies, slowing climate change would require broader participation in emissions reductions by all major emitters.

In the decade following the approval of the Kyoto Protocol, the global coalition favoring climate action, propelled by increasing scientific knowledge of the threat, gained strength. In the United States, the movement acquired a new champion with the 2008 election of President Barack Obama. Many developed countries moved ahead with domestic measures to curb GHG emissions, though the U.S. Congress was unable to agree on any economy-wide policy to do so. Also during that decade, the extraordinary economic growth in China and elsewhere among the emerging-market economies strengthened the argument that the large emitters among developing countries must also commit to some reduction in or slowing of emissions, as total emissions from developing countries surpassed emissions in developed countries.

So, when the COP convened in Copenhagen at the end of 2009, there was some optimism about reaching a new agreement on emissions reductions to follow the Kyoto Protocol or potentially to breathe new life into the protocol itself. But developed and developing countries—and the United States and China, in particular—were still far apart on both the preferred structure of an agreement and what their respective commitments to achieving global mitigation goals should be. While we do not have the space here to go into details on the matter, there were also many criticisms that the process in Copenhagen was not conducive to overcoming the divisions among countries on a path to a revitalized global climate regime.

The result was that consensus was not fully reached on the resulting Copenhagen Accord, which invited countries to voluntarily submit their plans for emissions reductions to 2020, with the ultimate goal of limiting the global average temperature increase to 2 degrees Celsius (°C) over pre-industrial levels. But the Copenhagen Accord did succeed in setting a new template for a workable climate agreement. In particular, shifting from a top-down to a bottom-up agreement architecture—structured around self-determined pledges—showed important promise for enhancing participation from more of the world’s major emitters than was seen with the Kyoto Protocol. Within a month after Copenhagen, some 60 countries—collectively responsible for approximately 75 percent of global emissions, including the United States, China, and India—officially registered what they were willing to do unilaterally to reduce their emissions by 2020. At the 2010 COP in Cancun, Mexico, due in part to the resolute and astute leadership by the Mexican government, consensus was achieved not only on the basic structure that had been created in Copenhagen supporting these pledges, but also on a commitment that donor countries would raise $30 billion in fast-start climate finance for developing countries in 2010–12 and mobilize $100 billion a year from both public and private sources for climate finance by 2020 and on new systems of measuring and verifying progress.

In the years following the 2010 Cancun Agreements, the coalition in favor of climate action greatly expanded for at least four reasons:

- First, the greater frequency and intensity of extreme events that can credibly be attributed at least in part to climate change has increased public awareness of the near-term as well as long-term risks of the problem, including economic, security, and health impacts.
- Second, the relative cost of renewable energy production continued to fall. Earlier subsidies for renewable energy in the United States, Europe, and China paid off; and the markets responded, driving down the price of electricity from renewable sources to price parity with fossil fuels in many markets. For example, the marginal cost of solar power systems has fallen...
Fourth, pro-climate action coalitions of advocacy groups, subnational political actors, and, in some cases, industry groups gained strength among cities and subnational governments. For example, the state of California has adopted its own comprehensive carbon pricing system (which is now linked with that of Quebec and may soon be linked to a possible carbon price in Oregon), and a broad coalition of major cities around the world is actively collaborating in climate-action measures. This proliferation of bottom-up approaches has been propelled by support from industry groups that will benefit from such transitions, by recognition of potential local co-benefits like reduced local air pollution, and by the greater connectivity made possible by rapid improvements and diffusion of information and communications technologies.

These and other trends in the broadening of coalitions around the world in favor of climate action (in particular, an active coalition including the United States, EU, Small Island Developing States, and some Latin American and other developing-country governments) made possible the 2015 Paris Agreement. At the heart of the agreement is a set of bottom-up commitments involving voluntary national programs and targets for mitigation measures by all countries. This outcome further eroded the original bifurcation between developed countries that had responsibilities for mitigation and developing countries that did not, which had been a point of contention in the original establishment of the UNFCCC in 1992, and which had begun to show signs of flexibility in Copenhagen and Cancun. Reflecting the strength of these growing coalitions and the increased political will of many governments, the national mitigation targets in the key countries are more ambitious than those advanced under the Copenhagen and Cancun Agreements and extend the horizon for national programs and targets to 2025 or 2030. Even before the first negotiating session was initiated in Paris, 188 of these pledges (or Intended Nationally Determined Contributions) were submitted by countries representing over 95 percent of global emissions. One of the improvements of the Paris Agreement over the Copenhagen and Cancun Agreements is the requirement that parties come back to the negotiating table at regular cycles to improve their targets informed through a regular global stock-taking exercise of where the world needs to be with respect to aggregate ambition, among other elements of the agreement. This system will make it more likely that long-term temperature stabilization goals can be met. Equally important, the parties in Paris agreed to move toward a more unified form of measurement, reporting, and verification (MRV) of emission reductions, with the details of this system finalized at the last COP in Katowice, Poland. These elements of the agreement are legally binding; the exact form and function of the compliance mechanism is still in the works, although it will be nonpunitive. Beyond this, the agreement will rely on international peer and public pressure to promote compliance by parties and increased ambition for commitments over time.
The most optimistic assessment of the cumulative targets, or nationally determined contributions (NDCs), after the agreement was finalized was that they could lead to a stabilization of global average temperatures at approximately 2.7°C above pre-industrial levels. While the temperature gains might not be this good, if that level of mitigation were achieved it would still be short of the original Copenhagen target, and the Paris Agreement is explicit that the ultimate goal should be even more ambitious, “pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.” But, again, the Paris Agreement sets in motion an ongoing process of commitments by parties in the future that will hopefully be strengthened if the domestic political coalitions within major emitters also continue to improve. One outcome of the Katowice COP was a compelling call for parties to begin increasing their ambitions in 2020.

In many ways, the success of the 2015 Paris Agreement is consistent with the more optimistic theories of Russell Hardin and Trumbull. The long, iterative process starting with the UNFCCC in 1992 has seen the gradual strengthening of coalitions of advocacy groups, some political leaders and civil servants, and some industry groups in favor of climate action. It is also consistent with Ostrom’s view that effective CPR management often involves polycentric governance by agents at different levels acting toward a common goal but applying locally designed, often idiosyncratic, policies that take into account local circumstances.

With that in mind, it is worth noting that Ostrom’s model highlights two considerations that will likely be crucial if the Paris Agreement is to be successfully implemented. First, in order for diverse agents to sustain and strengthen their commitments to actions for the public good, they need to trust that others are reciprocating. That puts a premium on good implementation of the agreement’s transparency provisions. In this respect, the outcome of the Katowice COP succeeded in maintaining the direction of travel from Paris to create one strong set of rules on transparency for all countries, with flexibility for the poorest. Second, all agents need to believe that the distribution of benefits and costs is at least roughly fair; and, in turn, that can present challenges to implementation of some more ambitious national programs.

The election of Donald Trump as president of the United States has been a serious setback for implementation of the Paris Agreement in the United States. In addition to his 2017 announcement of his intention to withdraw the United States from the Paris Agreement, his administration is now attempting to roll back many of the measures designed by the Obama administration to set the country on a track to fulfill its current commitments under the Paris Agreement. Nonetheless, other factors will likely mitigate these efforts, at least in the near term. Even though there was a rise last year in GHG emissions in the United States, it is expected that the country will remain on a long-term downward trajectory due to economic and technological factors that may not be much affected in the near term by any policy changes—especially the replacement of coal with natural gas in power generation, the expansion of solar and wind generation capacity, and improvements in the fuel efficiency of the vehicle fleet. A bigger concern may be whether the Trump administration slows the rate of decrease in emissions to the point where the United States cannot get back on track to achieve deeper levels of reductions by mid-century without incurring significant cost. (The U.S. NDC under Paris defended the adequacy of its 2025 target by arguing that it was on a trajectory to eventually achieve at least 80 percent reductions by 2050.) Nonetheless, climate mitigation policies adopted by more than 3,500 states, cities, companies, and universities within the United States—such as the cap-and-trade program and other measures in California—have been steadily increasing since President Trump’s announced withdraw from the Paris Agreement. Estimates are that those efforts could reduce emissions by 17 percent by 2025, and additional politically feasible measures by these actors could put the United States within striking distance of fulfilling its original commitment under the agreement (Fulfilling America’s Pledge 2018). Even if the Trump administration does go through with the announced plan to formally withdraw from the Paris Agreement, the rest of the world seems determined to carry on. This has been evident at both G20 meetings since Trump’s election. At the 2017 meeting in Hamburg and the 2018 meeting in Buenos Aires, 19 parties remained resolute in their vocal commitment to implementation of the Paris Agreement, calling it irreversible in the leaders’ statement, even while the United States did not join this commitments. This discouraging phase of U.S. policy is, it is hoped, temporary, but it has in many ways galvanized the U.S. nonfederal and nonstate actors and the international climate communities, and this bodes well for the long-term support for the agreement.
What about the Kigali Amendment?

The new Kigali Amendment to the Montreal Protocol was highlighted above as an example of successful international collective action. Its existence can be understood only in the context of the negotiations related to climate change. The HFCs that are the subject of the Kigali Amendment are not ODSs themselves: they were developed as a substitute for ODSs that were phased out following earlier amendments to the Montreal Protocol. Unfortunately they are extremely potent GHGs. When this was discovered, the international coalition for climate action was able to bring to bear the apparatus of the Montreal Protocol, including specific timetables and targets, given that the Vienna Convention stipulated that it could be used to phase out pollutants that were used as substitutes for ODSs.

In this case, the necessary elements for successful collective action identified by the theorists came together—a very compelling, legitimizing narrative based on a scientifically grounded and common understanding of the problem; a well-established, international political coalition; sufficient support from industrial actors; and a tested arrangement for polycentric governance that included means for financial and technical assistance to facilitate compliance. Support from industry came from both the relatively small number of firms producing proprietary alternatives to HFCs and the larger number of firms that will produce appliances using nonproprietary alternatives like propane (Seidel et al. 2015).

However, the successful negotiation of the Kigali Amendment also depended on something not highlighted by any of the theories: determined political leadership. As part of its broader effort to promote international action on climate change, the administration of U.S. President Obama, including the president himself, made a major diplomatic effort to use the Montreal Protocol to address the problem of HFCs (just as he had with the Paris Agreement itself). The Kigali Amendment almost certainly would not have come about as quickly as it did without this leadership.

Slowing Deforestation

The story of efforts to protect the world’s forests in some ways parallels the story of addressing climate change: After decades of discussions and many ineffective efforts (Chasek et al. 2017, 213–24), there now may be reason to hope for progress in slowing deforestation.

From an economist’s perspective, forests are complex things. Taken as a whole, forests are global public goods, providing a massive carbon sink and harboring a large share of the world’s biodiversity. They also generate local public goods, protecting local watersheds and offering intrinsic natural beauty. However, forests hold economic as well as ecological value: Trees have value as timber, and the land on which they grow has value as cropland or pasture. Discrete parts of any forest can be owned by an individual, a company, or a government. So, seeing the forest for the trees—realizing the public, ecological value rather than only the private, commercial value—can be difficult.

Concern about forest conservation had been on the national agenda of many countries for decades, and the FAO had established a committee on forests in the late 1940s. However, management of the world’s forests first became the subject of international negotiations from the perspective of the trees as products. In the late 1970s, as governments around the world explored the use of international commodity agreements to promote price stability, the UN Trade and Development Commission convened negotiations for an international tropical timber agreement. Through three iterations, the international tropical timber agreements of 1983, 1994, and 2006 tried to strike a balance between commercial exploitation and conservation. But, despite sponsoring hundreds of projects around the world in the past 30 years, there is little evidence that these agreements have improved tropical forest management.

In other fora, the environmental value of forests—and slowing or even reversing deforestation—was the focus of concern. In the early 1980s, grassroots groups in Brazil, India, and elsewhere began international media campaigns to draw attention to the deforestation in their countries. As a result, in 1985 the FAO along with the United Nations Development Programme, the World Resources Institute (WRI), and the World Bank launched the Tropical Forestry Action Plan (TFAP), which intended to help countries design and implement their own national forestry action plans. However, multiple reports showed that TFAP was largely ineffective, and several suggested that the program could actually be accelerating deforestation and cultural destruction (Winterbottom 1990; La Viña and de Leon 2014, 10). By 1995, the majority of TFAP initiatives had collapsed. At the national level, it seemed that the incentives for commercial
exploitation of timber (which were often driven by the interests of international timber companies) and for expansion of agricultural land uses were prevailing.

Going into the 1992 Earth Summit in Rio de Janeiro, slowing deforestation was one of the major goals of many developed-country governments and NGOs, which were pushing for an international tropical forest convention. But most developing-country governments objected to such a challenge to sovereignty over their forests, noting that the developed countries had already exploited their own forests for centuries. Slowing deforestation did become a goal of two of the conventions to come out of Rio—the United Nations Convention on Biodiversity (CBD) and the UNFCCC—but neither included specific targets or provided international instruments to support programs to reduce deforestation. The Earth Summit at Rio adopted nonbinding Forest Principles that only hinted that deforestation was a global environmental problem and omitted the idea of international guidelines for forest management. Since then, the UN has sponsored a series of discussion fora—the Intergovernmental Panel on Forests (1995–97), the Intergovernmental Forum on Forests (1997–2000), and then the UN Forum on Forests (2000–present). These three bodies produced several proposals for action and, most recently, the International Arrangement on Forests. Still, although showing some signs of slowing, overall the pace of deforestation continues in some parts of the world largely unabated.

There have also been efforts by the private sector to promote sustainable management of tropical forests. For example, in 1994 a coalition of timber companies and NGOs established the Forest Stewardship Council, which agreed on criteria by which forests could be certified and their resulting products labeled as sustainably managed. Today, substantial areas of forested land are certified under the Forest Stewardship Council, with more than 1,000 certifications in 82 countries (Forest Stewardship Council 2017, 217). However, the effectiveness and overall impact of these efforts is debated (Greenpeace 2013).

The 1992 UNFCCC had recognized the importance of forests as carbon sinks, and subsequent COPs discussed means by which countries could be incentivized to protect these sinks. Especially within the discussions of the Kyoto Protocol’s Clean Development Mechanism, through which developed countries could finance mitigation projects in developing countries, consideration was given to ways in which developing countries could be paid for preventing deforestation. But the conceptual and practical problems of doing so proved difficult. The core problems are how to ensure additionality and prevent leakage. If a country is paid for not cutting down a certain forested area, how can it be determined that that area wouldn’t have been cut down in the first place? And how can it be ensured that the forest just down the road is not cut? Since the UNFCCC COP 11 in 2005, solutions to such problems have been pursued under the heading of REDD+ (Reducing Emissions from Deforestation and Forest Degradation). By 2013, agreement was reached on a REDD+ framework for in-country monitoring systems, forest reference levels, and other elements that, once established at the national level, would provide a sound basis for external financing. Setting up these prerequisite frameworks is difficult and requires a serious political commitment from concerned governments, including those providing external financing (Seymour and Busch 2016).

There has been one hopeful story in slowing deforestation—the story of Brazil (Hochstetler and Keck 2007). Organized concern over forests began early with the Foundation for the Conservation of Nature. Founded in Rio de Janeiro in 1954, this group advocated for protected areas and national parks to preserve the Brazilian Amazon. But the modest efforts of the conservationist elite did nothing to slow rapid economic development of Brazil in the 1960s and early 1970s that decimated large swaths of the Amazon’s forests. The degradation of the environment during this period caught the attention of those outside the original circle of elite conservationists: businesspeople, journalists, the middle class, and indigenous people all began to express concern for the Amazon. This expansion of concern led to a transformation of the Brazilian environmental narrative from strictly conservationist to one of socioenvironmental justice, reflecting concerns about sustainable livelihoods as much as forest conservation. As various state and national NGOs gained momentum, civil society began to act, setting up conferences, demonstrations, and campaigns throughout the late 1970s.

The vigor of the Brazilian movement to protect the Amazon gained the support of many international NGOs and advocacy groups, especially when Rio de Janeiro was selected to host the 1992 Earth Summit. International campaigns by groups such as Greenpeace, Friends of the Earth, and Conservation International raised concerns with international buyers of products of the Amazon and increased public awareness of the harm being...
done to tropical forests worldwide. While the Brazilian government consistently objected to any international agreements that would infringe on its sovereign rights over forests, by the early years of this century, the political coalition within Brazil in favor of forest conservation was able to push through national laws that constrained commercial exploitation and led to a significant reduction in deforestation since 2003. These efforts have been supplemented by financial support (mostly from Norway) through performance-based payments for conservation of the Amazon since 2008, as part of the World Bank’s Forest Investment Program. However, sustained political and financial support (both national and international) is needed to continue this trend. Unfortunately, although deforestation in Brazil reached an all-time low in 2012, deforestation rates since then have been on the rise as those interested in commercial exploitation pushed through some regulatory changes, and law enforcement resources have been inadequate (Biderman and Nogueron 2016). The struggle to protect Brazilian forests will be ongoing.

Despite this tortured history of global efforts to slow deforestation, the prospects for better governance of the world’s forests now seem promising (Seymour and Busch 2016). The Brazil case shows the potential power of national coalitions that are driven by passionate advocacy groups in alliance with political agents and based on a legitimizing narrative that embraces both national and global public goods. The future of REDD+ may also be promising. The implementation of the UNFCCC 2013 Warsaw Framework clarifies and outlines the financial and MRV requirements of REDD+ projects (UNFCCC 2013), and the 2015 Paris Agreement includes REDD+ as a major way for countries to meet their mitigation pledges (Harris and Stolie 2016). The greatly improved technologies for satellite monitoring of forests will likely make possible a substantial acceleration of REDD+ programs in the coming years, and the lessons learned from pilot projects in some Brazilian states and Indonesia should contribute to the successful implementation of such programs. National coalitions, such as those seen in Brazil, can now be strongly supported by the international community through REDD+, provided that sufficient international finance is available.

Protecting Endangered Species and Biodiversity

Efforts discussed earlier in this paper to preserve the global environment, if successful, would also contribute to the broad goals of protecting the Earth’s biodiversity on land and in the oceans. In addition, there is a good deal of national legislation and, as presented in the appendix, a long list of multilateral environment agreements intended specifically to protect endangered species, preserve biodiversity, and prevent overexploitation of the world’s oceans. Nevertheless, most assessments indicate that, at a global level, these efforts have had limited success, and it is important to review why.

Concern about humanity’s harmful impacts on the natural world actually predate the industrial revolution. In the early 1800s, Alexander von Humboldt, the most famous scientist of his age, eloquently described the interdependence of the biosphere and decried the ecological destruction caused by agriculture and, especially, deforestation (Wulf 2015). Conservationists in Europe and the United States in the 19th century embraced Humboldt’s theme, giving rise over subsequent decades to advocacy groups and national legislation (Dolye 2005). For example, the Royal Society for the Protection of Birds was founded in Britain in 1889, and in 1912 the more broadly focused Society for the Promotion of Nature Reserves (now The Wildlife Trusts) was created to advocate for the protection of natural sites for wildlife across the United Kingdom. These organizations and others worked to pass the 1949 National Parks and Access to the Countryside Act, with specific provisions on nature conservation. In the United States, a series of federal laws were enacted over several decades to protect migratory birds, whales, bald eagles, and also important habitat areas, culminating in 1973 in the much stronger U.S. Endangered Species Act. These and many other early efforts within developed countries to protect the natural capital of the biosphere seem to best fit Trumbull’s model of political coalitions organized around a compelling, legitimizing narrative. In most respects, these efforts were directed toward generating public goods at the national level or protecting national common pool resources.

Nevertheless, even before World War II, conservationists, recognizing the great global depositories of biodiversity in the tropical and semitropical regions of the world, began to think and act globally. In 1933 the European
colonial powers agreed on the London Convention, which promoted the establishment of national parks and the protection of a specific list of species within their then colonial domains. As the world emerged from the Great Depression and World War II, in 1948, the International Union for the Protection of Nature, which became the International Union for Conservation of Nature (IUCN) in 1956, was established following an initiative advanced by the British biologist Julian Huxley in his capacity as the first director general of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Considered to be the first governmental and nongovernmental organization (GONGO), the objectives of the new union were to encourage international cooperation in the protection of nature; to promote national and international action; and to compile, analyze, and distribute information informing and supporting these endeavors (IUCN 2010). In 1949 IUCN and UNESCO jointly convened the International Technical Conference on the Protection of Nature at Lake Success, New York in the United States. The IUCN went on to organize substantial scientific work on conservation and to begin publishing its Red List of Threatened Species.

The first fruits of these efforts in terms of formal international cooperation came about 20 years later as the modern environmental movement took off in the 1960s. In 1968, after independent nation-states had largely replaced the colonial governments, the African Convention on the Conservation of Nature and Natural Resources superseded the 1933 London Convention (IUCN 2004). Since then, there has been a series of MEAs related to protecting biodiversity as listed in the appendix, including the 1971 Ramsar Convention on Wetlands of International Importance, CITES, the 1979 Convention on the Conservation of Migratory Wild Animals, and the overarching 1992 CBD. How did these efforts at international collective action come about?

During the 1970s and 1980s, the number of advocacy NGOs focused on biodiversity issues—primarily based in developed countries but with international partners, and in some cases independent offices—grew in number and strength. The Sierra Club, World Wildlife Fund, Friends of the Earth, Greenpeace, and others became especially influential (Betsill and Corell 2008; Doyle and MacGregor 2013). These groups were key to pushing forward policies within developed countries to protect endangered species and special areas of biodiversity within national boundaries. As national programs to protect biodiversity within developed countries gained ground, NGOs and national agencies in these countries began to make common cause with nascent conservation advocates within developing counties and with political and policy interests around the world, especially within the UN system following the creation of UNEP in 1972. Together, they raised the profile of biodiversity on the international agenda, and, although the term itself was coined in 1988 (Wilson 1988), the concept of biological diversity was put forward by Thomas Lovejoy in 1980 and was an important element in the 1987 Brundtland Commission report (WCED 1987). This international movement gained sufficient strength to win support for the CBD, which was approved at the 1992 UN Conference on Environment and Development (the Rio Earth Summit).

In key respects, the MEAs dealing with the protection of biodiversity and conservation of particular species have the same characteristics as the MEAs in the chemical and waste cluster. Signatory governments retain sovereign rights over the natural and biological resources within their territories and over their own environmental laws and regulations. The MEAs commit them to pursue broad principles, to formulate national laws and policies consistent with those principles, to provide an ongoing forum to attempt to negotiate disagreements among the parties on particular issues, and to report on those laws and policies and their implementation to the secretariats established by the relevant MEAs, although this latter provision is not included in the CBD (Chasek et al. 2017, 192–93). There are no specific obligations or quantified targets for which each signatory government is responsible or for which failure to achieve them would be sanctioned by the other signatories.

But protecting biodiversity turns out to be harder than limiting chemical pollution. First, relative to chemical pollution, most of the goals related to biodiversity are harder to define and even harder to measure. Only in 2010, 18 years after approval of the CBD, did the CBD COP adopt a 2011–2020 Strategic Plan for Biodiversity that included the global Aichi Biodiversity Targets and urged signatory governments to flexibly apply these global targets to quantify targets within their national plans (CBD 2010). Nevertheless, collecting data on some individual species is difficult, and, despite progress in
doing so, measuring the health of ecosystems and the status of biodiversity remains challenging. So, even with the best political will and decent administrative capacity, there are specific and sometimes unique hurdles in establishing and implementing programs to protect biodiversity.

A second difficulty is that, at least relative to many types of chemical pollution, many of the benefits to humans from protecting biodiversity are realized only over longer time horizons, and biodiversity’s relevance to human well-being is not always easily appreciated. In this sense, the definition of the problem remains contested. So creating a legitimizing narrative that compels action to provide this intergenerational benefit is challenging. In this connection, it should be noted that the leadership of the CBD in the past decade has sought to address this problem by highlighting that protecting biodiversity contributes to climate-change mitigation and adaptation (Chasek and Wagner 2012, 115).

Third, and perhaps most importantly, it is the tropical and semitropical regions that have the greatest biodiversity, and so the day-to-day burdens of management and protection fall largely on the shoulders of developing countries. The key question, then, is whether or not coalitions of advocacy groups and political actors at the national level within developing countries can overcome the interests of those who would benefit from unsustainable exploitation of biodiverse environments and particular species, especially when external support from the international community is limited.

Given these difficulties, it is not surprising that most assessments of the efforts to protect biodiversity do not indicate much success. In the UNEP GEO5 assessment, 10 of the 18 key issues and goals identified in the report for which data are available were rated C—“very little or no progress”—including the key goals of reducing the drivers of habitat loss and degradation, reducing levels of exploitation, and improving the status of biodiversity (UNEP 2012, Table 5.2). An assessment by Tollefson and Gilbert (2012) was similarly discouraging: With respect to the main goal of reducing the rate of biodiversity loss, they give the CBD an F, although they give protecting specific ecosystems a C and recognizing indigenous rights a D. The CBD’s Global Biodiversity Outlook 4 from 2014 states, “Extrapolations for a range of indicators suggest that based on current trends, pressures on biodiversity will continue to increase at least until 2020 and that the status of biodiversity will continue to decline” (CBD 2014, 3).

Within UNEP’s GEO5 report, there were, however, two significant goals that received a B grade: strengthening the extent and integrity of protected areas as well as areas conserved by indigenous communities. What explains this relatively good progress? The theorists do provide some insights. As already mentioned, Garrett Hardin thought that the efficient management of a CPR will usually require establishing a single authority over the resource or distributing property rights to the resource to private agents. The creation of protected areas such as national parks in places of important biodiversity is an application of Hardin’s first approach. Of course, effective implementation still requires the political willingness and administrative capacity for government management agencies to enforce their authority to protect designated areas, and these are still often lacking. Also, the apparent progress of protecting biodiversity by ensuring the rights of control over certain areas by the indigenous communities is consistent with Ostrom’s observation that local communities often design and enforce their own arrangements for the efficient management of a CPR. Such arrangements are most likely to emerge when a local community that has intimate knowledge of the resource and some degree of mutual trust can put in place its own rules rather than merely accept rules designed by an external agent. Based on this expectation, the GEO5 report indicates that indigenous and community-conserved areas are likely to increase in importance and that empowerment of local communities in decision-making is needed.

Within the biodiversity cluster of MEAs, there is one outlier in terms of its apparent success, the Cartagena Protocol, and this deserves some explanation. This protocol to the CBD, which was approved in 2000 and came into force in 2003, is designed to help regulate movement of genetically modified organisms (GMOs) between countries (Burgiel 2008). It was negotiated at the insistence of developing countries, which are generally the importers of GMOs. The protocol requires governments of exporters of GMOs to provide full notification and information to governments of importing countries, and it gives the governments of importing countries the right to apply the precautionary principle in deciding whether or not to admit the GMOs. In their ratings of the effectiveness
of various components of the CBD, Toffelsoon and Gilbert (2012) give only the Cartagena Protocol an A. This rating is surprising in light of the fact that the United States, which has the largest biotechnology sector and is the largest producer and exporter of GMOs, is not a signatory to the protocol.

There are two likely explanations for the Cartagena Protocol’s apparent success. First, most national governments in countries with biotechnology industries that are likely GMO exporters, including the United States, already had in place laws and regulations governing GMOs. Compliance with these national laws would facilitate meeting the obligations under the protocol. As in the case of chemicals and wastes, these national laws and regulations among potentially exporting countries could reflect, in part, a compromise between activist NGOs and government actors and the interests of the biotechnology industry and producers of GMO commodities. In particular, the national laws and regulations within the United States presumably make it easier for U.S. companies to comply with the protocol’s requirements even though the U.S. Senate has not been willing to ratify the protocol as an international treaty. And, second, on the side of importing countries, a coalition of various actors has successfully promoted a compelling narrative about the need for caution in the use of GMOs to which most governments have responded (Gupta and Falkner 2006). In short, the protocol’s success reflects its compatibility with nationally established regulations that are grounded in the perceived national interests of each country, not primarily its contribution to a global public good.

Managing the World’s Oceans

Like Antarctica, outer space, and the atmosphere, the world’s oceans are truly a global commons. Under the United Nations Convention on the Law of the Sea (UNCLOS), countries can exercise some control over exclusive economic zones (EEZs) within 200 nautical miles of their shores. Beyond this, the open oceans are outside national sovereignty, making their governance especially problematic.

There are numerous threats to the health of the oceans, such as runoff of nitrogen and phosphate fertilizers and other chemicals from the land, aggregation of plastics and other solid wastes, dumping of fuel and wastes from ships, and acidification from the increased concentrations of carbon dioxide absorbed into the oceans. In this paper, we do not discuss all of these threats but will focus on the exploitation of whales and fisheries, as these cases suggest lessons about governance of the global environmental commons.

In the early 1800s, whales were a major source of lamp oil, which illuminated the cities and households of Europe and the United States. Great fleets of whaling ships scoured the oceans, and the populations of several whale species, such as the North Atlantic right whale, plummeted. When petroleum products and natural gas replaced whale oil for lighting, the hunting of whales fell significantly, but demand for whale meat and by-products led to continued exploitation. Given that whales were “out of sight, out of mind” for most people and that they lived beyond the boundaries of national jurisdictions, it might seem unlikely that their overexploitation—and perhaps eventual extinction—could be prevented. But, recognizing the threat of declining populations to their commercial interests, the major whaling nations began to cooperate during the 1920s and 1930s to set catch limits on certain species.

In 1946, this cooperation was formalized under the International Convention for the Regulation of Whaling, which established the International Whaling Commission (IWC), a club arrangement among the governments of whaling nations intended to ensure sustainable whaling. In the 1970s, environmental advocacy groups began to lobby for much stricter limits. The World Wildlife Fund persuaded nonwhaling countries to join the IWC and to press for strict limits, and Greenpeace’s campaign to interfere with whaling ships on the high seas attracted lots of media attention. Mobilized around the legitimizing narrative of protecting these iconic, highly intelligent mammals, the political coalition of advocacy groups and the governments of some nonwhaling countries compelled the IWC in 1982 to declare a moratorium on whaling. Despite the voluntary nature of the IWC and the continuing struggles to further limit catches by traditional whaling nations like Japan, Norway, and Iceland (Chasek et al. 2017, 246–49), populations of most whale species have shown signs of recovery (IWC 2016). In this case, governance of the GEC has been mostly a success.

That is not the case for ocean fisheries. Interestingly, the theory of the “tragedy of the commons” was first articulated to describe the threat of overexploitation of ocean fisheries. In 1954, 14 years before Garrett Hardin wrote...
his famous article, H. Gordon published a paper (Gordon 1954) declaring that overexploitation of fisheries is inevitable as long as fish are treated as a common, rather than a private, resource. In fact, overexploitation of the world’s fisheries has been widely recognized for decades, but good governance has been often completely absent or ineffective (Allison 2001).

The near universal agreement in 1982 on the United Nations Convention on the Law of the Sea created a legal basis for better governance of ocean fisheries. UNCLOS created EEZs extending 200 nautical miles from shorelines, giving governments rights to control fishing in these zones. Because the great majority of fisheries are within these zones rather than in the open oceans, this potential reduction in the commonness of the resource—making it a national rather than global commons—made it legally possible to develop national regulatory regimes to sustainably manage a country’s fisheries. In some countries, this has been attempted through systems of individual transferable quotas (ITQs) that more or less grant private property rights over a defined quantity of fish. In some cases, these ITQ regimes have been put in place by governments—an application of Garrett Hardin’s theoretical remedy of privatizing a common pool resource. Of course, the success of any regime depends on enforcement capacity, including a capacity to prevent illegal intrusion by foreign fishing vessels, which can be a serious problem. In other cases, diverse regimes for regulating fishing have been largely negotiated and enforced among the fishing communities themselves—a manifestation of Ostrom’s description of self-organized CPR management. By these means, some important species of fish and some fisheries are now sustainably managed (FAO 2016). Nevertheless, the FAO estimates that about 15 percent of the global fish catch is illegal under existing government regimes and that the share of fish stocks that are unsustainably exploited has grown over the last four decades and now stands at about 31 percent (FAO 2016, 38–45).

The overexploitation of commercially important species of highly migratory fish stocks like tuna that roam the open oceans rather than staying within the EEZs is especially acute. Since the problem is well recognized, governments—in cooperation with international bodies such as the FAO and fishing industry organizations and under pressure from various international advocacy groups—have tried to put in place arrangements for better management (Chasek et al. 2017, 236–243). In 1995, the FAO adopted the international Code of Conduct for Responsible Fisheries, and since 2001 it has negotiated fish stock agreements, which established international standards on fish stocks for the high seas (outside EEZs). There have also been various regional efforts such as regional fishery management organizations. For example, the International Commission for the Conservation of Atlantic Tunas has established total allowable catches (TACs) that are intended to limit exploitation to sustainable levels. But these codes of conduct, fish stock agreements, and TACs have not eliminated the incentive to race for fish, and the mechanisms for monitoring, much less enforcement, are weak.

To some extent, the private sector, in cooperation with advocacy groups, has tried to solve the problem. The Marine Stewardship Council has put in place systems to monitor the sustainability of catches for key species and to encourage consumers to buy only fish that are certified sustainable (Chasek et al. 2017, 339). While these efforts should be continued, according to the FAO, the most commercially valuable species of the open oceans are still not sustainably fished. Without the very compelling narrative about iconic, intelligent mammals that saved the whales, without easier access to areas beyond national jurisdiction, and without good means for monitoring and enforcing any international agreements, ocean fisheries remain a global CPR that is not well governed.

WHAT BROAD LESSONS HAVE BEEN LEARNED ABOUT HOW TO RAMP UP GOVERNANCE OF THE GLOBAL ENVIRONMENT COMMONS?

The mixed track record of the last 40 years or so does not provide unambiguous support for either the theoretical pessimists—Olson and Garrett Hardin—or the relative optimists—Russell Hardin, Ostrom, or Trumbull. Furthermore, history shows that, given the great diversity of circumstances and cases, there are no tight and straightforward linkages among these theories and the ways in which efforts to improve environmental governance have actually played out. Nevertheless, taken together, the theories and the history suggest a set of recommendations about how to ramp up global environmental governance in the years to come. In summary, improving governance of the GEC requires a movement—a coalition of governments, advocacy groups, and, in most cases, some industry and private-sector groups built around a compelling, legitimizing narrative of the public good and usually facilitated by
technological innovation that lowers the cost of provision of that public good. So what are the necessary components of that potentially winning formula?

**Strengthening the Legitimizing Narrative for Sustainable Development**

A compelling, legitimizing, science-based narrative is key for rallying a political coalition to produce a public good such as a better global environment. Such narratives have propelled historic efforts to reduce chemical pollution, protect endangered species, and slow human-caused climate change. Now ramping up global environmental governance requires an overarching narrative that integrates environmental goals with the equally compelling goals of economic and social development. That, in fact, has been the purpose of the concept of sustainable development, which was originally defined by the World Commission on Environment and Development 1987 as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

An ongoing task for improving governance of the GEC is to refine, adapt, and ensure the credibility of this legitimizing narrative of sustainable development. As expressed in UNEP’s GEO5, it remains essential to expand “social consensus around compelling visions of sustainability” (UNEP 2012, 445). While the UNEP report recognizes that the 2015 agreement on the Sustainable Development Goals (SDGs) has been an important step in this direction, the continuing refinement and propagation of this narrative must be an ongoing effort that incorporates new scientific knowledge, adapts to social and economic trends, and provides a basis for broadening political support for this concept.

To be successful, this work should be done at both the global level and the national level—and, for the largest countries, at the subnational level. At the global level, the High-Level Political Forum on Sustainable Development (United Nations) and the UN Global Sustainable Development Reports (United Nations 2013a) should make useful contributions (Bouye 2016). Recent work by the Global Commission on the Economy and Climate demonstrates what can be done to construct a compelling vision of sustainable development at a global level (GCCE 2014). In this effort, the major international advocacy groups need to ensure reasonable consistency among their specific narratives to the extent possible. Contributing toward such consistency will continue to be an important function of global conferences and summits. Equally important is articulating a legitimizing narrative for sustainable development at the national level that is consistent with the particular and highly variable circumstances and development priorities of each country. Examples of such work include the reports of the Global Commission on the Economy and Climate on India, the United States, China, and Ethiopia (GCCE 2015).

The definition and international adoption of the SDGs was a major step forward, and substantial efforts by governments are under way to create a common system of metrics for measuring progress on each of the 169 targets and to establish the means to collect and report the required data. As part of that effort, the UN’s Inter-Agency and Expert Group on SDG Indicators put forward, and in March 2017 the UN General Assembly endorsed, a set of 232 SDG indicators for measuring progress. But data systems for measuring such indicators are often inadequate, and capacity building for data collection is essential. Advocacy groups for better GEC governance should provide strong support for these steps, including support for investments by national governments in the institutions for data collection.

Even if data collection can be improved, the SDGs must be adapted to national circumstances. Under the 2030 Agenda for Sustainable Development, governments are expected to engage in a process to selectively adapt the SDGs to their national development requirements and priorities. As noted in the 2013 report of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda, “. . .global targets are only effectively executed when they are locally owned . . . embedded in national plans as national targets” (United Nations 2013b, 21). While true, it is clearly also the case that there can often be tensions between global and national targets.

The ongoing process of refreshing the legitimizing narrative should build on particular and dramatic events that help to spread understanding and compel action. Singular incidents like the discovery of the Antarctic ozone hole, the Love Canal pollution, the Bhopal chemical plant disaster, and the wandering ship Khian Sea carrying chemical wastes played important roles in strengthening the narratives that propelled action. Capturing such events within the relevant narratives will remain important.
Even when supported by dramatic events, the compelling narrative of sustainable development must still compete with alternative narratives that favor economic growth with minimal regard for the environment or even advocate economic growth at the expense of the environment. This competition between narratives can become significantly tilted in favor of unsustainable growth with exclusive reliance on gross domestic product (GDP) as the measure of social progress and by the absence of an alternative, integrated measurement of progress that encompasses its social, economic, and environmental dimensions. So, in addition to the SDG processes, the search should continue for more integrated, simpler indices that could complement more traditional indices, might help us to better understand the narrative of sustainable development, and could provide at least a useful complement to GDP metrics that can be applied for specific purposes. The 2009 report by the Commission on the Measurement of Economic Performance and Social Progress, led by Professors Stiglitz, Sen, and Fotoussi and sponsored by the French government, was a noteworthy step in that direction (Stiglitz et al. 2009). That report distinguished between an assessment of current well-being and an assessment of sustainability and put forward an ambitious framework for measuring each. As the authors acknowledged, the report is only a beginning and must be followed by intensive work involving governments, academics, and advocacy groups, which might lead to fruitful experimentation.

Grounding the Legitimizing Narrative in the Latest Science

The legitimizing narrative about sustainable development must be grounded in scientific knowledge about the environment and must keep up with that knowledge as it evolves. As noted in the history discussed earlier, successful efforts to better manage the GEC always depended on mobilization of scientific knowledge—by individuals such as Rachel Carson, by NGOs and GONGOs such as the IUCN, and by organizations of scientists such as the IPCC. There are ongoing efforts to ensure that new scientific knowledge is routinely synthesized and made widely available. Through various agencies, especially UNEP, the UN has periodically sought to aggregate recent scientific knowledge and make that accessible to a broad audience. The UNEP’s Global Environmental Outlook reports, the 2006 Millennium Ecosystem Assessment, and the 2015 report by the Economics of LandDegradation are important examples. In 2012 the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services was created to support the CBD. The Global Sustainable Development Report, as noted earlier, is explicitly intended to contribute to improving the science-policy interface.

In addition to these broader efforts of scientific assessment that can inform the legitimizing narratives, there are many arrangements in place to bring new scientific knowledge to bear on the regular deliberations of the existing MEAs. In particular, each of the MEAs has some arrangement through which it gathers new information from scientists and makes it available to its constituencies, usually taking the form of a technical or scientific committee. UNEP and the Global Environment Facility (GEF) have also established a scientific and technical advisory panel, which advises the GEF. Providing sustained political and financial support for such groups remains critically important.

These ongoing efforts to improve the science-policy interface and to ensure that the legitimizing narrative of sustainable development reflects evolving scientific knowledge must consistently and explicitly recognize that such knowledge is never complete. There will always be important uncertainties, especially about complex global systems. As Peter Brown and Jeremy Schmidt put it, “. . . scientific uncertainty [should be understood] not as something to be overcome, but as something that is intrinsic to the way that we know the world around us” (Brown and Schmidt 2014). Acknowledgement of such scientific uncertainty led to the articulation of the precautionary principle, which was consistently endorsed in international declarations such as the Rio Declaration in 1992 and, in some cases, within national environmental laws. Although the term precautionary principle is now used less commonly, policies related to the GEC should continue to be cast in terms of risk management, and the legitimizing narrative should stress that uncertainties and risks are usually reasons for action rather than delay.

Building Movements for Better Governance of the GEC from the National Ground Up

Our history demonstrates that policies to better manage the environment have come about through a constructive interplay between national policies and international agreements. As should be expected, national policies to protect the environment often initially focus on capturing national benefits, such as preventing local chemical and air pollution or improving energy efficiency. They can also
provide a foundation for international cooperation toward global environmental goals. When national policies come first, as has usually been the case, international cooperation becomes easier and can enhance collective effectiveness. And efforts toward international cooperation can stimulate and reinforce national-level actions.

Because governments have been unwilling to surrender sovereign rights over their own environmental policies and natural resource management, MEAs have been, and likely will continue to be, built on national policies from the bottom up, rather than top down. And, of course, useful national policies depend on a winning national coalition of political leaders, national advocacy groups, and, when possible, national industry groups.

The growth of environmental advocacy groups everywhere around the world should provide a promising basis for strengthening national actions. In the 1970s and 1980s the number of environmental NGOs exploded: By the early 1980s it is estimated that there were about 13,000 environmental NGOs in developed countries and about 2,200 in developing countries (Doyle et al. 2016). The number and strength of such organizations has continued to expand for decades. Of course, these groups have varied hugely in terms of strength, focus, political orientation, and strategies (Dwivedi 2001). Nevertheless, these groups are increasingly tied together in international coalitions, and in the last decade the improvements in ICT coupled with the rapid expansion of social media have greatly strengthened opportunities for mobilizing support for environmental movements and advocacy groups within countries and across borders. In this effort, international advocacy groups need to take care not to unintentionally undermine the credibility of national groups, which must be seen as advocates for the interests of their national constituencies as well as international goals.

The potential potency of environmental NGOs has been strengthened not only by the ICT revolution but also by sensing and monitoring technologies that make it easier to monitor environmental outcomes. Three examples demonstrate this potential. In China, public concern about urban air pollution exploded in 2009 when the U.S. Embassy in Beijing began publishing its air quality readings from a sensor on its roof. In response to this public concern, in 2012 the Chinese government ordered cities to make public their own data on PM (particulate matter) 2.5 pollution levels. This information further bolstered the public demand for action that was amplified through social media. A documentary on air pollution called Under the Dome drew 160 million online views in 2015, and during a subsequent period of extreme air pollution across China, severe pollution was one of the top 10 trending topics and attracted over 230 million readers on Weibo, China’s version of Twitter (Yang 2016). A second example is the potential for monitoring of deforestation. Global Forest Watch (GFW) provides almost real-time satellite monitoring systems that can be used by anyone with the access to the internet or, for some features, just a mobile phone. Users can contribute data, review the satellite data, send alerts to the GFW network, and connect with other users (companies, governments, individuals, organizations, etc.) via GFW’s crowdsourcing platforms, blogs, and discussion groups. Third, the growth of biodiversity recording platforms such as iNaturalist and eBird allows citizens to contribute directly to data collection.

### Strengthening the International Architecture to Support National Movements

Historically, the international environmental agencies, especially UNEP, and the periodic UN environmental conferences have had an important catalytic role in both stimulating national movements and bringing about the international dialogue necessary to create MEAs. Given its key role, ensuring the capacities of UNEP remains important. With that in mind, in December 2012, as agreed at the Rio+20 conference in the previous June, the UN General Assembly adopted a resolution to “strengthen and upgrade” UNEP by extending participation in its General Assembly to all 193 member countries (previously it had been restricted to 58) and ensuring stable and increasing financial resources. Several months later, UNEP’s governing body was upgraded from the General Assembly to the UN Environment Assembly, creating the highest-level global governing body on the environment and formally recognizing the environment’s place in issues of global prominence, alongside the long-standing issues of health, poverty, finance, and peace. If effective, these may be useful steps forward in creating a stronger international framework for better environmental policies. The consequences of these changes deserve careful monitoring, and it seems especially important that the promise of larger, stable financial resources for the UNEP be fulfilled if the organization can prove that it can use such resources in an efficient and effective manner.

International institutions can also support the key role of nonstate actors by giving them voice on the global stage and thereby potentially enhancing their status within
international processes and national movements. The Talanoa Dialogue, launched in January 2018, is a useful example. Following a mandate under the Paris Agreement to facilitate a dialogue on its implementation, the UNFCCC established an online and in-person platform for inputs from NGOs, scientific bodies, and private companies in dialogue with national governments, highlighting how all of these actors could work together.

**Bringing Industry Groups into the Coalitions and Supporting Technological Innovation**

Widely regarded as the most successful MEA to date, the Montreal Protocol demonstrates two key points that are important at both the national and the international levels. First, coalitions supporting better environmental policies are significantly stronger when they include important actors from the industrial and business communities. Second, gaining the support from within the industrial and business communities is much easier when new technologies provide a relatively low-cost fix.

With that in mind, the need for more rapid innovation in environmentally friendly technologies has been widely recognized. This is especially critical in relation to climate change, where continuing innovation to lower the costs of renewable energy and other low-carbon technologies, as well as efficiency and storage technologies, is still needed. Although the private sector has played critical roles in technological innovation, publicly funded research, development, and demonstration (RD&D) remains essential at early stages of technological development, and international coordination of RD&D can boost its effectiveness. For this reason the legitimizing narrative supporting climate action must be carefully crafted so that, without denigrating the opportunities presented by existing technologies, it gives sufficient importance to the need for RD&D and to the key role of public funding to complement private RD&D initiatives.

Importantly, we are seeing movement in this direction. In part stimulated by the push for creation of the Paris Agreement, subsets of parties have mobilized more intensive cooperative action on renewable energy, such as the launch at the beginning of the Paris COP of Mission Innovation. This effort commits 20 countries, responsible for approximately 80 percent of noncarbon energy research and development, to double their budgets in these sectors by 2020. They were joined by a group of investors, led by Bill Gates, pledging billions of U.S. dollars to support this effort. Optimally, the global stocktake mechanisms created as part of the Paris Agreement will provide opportunities not only to assess the state of the world’s action on mitigation, adaptation, and climate finance but also to expand awareness of emerging technological opportunities.

Another example of engaging industry groups to support technological innovation is the Environmental Defense Fund’s methane detection challenge, in which the NGO has cooperated with industry to produce new technologies for continuously monitoring methane leaks in natural gas installations (EDF 2016). When fully developed and deployed, such technologies could greatly reduce the costs of limiting fugitive methane, making it easier for industry to comply with regulations governing such emissions and also for watchdog groups to check on the performance of industry.

**Strengthening International Cooperation through the MEAs**

Theorists, experience, and common sense all indicate that governments are more likely to make contributions to a global public good—and less likely to try to free ride—if they have some confidence that other governments are also making reasonable contributions and if they expect that their own efforts (or lack of effort) will be known by others. Confidence-building exercises and review mechanisms can matter. And that is where MEAs can come in: They provide important processes for monitoring, reporting, and verification (MRV) of national policies and actions. But, according to the UNEP GEO5 report, there are many gaps in MRV efforts across the full range of MEAs; and compliance with existing requirements for national reporting and the quality of national reports has not been universally strong. For example, “data from national reporting to the Basel Convention Secretariat is sparse and difficult to interpret; reporting by the Parties is declining” (UNEP 2012, Table 6.4). Part of the problem has been that the reporting requirements are sometimes excessive; and although past efforts to streamline these requirements have usually not been successful, the MEA secretariats must continue trying to do so. The MEA secretariats could also provide support to and incentives for each government to improve its own MRV systems. For example, the CBD secretariat has issued detailed expectations for data collection and reporting, and the Stockholm Convention not only produced a handbook on guidelines for National Implementation Plans (NIPs) but also provides documents outlining how to update NIPs to include newly regulated chemicals.
Yet the guidelines produced are not binding. While they can instruct countries in how to collect data and prepare reports, countries are not required to use them. Even when countries want to improve their systems, developing-country governments often lack the requisite capacity. The closest an MEA gets to standardization of data reporting methods so far is the Montreal Protocol’s common data forms that every country signed on to the protocol is required to fill out each year. The Paris Agreement is moving in the same direction with flexibility for the poorest countries. Such guidelines, with greater authority, may be a useful vehicle for standardization of metrics and MRV systems. In this respect, a positive development was the creation of the Capacity Building Initiative for Transparency (housed at the GEF) as part of the Paris Agreement, which provides financial and technical support for developing countries to meet the enhanced transparency requirements of the agreement as iterated in Article 13.

Another way in which the MEA secretariats might improve MRV is by identifying and promoting new MRV technologies. The technologies available for monitoring environmental status and for verifying outcomes related to environmental interventions are constantly improving. For example, as noted above, the rapid increase in remote sensing capabilities has transformed the means to monitor deforestation. Increasing use of such new technological capacities might greatly reduce the costs as well as the contentiousness of MRV. The technical and scientific advisory committees of each MEA might usefully be tasked to periodically review technological changes that could improve MRV and to bring opportunities to the attention of the secretariats, which could in turn disseminate such information to signatory governments.

Even when governments want to do the right thing, figuring out how to do so is not easy. The MEAs also have a role to play in mutual learning. This perhaps can be encouraged through a more intensive process of peer reviews of national programs. Most MEAs require that each signatory government submit a report on its national program to support the objectives of the agreement. Such a requirement should be added to the CBD. Routine use of peer reviews of each national program is likely to be a useful vehicle for sharing ideas and lessons learned as well as creating peer pressure for improvements. Such peer reviews of national programs that are of international interest have been used in other contexts. For example, the Development Assistance Committee (DAC) of the OECD has had a long-standing practice of peer reviews of national bilateral aid programs (OECD 2018). Also, since 2010 the UNFCCC secretariat has organized such peer-review processes of national climate action programs, and use of such processes for reviewing Nationally Determined Contributions under the Paris Agreement will be very important. Perhaps UNEP could study the current use of peer-review processes across both environmental and nonenvironmental domains and put forward to each secretariat ideas for expansion and improvement.

Sharing ideas and experience is one thing, but continuous learning about what works and what does not still requires soundly designed evaluations of effectiveness. Through both guidelines for national reporting and peer-review processes, MEA secretariats should encourage—and to the extent possible, find financial support for—good evaluations. Some MEA conventions, such as the Stockholm Convention (Article 16), explicitly require countries to undertake effectiveness evaluations. Measuring the effectiveness of environmental programs—the objective of evaluations—is conceptually challenging and has been the subject of some academic literature (Sprinz 2015). Secretariats could have an important role to play in defining and encouraging rigorous evaluation design. Particular attention might be given to evaluations, including cross-country evaluations, of policy instruments that are considered most promising or innovative, such as the programs of payments for ecosystem services (Engel 2015).

Complementing the Existing MEAs through Club Arrangements

Most of the existing MEAs have been negotiated among a very large number of governments operating under the UN rules, which most often means consensus, and many have not required specific and quantified commitments for actions. The exceptions have been the Montreal Protocol, which largely succeeded for reasons discussed above, and the Kyoto Protocol, which failed to establish an ongoing global framework of quantified commitments. The UNFCCC process evolved into a nationally determined commitment process with mechanisms that strongly encourage, but do not ensure, that the total effort will be sufficient to achieve the agreed climate stabilization targets. Nonetheless, the amount of buy-in and the overall ambition in the first round of pledges is very promising.
The hope is that the annual revision of national contributions, informed by the global stocktake, will bring about aggregate GHG emission reductions sufficient to achieve the objective of avoiding catastrophic climate change.

Still, some argue that increasing global ambition with respect to climate-change mitigation policy must also include substantial efforts at mini-lateralism, that is, an agreement among a limited number of countries, such as among the largest emitters of GHGs, or a number of parties with interests in a particular sector. The concept of mini-lateralism has been pursued through the G20, the U.S.-designed Major Economies Forum to discuss climate change, and other climate-related dialogues to discuss both the global negotiations and other cooperative measures to reduce emissions such as from short-lived climate pollutants (for example, the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants) or from agriculture (for example, the Global Alliance for Climate-Smart Agriculture). One advantage of such organizations is that they often include nongovernmental organizations as members as well. Success has been hard to measure, ranging from significant advances in negotiations prior to the COPs and the launch of substantial pilot programs in specific sectors to more limited progress in implementing the 2009 G20 pledge to eliminate fossil fuel subsidies. Nevertheless, as in Olson’s original analysis of the collective action problem, by limiting the number of parties involved in a negotiation of reciprocal commitments, mini-lateralism in some form can be promising.

One mini-lateral approach put forward by David Victor (2011) would create a carbon club in which a limited number of governments would negotiate commitments for climate-change mitigation policies through a process of contingent bids, and the first set of governments to accept the contingent bids of the others would constitute the initial membership of the club. Membership in the club would confer specific benefits, such as access to the emissions trading markets and national technology markets of other members, and also to special purpose funds, such as for RD&D. Similar to the process for joining the World Trade Organization, new members could join the club through negotiation of a climate accession deal with existing members. Victor’s proposal for a carbon club has not gained any traction to date but perhaps could be pursued as a means of increasing ambitions within the framework of the 2015 Paris Agreement.

Club-like, mini-lateral approaches might also take more flexible forms. For example, the New York Declaration on Forests is a voluntary, nonbinding partnership among more than 35 governments as well as many multinational companies, NGOs, and indigenous groups that is dedicated to reducing deforestation. Similarly, Initiative 20x20 is a partnership among governments, regional organizations, NGOs, and others in the Latin America and Caribbean region to restore and reforest 20 million hectares of degraded lands by 2020. WRI is the acting secretariat for this initiative.

Supporting Better Environmental Policies and Implementation Capacity among Developing Countries

Building greater capacity in developing countries for environmental management is extremely important. Even when there are national advocacy groups and political leaders supporting good environmental policies, the administrative and technical capacities to do so can be inadequate. Recognizing this problem, all of the UN conferences and summits related to the environment have called for financial and technical assistance to build capacity within developing countries. Also, the existing MEAs consistently involve general commitments to provide financial and technical assistance to those developing countries that request such assistance for the design and implementation of the associated national programs. However, funds for such assistance available through the MEAs are limited (UNEP 2012, Table 17.2). An important exception has been the Multilateral Fund established under the Montreal Protocol, which has been a key to its successful implementation among developing countries. Outside of the MEAs themselves, some funds for strengthening environmental management capacities are available from multiple other channels: the UNEP’s Environment Fund, the GEF, the Green Climate Fund, bilateral assistance programs, UN agencies, the World Bank, and other multilateral development banks. The adequacy and effectiveness of financing related to GEC objectives across this wide spectrum of sources must be kept under regular review.

Making judgments about the adequacy of financial assistance is always complicated, and one of the complications is essentially about definition. The provisions for financial assistance to developing countries under the
MEAs have consistently included assurances that such financing would be new and additional to financing for development assistance. For several reasons, it has been difficult to measure the financial flows for environmental programs and to determine to what extent developed-country donors have complied with such assurances (UNEP 2012, Box 17.2). It is particularly difficult, for example, to separately identify financing for adaptation to climate change from financing for development in general. The concept of sustainable development severely compounds these difficulties: If designed in a way that truly integrates social, economic, and environmental goals, few policies, programs, or projects can be separately identified as addressing only environmental goals. With that in mind, there is a risk that attempting to account rigorously and separately for funding for environmental goals will undermine attempts to operationalize the concept of sustainable development. Instead, as expressed by Chan and Amerasinghe (2018), “. . . even asking the question, ‘Is this an adaptation project or a development project?’ sets up a false dichotomy that must be cast aside if the world is to deploy adaptation finance with maximum impact.”

Regardless of the level of financial assistance, it is critically important that available funds be used as effectively as possible. The mixed and contested track record of development assistance shows clearly that the effectiveness of financial assistance for environmental policies and programs cannot be taken for granted. Instead, it is important that all agencies involved in providing such assistance take into account the lessons of long experience with development assistance. There is, in fact, some consensus about those lessons, and that consensus was best captured in the OECD/DAC Paris Declaration on Aid Effectiveness in 2005 (OECD-DAC 2005). That declaration established the principles of country ownership, alignment of donor programs with each country’s own programs, harmonization among donor processes, managing for results, and mutual accountability.

What do these general principles mean for agencies providing assistance for environmental programs? First, unless a program is “owned” by a sufficiently strong set of actors within the recipient government, it will not be implemented and sustained over time, regardless of external financing. External actors cannot create such ownership and therefore should carefully select for financing programs that are both domestically “owned” and consistent with the external financier’s objectives.

In making such selections, an important indicator of domestic ownership is significant and sustainable financing by the government itself. Second, projects with external financing that are implemented largely outside of a government’s own institutions—for example, through separate project implementation units—might end up doing more harm than good. Such separate units could bypass and thereby undermine the authority of the related government institution and often poach the best available national personnel from those institutions. Third, external financing should be fully aligned with and perhaps directly supportive of government programs that are at least sectoral in scope. Such alignment of external assistance with the government’s own program will help overcome the many problems associated with the extreme fragmentation of such assistance among many donors. And, finally, to the greatest extent possible, providers of external assistance should harmonize their key processes—such as for procurement and audit—with those of the recipient government.

**CONCLUDING REMARKS**

This history of governance of the global environment suggests that neither the theoretical optimists nor the pessimists have been consistently correct: The experience of the last 50 years shows that success is often possible but certainly not to be taken for granted.

We might take some comfort in Russell Hardin’s theoretical point that collective action involves an interactive, dynamic game and that success takes patience, persistence, and time. But it increasingly seems that we are running out of time to protect the global environmental commons. We need to ramp up governance of this commons very quickly.

This history suggests that the foundations for ramping up environmental governance could be put in place if there is sufficient political will to do so. Nationally anchored coalitions of NGOs, political and other leaders, and, increasingly, industry that are mobilized around a legitimizing narrative of the public good have been established in almost all countries around the world. Subnational and grassroots efforts are important elements of these coalitions in many places. What is needed is a dramatic strengthening of these coalitions so that each nation can design and implement a pathway of sustainable development that is appropriate to its national circumstances and contributes to global sustainability.
Several important factors favor such strengthening. The continuing ICT revolution can dramatically accelerate mobilization of citizens to support better environmental policies. New technologies for measuring environmental impacts can accelerate scientific knowledge as well as public awareness. Technological innovation is rapidly lowering the costs of new pathways for sustainable development, and much can be done to accelerate such innovation. And, as evidenced by the creation of the SDGs and the Paris Agreement, there are dedicated champions in place determined to cement these issues on the international agenda. Nonetheless, political leadership at the international level will remain essential. We would be remiss to not also point out that mitigating against these trends has been the rise of nationalist movements around the world, calling into question the very idea of global governance on many issues, including environmental protection. Nevertheless, worsening environmental problems compel us to seek a better understanding of how global governance of the environmental commons has worked, and how it can be improved. It is plausible to hope that the relative optimists about the production of global public goods will eventually be proved correct.
APPENDIX

Table A1 | Key Multilateral Environmental Agreements by Cluster and Date of Approval

<table>
<thead>
<tr>
<th>CLUSTER</th>
<th>CHEMICALS AND WASTES</th>
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<tbody>
<tr>
<td>1989</td>
<td>Basel Convention on Hazardous Wastes</td>
</tr>
<tr>
<td>1991</td>
<td>Bamako Convention on Wastes</td>
</tr>
<tr>
<td>2001</td>
<td>Stockholm Convention on Persistent Organic Pollutants</td>
</tr>
<tr>
<td>2013</td>
<td>Minamata Convention on Mercury</td>
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<table>
<thead>
<tr>
<th>CLUSTER</th>
<th>BIODIVERSITY</th>
</tr>
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<tbody>
<tr>
<td>1968</td>
<td>African Convention on the Conservation of Nature and Natural Resources</td>
</tr>
<tr>
<td>1971</td>
<td>Convention on the Conservation of Migratory Species of Wild Animals</td>
</tr>
<tr>
<td>1971</td>
<td>Ramsar Convention on Wetlands of International Importance</td>
</tr>
<tr>
<td>1973</td>
<td>Convention on International Trade in Endangered Species (CITES)</td>
</tr>
<tr>
<td>1983</td>
<td>International Tropical Timber Agreement</td>
</tr>
<tr>
<td>1986</td>
<td>Moratorium on Whaling</td>
</tr>
<tr>
<td>1992</td>
<td>Convention on Biological Diversity (CBD)</td>
</tr>
<tr>
<td>2000</td>
<td>Cartagena Protocol on Biosafety</td>
</tr>
<tr>
<td>2001</td>
<td>International Treaty on Plant Genetic Resources</td>
</tr>
<tr>
<td>2010</td>
<td>Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization to the Convention on Biological Diversity</td>
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<table>
<thead>
<tr>
<th>CLUSTER</th>
<th>ATMOSPHERE</th>
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<tbody>
<tr>
<td>1979</td>
<td>Convention on Long-range Transboundary Air Pollution</td>
</tr>
<tr>
<td>1982</td>
<td>Helsinki Protocol on the Reduction of Sulphur Emissions</td>
</tr>
<tr>
<td>1985</td>
<td>Vienna Convention for the Protection of the Ozone Layer</td>
</tr>
<tr>
<td>1987</td>
<td>Montreal Protocol on Substances that Deplete the Ozone Layer</td>
</tr>
<tr>
<td>1992</td>
<td>United Nations Framework Convention on Climate Change (UNFCCC)</td>
</tr>
<tr>
<td>1997</td>
<td>Kyoto Protocol on Climate Change</td>
</tr>
<tr>
<td>2010</td>
<td>Cancun Agreements on Climate Change</td>
</tr>
<tr>
<td>2015</td>
<td>Paris Agreement on Climate Change</td>
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</tbody>
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REFERENCES


Ramping Up Governance of the Global Environmental Commons: What Do Theory and History Tell Us?


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ABOUT THE AUTHORS

Daniel Morrow is a former professorial lecturer at The George Washington University and staff of The World Bank. He has been a visiting fellow at the Center for Global Development and the Carnegie Endowment for International Peace.

Andrew Light is a distinguished senior fellow at the World Resources Institute and university professor at George Mason University. From 2013 to 2016, he served as senior adviser and India counselor to the U.S. Special Envoy for Climate Change and as staff adviser in the Secretary of State’s Office of Policy Planning in the U.S. Department of State.

ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

Our Challenge
Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth’s resources at rates that are not sustainable, endangering economies and people’s lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

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We don’t think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people’s lives and sustain a healthy environment.

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