The Regime Complex for Climate Change

Robert O. Keohane and David G. Victor

There is no integrated regime governing efforts to limit the extent of climate change. Instead, there is a regime complex: a loosely-coupled set of specific regimes. We describe the regime complex for climate change and seek to explain it, using interest-based, functional, and organizational arguments. This institutional form is likely to persist; efforts to build a comprehensive regime are unlikely to succeed, but experiments abound with narrower institutions focused on particular aspects of the climate change problem. Building on this analysis, we argue that a climate change regime complex, if it meets specified criteria, has advantages over any politically feasible comprehensive regime. Adaptability and flexibility are particularly important in a setting—such as climate change policy—in which the most demanding international commitments are interdependent yet governments vary widely in their interest and ability to implement them. Yet in view of the serious political constraints, both domestic and international, there is little reason for optimism that the climate regime complex that is emerging will lead to reductions in emissions rapid enough to meet widely discussed goals, such as stopping global warming at two degrees above pre-industrial levels.

For two decades, governments have struggled to craft a strong, integrated, and comprehensive regulatory system for managing climate change. Instead their efforts have produced a varied array of narrowly-focused regulatory regimes—what we call the "regime complex for climate change." The elements of this regime complex are linked more or less closely to one another, sometimes conflicting, usually mutually reinforcing.[1]

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This article explores the continuum between comprehensive international regulatory institutions, which are usually focused on a single integrated legal instrument, at one end of a spectrum and highly fragmented arrangements at the other. In between these two extremes are nested regimes and regime complexes, which are loosely coupled sets of specific regimes.[2] We outline an analytical framework to help to explain why regulatory efforts in different issue areas yield outcomes that vary along this spectrum. We argue that, in the case of climate change, the structural and interest diversity inherent in contemporary world politics tends to generate the formation of a regime complex rather than a comprehensive, integrated regime. For policymakers keen to make international regulation more effective, a strategy focused on managing a regime complex may allow for more effective management of climate change than large political and diplomatic investments in efforts to craft a comprehensive regime. Recent years have seen massive global summits, such as the Copenhagen meeting organized around the goal of a single universal treaty, but our analysis suggests that more focused and decentralized activities will have a bigger impact. In settings of high uncertainty and policy flux, regime complexes are not just politically more realistic but they also offer some significant advantages such as flexibility and adaptability.

We first describe the regime complex for climate change, which has not been comprehensively designed but rather has emerged as a result of many choices—made mainly by states and their diplomatic agents—at different times and on different specific issues. These institutional arrangements constitute a textbook illustration of a regime complex and thus provide a useful illustration for building a more general theory.

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We next seek to explain why efforts to regulate climate change have yielded a regime complex. We argue that climate change is actually many different cooperation problems, implying different tasks and structures. Three forces—the distribution of interests, the gains from linkages, and the management of uncertainty—help to account for the variation in institutional outcomes, from integration to fragmentation. These forces create incentives for governments and non-state actors to invest in a wide array of institutions rather than a single hierarchy. That array includes some tight couplings, especially where links between regime elements help channel resources such as money, technology, and ideas. However, most of the institutional elements in that array are decentralized and marked by loose couplings and lack of hierarchy.

We then explore ways to facilitate more effective policy action on the pressing contemporary challenges of climate change. Despite some success in Cancun (December 2010) to institutionalize agreements made in Copenhagen a year earlier, efforts to create an integrated, comprehensive regime are unlikely to be successful. They risk diverting political and economic resources from narrower regulatory institutions focused on particular climate change problems. A multitude of narrower, partially linked efforts will reinforce the regime complex that is already emerging. Such a policy strategy can yield institutions that are more flexible and adaptable—a point we illustrate with examples from international emissions trading, innovation in strategies to manage forests, accommodation of border tax adjustments, and cooperation on technology policy. Although such a strategy of focusing on loosely coupled elements is promising, it is not *necessarily* superior. To improve on the elusive search for a comprehensive regime, a regime complex must meet standards of coherence, accountability, determinacy, sustainability, epistemic quality, and fairness.

The failure of efforts to develop a comprehensive, integrated climate regime reflects resistance to costly policies in rich countries, such as the United States, and in developing countries alike. It also reflects policy choices that have unwisely concentrated diplomatic efforts on crafting integrated international legal regimes. The sources of failure are deep seated, and the prevailing literature is not optimistic.[3] Although we do not disagree with this pessimistic outlook, we argue that the infeasibility of a comprehensive and integrated regime is not a reason for despair: actions can be taken to alleviate the problem and to enhance global cooperation on climate change.

International Cooperation and the Regime Complex for Climate Change

We think about the regime complex for climate change in ways that are consistent with the analytical framework that one of us helped to develop in the 1970s, and that he has since sought to elaborate.[4] International regimes with legally binding rules are formally constructed by elites who represent state interests as they conceive them. Elites face a wide array of political pressures, both domestic and international, that determine how they calculate interests and make decisions on behalf of the state. And while states remain central to the process of making and implementing international law, many other non-state actors play important roles, including nongovernmental organizations (NGOs), business enterprises, and the media. At times these groups act independently; they also form constituencies that influence the tenure and decisions of elites and thus the calculus of state interests. The interests of these constituencies are multiple and often conflicting, since the benefits and costs of action fall differently, and shift over time. The weighting of state interests in determining international outcomes, such as the design and content of international agreements, depends on the power resources, relevant to the issue area, that are available to the states involved. Power is a function of both the impact of one's own decisions on others (which depends mainly on size and economic output) and on favorable asymmetries in interdependence leading to better default (no-agreement) positions for the state.

How these constituencies organize and conceive of their interests varies over time, since perceived interests are also a function of changing information and beliefs. That is, ideas often matter.[5]

To further their interests, states build international institutions—"regimes"—to help them realize the benefits from cooperation. Such institutions help states achieve their objectives through reducing contracting costs, providing focal points, enhancing information and therefore credibility, monitoring compliance, and assisting in sanctioning deviant behavior.[6]

When states invest resources in building regulatory regimes, the outcomes can vary along a continuum. At one extreme are fully integrated institutions that impose regulation through comprehensive, hierarchical rules. At the other extreme are highly fragmented collections of institutions with no identifiable core and weak or nonexistent linkages between regime elements. In between is a wide range that includes nested (semi-hierarchical) regimes with identifiable cores and non-hierarchical but loosely coupled systems of institutions.[7] What we are calling "regime complexes" are arrangements of the loosely coupled variety located somewhere in the middle of this continuum. Regime complexes are marked by connections between the specific and relatively narrow regimes but the absence of an overall architecture or hierarchy that structures the whole set. While the term "regime complex" is not new, what has been missing is a theoretical explanation for why this institutional form prevails in some areas but not others.

Three forces could help to explain where a regime becomes situated on the continuum. One is the distribution of interests, weighted by power. We expect comprehensive regimes when the interests of all crucial powerful

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actors (states and non-states) are sufficiently similar, across a broad issue area, that they "demand" a singular international institution as the best way to gain the benefits of cooperation. Information and beliefs about which institutional forms suit their interests may facilitate a convergence of interests around a single regulatory regime. Strong demand by all key players around a common objective yields an integrated institution with no viable rivals. The ozone layer accords emerged in this way, with a dominant set of ideas that favored a United Nations-sponsored global treaty on the ozone layer and a strong demand from the most powerful states, firms, and NGOs to invest resources exclusively in that treaty.[8]

Of course, international regimes often come about not through deliberate decision-making at one international conference, but rather emerge as a result of "codifying informal rights and rules that have evolved over time through a process of converging expectations or tacit bargaining."[9] That is, they emerge in path-dependent, historically-shaped ways.[10] The full importance of path dependence is beyond this article, but path dependence can explain why states and non-state actors alike encourage (or tolerate) a plethora of regulatory institutions especially when their interests diverge and no unique focal points have emerged. A multiplicity of regulatory regimes offers opportunities to shop or shift forums.[11] Once many different institutions are already firmly in place and the benefits from forum shopping are apparent to at least some important states, some degree of fragmentation may be difficult to reverse.

A second force is uncertainty. When states seek to cooperate on highly complicated issues with large numbers of other actors, they may be highly uncertain about the gains they will accrue and their exposure to risks from regulation. As cooperation deepens, governments are increasingly unable to make reliable promises about exactly what they will be willing and able to implement, since large shifts in domestic policy necessarily require highly capable systems of public administration and affect important national interest groups in ways that are hard to predict with precision. In such settings, smaller groups of states often form "clubs" that are easier to manage because they are smaller. Clubs also allow members to withhold benefits from states that do not share their interests or seek to act as free riders.[12] As a result, even when the structure of a cooperation issue would seem to call for a large and broad regulatory regime, uncertainty can lead to smaller cooperative structures that vary in membership.

A third force is linkage. Many issue-areas lend themselves to linkages as a way to enlarge the scope for dealmaking, which encourages integration.[13] Indeed, many institutions are designed to encourage linkages that increase the gains from cooperation and strengthen the incentive for compliance. The evolution of the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO), for example, encouraged (until about a decade ago) investment in a single integrated regime because private benefits to states and to major transnational actors such as multinational enterprises from the regime were large and readily extended to all member states through the norms of most favored nation status and reciprocity. These norms made it easier for states to link many trade-related issues, and the reciprocal nature of trade encouraged such linkages as well. In other settings, institutional design may favor continued fragmentation such as when it is administratively difficult to link different regulatory arrangements.

Linkages help define the boundaries around an issue-area. Where linkages lead to deeper cooperation an issue area can expand in size, such as happened under the GATT/WTO regime, which originally focused on border tariffs and now encompasses a broader array of trade-related measures such as subsidies, government procurement, and food safety standards. In trade, linkages arose not just in the formation of new agreements, but also through the WTO's system for enforcement of trade obligations. Where cooperation focuses on an issue area that does not readily lead to integrating linkages, then the result can be a broad, thin regime or many individual regimes focused on individual areas where cooperation is possible. The issue-area of "biological diversity" has emerged in this way, with one broad treaty that has minimal impact (The Convention on Biological Diversity) and many narrower agreements (many of which predate the broad agreement) that focus on particular elements such as regulating trade in endangered species, coordinating the protection of wilderness areas, and promoting stronger intellectual property rights on biodiversity-related innovations.[14] Weak linkages blur the boundaries around an issue-area—in the extreme leading to legal agreements, such as the Convention on Biological Diversity, that touch on so many diverse areas of possible international coordination that the agreement is unable to focus much practical policy effort on any topic.

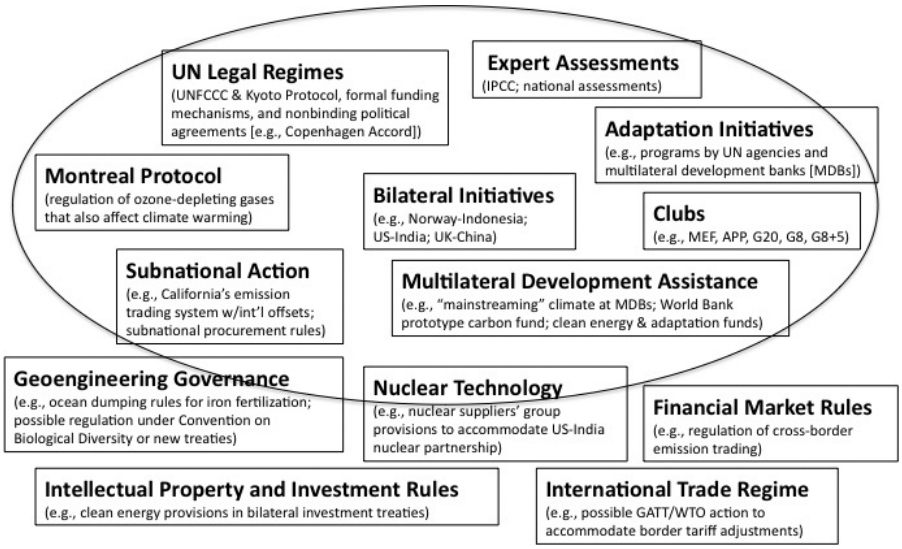
We have identified three forces for integration or fragmentation: the diversity of interests, uncertainty, and linkages. These forces may be present, to different degrees, in any issue-area. Next we examine how those forces interact using the example of climate change. The climate change regime complex is a loosely coupled system of institutions; it has no clear hierarchy or core, yet many of its elements are linked in complementary ways. It occupies neither extreme. Instead, it is a regime complex whose elements are loosely linked to one another, between the poles of integration and fragmentation.

The Climate Change Regime Complex

The most visible efforts to create climate institutions cluster around the United Nations Framework Convention on Climate Change (UNFCCC). By design the UNFCCC is nearly universal in membership. It spawned the Kyoto

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Figure 1
The regime complex for managing climate change.



Note: Boxes show the main institutional elements and initiatives that comprise the climate change regime complex. (For a thorough recent description of many elements of the regime complex, see Michonski and Levi 2010). Elements inside the oval represent forums where substantial efforts at rule-making have occurred, focused on one or more of the tasks needed to manage the diversity of cooperation problems that arise with climate change; elements outside are areas where climate rule making is requiring additional, supporting rules.

protocol with the aim of being a thickening and comprehensive regime, modeled on the same process of institutional evolution that occurred in the ozone layer where a single UN-sponsored treaty system emerged as the sole, integrated regulatory system.[15] In practice, because Kyoto placed no obligations on developing countries and because the United States never ratified the agreement, its effect was narrow, thin, and in most of the world, ultimately symbolic.[16] Attempts are now under way to renegotiate and extend the Kyoto Protocol under the auspices of the UNFCCC. In adiditon, several other clusters of institutional efforts are taking shape, with none of them organized in a hierarchy. Figure 1 illustrates the arrangements.

Facing gridlock in the universal UN-sponsored talks, several governments have tried to create smaller clubs of key countries that could cooperate on climate change issues. Some of these efforts are *de novo,* which has required club leaders to incur the costs of organization. Others build on existing institutions, which offers the advantage of lower transaction costs but the disadvantage that membership and expectations are already largely formed. We have identified four nascent club-making efforts. We do not expect that the climate change issue will survive as a prominent element in all of these clubs, but each club has been host to regulatory and collaborative initiatives that have attracted resources and could channel path-dependent efforts in the future.

The first, created by the United States under George W. Bush in the wake of criticism about the US decision to abandon the Kyoto treaty, is the Asia Pacific Partnership (APP). Six countries on the Asian rim agreed in 2005 to cooperate on research and deployment of new low-carbon technologies. (A seventh, Canada, joined in 2007.) APP was intended to chart an alternative path to the Kyoto process (only one of its members [Japan] was a strong advocate for Kyoto-style regulation of emissions) while also forging special relationships that might lead to commercially-viable deployment of low-carbon technologies—if not through the APP itself, then in other forums. The APP was also intended to offer a model for how to engage major developing countries, as its members included both China and India. The US never fully realized the potential of its APP club, in part because pockets of the Bush administration remained hostile to investing any substantial resources in climate change regulation.

In 2007 the Bush administration, seeing that its club was too small and without much practical consequence, created the Major Economies Meetings on Energy Security and Climate Change (MEM). This club of sixteen states plus the European Union first met before the Bali conference and aimed to set its own rules for a more flexible strategy to reduce emissions. The MEM exists to this day—reoriented slightly and renamed the Major Economies Forum on Energy and Climate (MEF).[17] In parallel, the Group of Eight (G8) club took up the climate issue, which has been relatively easy since the G8 already existed and was in perennial search of agenda items. Every G8 meeting during the last six years has included a prominent

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statement on climate change. Starting in 2005, several G8 meetings have also included a stepchild session where G8 leaders met with leaders from the five most pivotal developing countries (the so-called "G8+5"); climate change was always on their agenda. Among intergovernmental institutions, the G8 and EU have offered the earliest and clearest articulation for the global goal of limiting warming at 2 degrees Celsius above pre-industrial levels.

Finally, frustration with the small size of the G8 (and the irrelevance of the G8+5) created pressures for a larger, regular meeting of leaders from the most important industrialized and developing countries: the group of 20 (G20). The original G20—the Group of Twenty Finance Ministers and Central Bank Governors—was created by Canada and the United States to help finance ministers coordinate their actions in the wake of the Asian financial crisis. Since late 2008 the leaders of the G20 countries have also met regularly and issued communiqués. Because the G20 engages finance and industry officials much more readily than other clubs such as the MEF and the APP, it has been a locus for some progress on low-cost measures that help reduce emissions. For example, the September 2009 G20 summit in Pittsburgh found it difficult to gain traction on the broad issue of regulating warming gases—energy was just one of 17 issues on an agenda that included more urgent troubles such as financial market regulation—but it did forge an agreement to reduce fossil fuel subsidies.[18] With lower subsidies, fuel users will be encouraged to use fuel in more frugal ways, leading to lower emissions.

In addition to these clubs, nearly all the large industrialized countries that are most worried about climate change have created bilateral deals of various types. The UK has created a bilateral partnership with China to test advanced coal combustion technologies. Other countries, including Australia, France and the US, as well as several private firms, are also crafting bilateral deals concerning coal and nuclear power with the Chinese government and Chinese institutions such as the country's large electric utilities. The US has also forged a major partnership to give India access to fissile material and technology that had been unavailable because India was not part of the nuclear nonproliferation treaty. This arrangement, which could lead to massive reductions in India's emissions relative to the expected level, required in turn new multilateral decisions within the 45 member Nuclear Suppliers Group, as well as difficult domestic negotiations in both India and the United States.[19] Since about 2007 the UN process has included active diplomacy to improve management of forests—the so-called "reducing emissions from deforestation and degradation (REDD)" process. Those efforts have produced new agreements but not much practical benefit for forests until several major governments that are rich in forests (Brazil and Indonesia, notably) and also keen to invest in forest protection (Norway and the United States, among others) focused on practical deals for forest protection. A bilateral deal between Norway and Indonesia in 2010 signaled the first major investment under these REDD-related efforts, and many other similar bilateral and "club" arrangements on forests are taking shape at this writing. Some are following the model that Norway set with Indonesia.

While most efforts to set targets for warming emissions have focused on the UNFCCC, other regulatory treaties have a big impact on emissions of these gases. Indeed, some studies have concluded that the Montreal Protocol on the Ozone Layer has actually had a much bigger impact than the Kyoto Protocol on warming because the gases that are the chief cause of ozone depletion are also extremely potent warming agents.[20] Frustrated by lack of progress in the UNFCCC system, some governments have explored fuller use of the Montreal Protocol to cut some of the industrial gases that were invented to replace ozone-depleting substances but themselves proved to be strong warming agents. Several regional air pollution institutions may ultimately play an important role in climate change as well. Some of the pollutants they regulate mask warming—notably sulfure oxides (which cause acid rain and thus are regulated, but which also lead to sulfate particles that can make clouds brighter and thus dampen warming); international rules on the allowable sulfur content for the fuels burned by ocean-going ships are likely to increase warming by lessening this sulfate-masking effect. Increased attention is now focused on particulate pollution, which is presently regulated because it contributes to local air pollution; there is mounting evidence that sooty particulate pollution (also called "black carbon") is a big cause of climate change.[21] Regional institutions, such as in Asia and the Arctic, are now exploring how to coordinate black carbon regulations since these particles not only cause warming but also lead to regional effects such as melting of ice packs and glaciers. (Soot is dark and thus absorbs heat when it dusts bright snow and ice.)

Existing multilateral institutions, notably the World Bank, have also been a locus of institution-building on climate change. For example, the World Bank sponsored the Prototype Carbon Fund (PCF) in the late 1990s to channel early investment into the Kyoto Protocol's Clean Development Mechanism (CDM)—the mechanism that encourages investment in low-emission technologies and practices in developing countries. The experience with PCF projects, in turn, helped speed the process of designing rules for the CDM and probably raised the quality of the subsequent CDM projects. The Bank, working with other multilateral institutions and through the Global Environment Facility (GEF), also manages the formal financial mechanisms that pay for developing country participation under the UNFCCC and the Kyoto treaty. (It plays a similar role in other multilateral environmental institutions.) In addition to these efforts, which are formally subordinate to the UNFCCC institutions, the Bank also

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manages several other funding windows that are formally distinct. It is organizing a large fund to invest in projects that reduce deforestation and has created a special fund to help countries adapt to the effects of climate change. Perhaps most important, the Bank has adopted an across-the-board effort to bring climate change concerns into its main lending and granting activities, thus creating much larger leverage on the money that flows into agriculture, power plants, infrastructure, and other investments that cause or are affected by the changing climate.[22]

Beyond these efforts at formal international coordination, a number of unilateral initiatives are intended to encourage changes in behavior in other jurisdictions. For example, frustration at the slow progress of US federal legislation has led at least two sub-units within the United States to adopt their own limits on emissions—California (under AB32 and other legislation) and the northeastern states (under the Regional Greenhouse Gas Initiative, or RGGI). Both those sub-national systems include emission trading schemes with "docking" provisions for international trading, which would allow these states to set rules that created valuable private goods (emission credits) that firms could generate in other countries.[23] In addition to these unilateral actions by governments, regulatory efforts led by civil society organizations are emerging. NGOs have organized to build awareness and to focus on practical solutions for controlling emissions. Many firms have adopted their own regulatory programs and have also created coalitions to press for regulatory action. Among the examples is the US Climate Action Partnership (USCAP), an alliance of firms and NGOs.

So far, we have focused on efforts to coordinate regulation of emissions. In addition, there is growing attention to the need to adapt to a changing climate. Funding for adaptation has come partly from a small tax on CDM transactions and mainly from government budgets; efforts to build larger adaptation funds have faltered, in part due to the inability to link this funding need to a large, reliable source of resources. Governments promised at Copenhagen in December 2009 and again in Cancun a year later to expand vastly funding for adaptation. Very poor, vulnerable countries have become increasingly well organized to demand help with adaptation since they see climate change as inevitable.

There is also a small but growing investment into technologies, known as "geoengineering," that might crudely offset warming in case the climate started changing quickly in catastrophic ways. A wide array of international institutions is now considering whether and how to govern geoengineering. Where such technologies involve manipulation of the oceans, the London Dumping Convention has already been involved. Where they affect biological diversity, the Convention on Biological Diversity is exploring regulatory options (including a formal decision in November 2010 aimed at discouraging geoengineering research). Where they influence the ozone layer, the Montreal Protocol on the Ozone Layer might play a role. Wholly new international agreements might emerge in this area in future.

International cooperation has also focused on such other tasks as improving shared knowledge about the science of climate change. The most prominent of these efforts are organized under the Intergovernmental Panel on Climate Change (IPCC) that sponsors in-depth scientific reviews. IPCC also entertains requests, which come at arm's length from other institutions such as the UNFCCC, to provide technical information such as the reporting procedures for emissions inventories. In parallel with the multilateral IPCC process, several governments have undertaken their own assessments—often looking expansively not just at impacts at home but also around the world.

International cooperation on climate change has been under way for decades, yet there remains no central core to the emerging regulatory arrangements on climate change. Instead, what we observe is an array of regulatory elements that is only partially organized hierarchically. Some are attached to existing narrow and deep regimes—such as bilateral initiatives that are making it easier for India to obtain fissile material, or the efforts to mainstream climate change issues within the existing robust World Bank system for lending and grants. Others involve nascent institutions such as the emerging markets for carbon offsets and trading, which in some cases have not progressed beyond initial modest efforts (e.g., the RGGI market), while others are becoming deep quickly (e.g., the EU's emission trading scheme). These efforts are akin to the Cambrian explosion—a wide array of diverse institutional forms emerges, and through selection and accident a few are chosen. The outcome of these efforts is at neither extreme in the continuum on institutional forms—it is neither integrated nor fully fragmented. Instead, loosely coupled arrangements among institutions are linked in a variety of ways—in which the UNFCCC process is particularly important but is not unrivalled—that together form a regime complex. In the next section, we aim to explain this outcome.

Toward Explaining the Regime Complex for Climate Change

The three generic forces discussed above help explain variation in the integration or fragmentation of international institutions. The *distribution of interests* helps explain why no single institution has emerged. Originally, differences between the EU and US mostly explained the lack of agreement on the Kyoto system. Today, major developing countries also have their own ideas about regulatory institutions, which has led to even more dispersion in institutional preferences. *Uncertainty* has made most governments wary about making costly commitments to global institutions when they are unsure of the benefits and whether

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other countries will make and honor promises to implement comparable efforts. And across most of the cooperation problems in climate change, governments are still struggling to find productive *linkages,* although in a few areas those linkages are tight and deep, such as the links between emission trading systems and compensation.

These three generic forces interact with two specific attributes of the climate change problem. First, a dispersed institutional outcome is due to *problem diversity:* the specific cooperation problems inherent in the challenge of "climate change" are enormously varied. Climate change is actually many distinct problems—each with its own attributes, administrative challenges, and distinctive political constituencies.[24] The diversity of problems is, in turn, associated with parallel diverse patterns of interests, power, information and beliefs. We see at least four distinct cooperation problems under the broad banner of "climate change":

1. The hardest and most central problem is *coordination of emission regulations*.
2. Another problem is *compensation*—such as financial transfers—for countries that are unwilling or unable to adopt emission controls. For example, essentially all developing countries at the Kyoto talks were unwilling to agree on measures limiting emissions in the absence of payments through mechanisms such as the CDM.
3. A third problem is *coordinating efforts* to brace for a changing climate, principally through adaptation, but possibly with geoengineering. With geoengineering, action by one or a few actors may be too tempting and need to be prevented, which makes the cooperation challenge the opposite of collective action to control emissions. That is, the challenge in geoengineering is how to make it *more difficult* rather than easier to act.[25]
4. The final cooperation problem is *coordination of common scientific assessments* to increase the public good of shared knowledge about the causes and consequences of climate change. (International cooperation is also required to promote and coordinate investments in new technologies, which also have public good characteristics. Most carbon-related technologies are traded in a global marketplace and, thus, the well-known market failures leading to underinvestment in research and development are increasingly global in scope.)

Put differently, there is no single "climate change" problem but an array of different cooperation games, each with their own incentives to free ride. Each of these individual cooperation problems is linked, to different degrees, to the others.

A second reason for dispersion of efforts is rooted in the severe *political difficulties* that confront any serious program for controlling emissions, which is the first and most important area for international cooperation. Deep cuts in emissions ultimately require global cooperation because the main warming pollutants are costly to regulate and influence economic competitiveness. Deep cuts require governments to adopt regulations that will influence the behavior of millions of firms and many more households—a particular challenge in countries that have weak, fragmented, or corrupt systems of public administration. And the benefits from these efforts are both uncertain and arise far in the future, while the costs are immediate.

We can now offer a tentative account of why the problem of climate change is likely neither to yield an integrated, comprehensive regime nor to be fully fragmented.

From a functional standpoint, the specific international cooperation problems involved in managing climate change are so varied that a single institutional response is exceptionally difficult to organize and sustain. Indeed, the diversity of problems is typically accompanied by a diversity of interests, power, information, and beliefs. Where contracting around these individual cooperation problems is coupled to other institutional arrangements, it is prohibitively complicated to arrange all couplings *ex ante* into a single comprehensive regime. No single country has the power to impose a solution on all others.

Not only are climate issues diverse; they are characterized by high uncertainty. Interests, power, information and beliefs are changing quickly. This is evident in the rapid rise of China and India as large emitters as well as in shifting beliefs about the dangers of climate change in popular and scientific discourse. Such rapid changes alter the institutional forms that important countries favor an dare willing to accept. As we argued above in general terms, such uncertainties make governments reluctant to enter into comprehensive agreements that make substantial policy demands.

Strategic considerations involving decisions about linkages also push toward an outcome that is fragmented, yet includes many loose couplings. On the one hand, the diversity of interests promotes tendencies toward fragmentation. Specific regimes are often anchored on private goods supplied to a small number of actors whose interests are similar to each other but dissimilar to other actors. These interests are also interdependent because, for example, regulatory decisions affect economic competition. Members of this "club" will then seek to maintain these arrangements for their own benefit. The benefits of a comprehensive regime may not seem sufficient to justify the bargaining efforts and concessions that would be required. On the other hand, a fully fragmented response is unlikely to satisfy the interests of the leading states, which make the largest investments in building institutions and which expect first-mover advantages. They will seek hierarchies or, failing that, linkages among issues that create politically-sustainable arrangements that are

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consistent with their interests. So the net result on climate change is a set of clubs that are linked in multiple ways.

Some examples help illustrate how linkages can arise between different regulatory elements and lead to a regime complex, rather than a fully fragmented set of institutions. States that seek deep cuts in emissions must find ways to compensate more reluctant nations that are also formidable economic competitors. The scale of resources being demanded is far beyond what most donor governments would accept—for example, the "Copenhagen Accord" that outlines the main points of agreement from the Copenhagen conference calls for $100 billion annually in new financial flows from industrialized to developing countries by 2020, a number comparable with the sum of all official foreign aid.[26] Faced with the infeasibility of organizing these large, new flows as direct government-to-government transfers, instead governments that have the strongest interest in an effective climate change regime are linking the compensation regime to emission control regulations that create carbon markets. The mechanisms employed already include the CDM and are likely to encompass various other offset schemes, including new offset systems focused on forests and land use. Efforts to promote greater innovation in low-emission technologies also benefit from links to carbon markets since the linkages create a price on emissions and a source of funding. Similarly, important linkages have emerged between the system for providing information about climate dangers and emission control efforts. The "Bali Roadmap" that set the agenda for the two years of diplomatic talks leading to the Copenhagen conference, for example, explicitly used the IPCC's findings about "safe" levels of warming gases in outlining the countries that must participate in efforts to control emissions.

These three forces—the dispersed distribution of power-weighted interests, uncertainty, and linkages—help to explain the loosely coupled nature of the regime complex for climate change.

In other areas of international relations, a diversity of cooperation problems has not always led to fragmented institutions or a regime complex—for example, the trade issue area has come to span a highly diverse array of types of international cooperation largely within a unified legal framework under the GATT/WTO. But that outcome in trade reflected two realities: that the scope of trade talks began with a focus on narrower issues (mainly tariffs) and the nature of trade readily led to strong linkages. The expansion of the issue-area today called "trade" from tariffs to a wide variety of trade barriers took almost half a century. By contrast, climate change diplomacy has engaged a broad array of topics from the outset and is still early in its evolution—the first formal diplomatic talks on climate change were only two decades ago. Problem diversity in climate change magnifies the three forces identified earlier as causes of fragmentation: it generates more complicated and shifting distributions of interests; it increases uncertainty; and it makes it harder to forge reliable linkages.

Path-dependence and organizational practices have also reinforced this pattern. Different countries and sectors have become interested in serious action on climate change at different times. When the timing of action varies, the leaders construct partial institutions that suit their purposes and their interests. Once they have done so, they are likely to resist changing these arrangements fundamentally, since it is costly to change organizational structures and state leaders are likely to engage in satisficing behavior so as long as the regime complex performs essential functions passably well.[27]

For example, Europe has been much more committed to the Kyoto process than most other industrialized countries, including notably the United States. The EU has invested heavily in the construction of international regulatory regimes for climate change that are based on legally binding targets and timetables as well as international emissions trading. In turn, the EU has crafted its own policies at home to align with that international approach. For the EU, different approaches are now more difficult to envision and implement—even as other countries find that they favor other regulatory schemes not anchored in binding targets and timetables. It may therefore be easier to build parallel club-oriented regimes as part of a regime complex than to try to re-open negotiations to achieve a comprehensive, integrated regime. Indeed, the final compromise reached at the Copenhagen conference explicitly creates legal flexibility so that some nations can continue the formal legal mechanisms such as extensions of the Kyoto Protocol while others (notably the United States and probably China, along with some other large developing countries) adopt different approaches. Such dispersion is likely to continue as more countries with diverse interests and capabilities—the developing countries—become seriously engaged in regulation in different ways and at different points in time.

Implications for Policy

The emergence of a climate change regime complex, rather than an integrated, comprehensive climate change regime, does not necessarily provide reasons to despair. On the contrary, policy-makers who seek more effective limitation on the magnitude of climate change can use regime complexes to their advantage. The high likelihood of lossely coupled outcomes suggests that countries most committed to doing something about global warming should rethink the strategy that has dominated most of their efforts so far: the unwavering investment in massive, integrated legal instruments and global summits such as witnessed in Copenhagen.

One potential advantage of regime complexes lies in the ability to fix and avoid the faults of integrated regulatory

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systems that are already apparent in the UNFCCC and the Kyoto Protocol. It is difficult to design effective regulatory systems in the context of a multiplicity of cooperation problems, a broad and shifting distribution of interests, extreme uncertainty about which measures governments are willing and able to implement, and ambiguity about how to craft viable linkages. When diplomats attempt to craft integrated agreements to span those many problems the outcome is likely to be unwieldy. And once established, the difficulty of renegotiation with so many distinct cooperation problems, interests, uncertainties, and linkages will lead participants to cling to existing institutions, which take on monopoly characteristics. Heroic efforts then concentrate on the monopoly; rival efforts, even when they could be more effective, are pilloried as distractions. For example, the broad coalition of developing countries—the so-called Group of 77 ("G77") and China—lambasted attempts to work in small groups and outside the UNFCCC process during the run-up to the Copenhagen conference, despite mounting evidence that universal negotiations were making little progress.[28]

The dysfunctions of the UNFCCC monopoly are especially evident in two areas. First, perhaps the most important aspect of the Kyoto Protocol is its system for encouraging low-emission investments in developing countries—the Clean Development Mechanism (CDM). Over the long term, engagement with developing countries is essential since it is mathematically impossible to reach deep cuts in world emissions of warming gases without these countries' participation.[29] The main compensation mechanism for enticing the participation of developing countries has been linkage to emission credit markets through the CDM. Yet studies suggest that a large fraction—perhaps half or even more—of the CDM credits issued do not represent bona fide reductions in emissions due to poor administration.[30] Despite this realization, it is proving very difficult to fix the CDM due to the complex and highly politicized nature of decision-making within its UN-based administrative system and the Kyoto Protocol. Moreover, the governments that have the greatest ability to push for changes in CDM administration also face strong pressures to ensure there is an even larger supply of credits, which makes compliance with the Kyoto targets easier, rather than higher quality credits.[31] The CDM monopoly has effectively excluded offsets in some areas (e.g., carbon storage and nuclear power) while favoring offsets in areas that may be less cost-effective, such as small, rural renewable energy projects. Since these rules create path dependence, such offsets rules are likely to be transposed into a new comprehensive regime, with the result the carbon equivalent of Gresham's law. Instead of a monopoly, if governments create other kinds of offset systems they could learn more about which kinds of systems work best. Competition between offsets schemes, if well designed, could reverse the perverse incentives that have plagued the CDM.

Secondly, the UNFCCC/Kyoto arrangements for linking national trading systems have encountered difficulties. The Kyoto architects envisioned that national emission control systems could be linked together to form an international trading system. In practice, the rules for "docking" have proven to be inflexible and do not encourage much additional effort by governments. More flexible docking rules would allow a wider array of countries to sell allowances into established carbon markets, conditional on setting country-wide or sectoral caps, and would therefore broaden the scope of carbon trading systems.[32] Yet it has proved difficult for countries to change their status under the UNFCCC/Kyoto system in ways that would expand the scope of effective emission controls. Kazakhstan has sought for over a decade to join Annex I of the Kyoto Protocol so it can participate more fully in carbon markets; but it has not been permitted to do so.[33] In this situation, a voluntary action that would contribute to the objective of the Kyoto Protocol is prohibited by procedural barriers and veto-points built into that agreement.

While institutional monopolies have dysfunctions, a regime complex can also be too fragmented. Components may conflict with one another in ways that yield gridlock rather than innovation; the lack of hierarchy among specific regimes can create critical veto points; through forum-shopping there could in principle be a "race to the bottom." Our argument is not that regime complexes are absolutely better than other institutional forms. Rather, we argue that actual international cooperation is unlikely to be integrated and comprehensive. An integrated regime might be attractive as the most legitimate institutional form, but efforts to craft such a regime face enormous political and organizational barriers. The result of efforts to tilt at such a system, as in climate change, will be gridlock and only weak substantive commitments. A more loosely coupled system is inevitable.

If governments and non-state actors that seek more effective management of climate change behave strategically, they can use the fragmented institutions to their advantage. Specifically, regime complexes—that is, loosely coupled sets of specific regimes—offer two distinct advantages: flexibility across issues and adaptability over time.

Flexibility across issues. Without a requirement that all rules be bound within a common institution, it may be possible to adapt rules to distinctively different conditions on different issues, or for different coalitions of actors. Different states can sign on to different sets of agreements, making it more likely that they would adhere to some constraints on greenhouse gas emissions. One variant of such a flexible approach involves proposals popular with Australia, the US, and several other governments (including key developing countries) during the negotiations leading to the Copenhagen conference that states construct "schedules" of their proposed climate change actions, rather

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than acceding to a common set of targets and timetables.[34] This approach is similar to the flexibility afforded when large governments engage in complex negotiations to accede to the WTO; each country's particular accession deal is tailored to its circumstances.[35] This approach was tried early in the climate change process under the heading of "pledge and review," but that idea lost favor when no government made the effort to flesh out how the concept would work in practice, and the governments and interest groups most keen on emission controls—notably in the EU governments and NGOs—favored simpler targets and timetables for emissions.[36] At Copenhagen when governments could not agree on a comprehensive regulatory system the institutional form that remained agreeable was this more flexible system of schedules.[37] At this writing, about five-dozen countries have offered their policy schedules and negotiations are under way to find places where those policy promises can lead to more effective international cooperation. Serious international cooperation is emerging "bottom up" because integrated "top down" institutions have been too difficult to craft.

Adaptability over time. Regime complexes may also have higher adaptability over time. Changes in different issue areas, or within the domestic politics of different countries, are likely to occur at different rates. Governments may make promises for policy coordination in international negotiations that prove unexpectedly difficult or impossible to implement at home; as one country adjusts its national efforts, other governments, too, may need to make alterations. In contrast with integrated, tightly coupled monopoly institutions, regime complexes may be able to adapt more readily—especially when adaptation requires complex changes in norms and behavior. Loose coupling may also be advantaged when the best strategy for institutional adaptation is unclear and thus many diverse efforts should be tried and the more effective ones selected through experience. Applied to climate change, this benefit is probably particularly important for engaging developing countries that are wary about obligations that could become too onerous too quickly, but the particular fears vary with each country and its circumstances.

These advantages of greater flexibility and adaptability stem, in part, from decision-making structures. In global institutions that are designed for legitimacy, such as the UN, decisions are made through universal voting rules that also often yield inaction. The UNFCCC has never adopted formal procedures for voting because the decision to adopt those procedures required unanimous consent and oil-exporting countries (a group generally abhorrent to policies that would cut consumption of carbon fuels) refused to agree. (Today, 15 years after the UNFCCC entered into force, the institution still works with provisional rules of procedure and takes all significant decisions by consensus.) Leaders are needed to incur the cost of organizing an effective response to problems in managing common pool resources, yet those few leaders who are willing and able to commit adequate resources may refuse to make the effort unless they can capture a large share of the benefits. Clubs with private decision-making rather than universal access help leaders avoid institutional outcomes that are thin and lack ambition because they must attract the consent of too many other countries with diverging interests.

Variation in Regime Complexes: Criteria for Assessment

We now turn briefly from our positive analysis to a normative commentary. As we have noted above, our argument about regime complexes does not imply that such a complex will solve climate change problems in an efficient or timely manner. We also do not assume that the advantages of a regime complex, which we have identified, will outweigh their liabilities. On the contrary, dispersed institutions can also be associated with chaos, a proliferation of veto points, and gridlock that deters policy makers and private investors from devoting resources to the climate change problem. And even if these pitfalls are avoided, the transaction costs of regime complexes may be higher than for integrated regimes with a single legal form and set of administrative rules.[38] Proposals for specific elements that would further fragment cooperation on climate change—such as new clubs or invitations for other institutions to take up topics that could help manage climate change—should therefore be carefully analyzed to see whether they would enhance the overall performance of the regime complex. Whether the proliferation of different forums working on the climate issue—such as the G20, the MEF, various bilateral technology and investment partnerships, and private sector and NGO initiatives—is an asset or liability depends on their content and how these efforts are coupled.

Normative assessments or proposals for new institutional arrangements should be made on the basis of carefully considered evaluative criteria. We propose six such criteria, each of which defines a dimension of variation running from dysfunctional to functional. Regime complexes toward the positive end of each of the six dimensions are likely to be normatively more justifiable than complexes that score lower on these dimensions.

1. *Coherence*. The various specific regimes of a climate change regime complex could be compatible and mutually reinforcing; they could be incompatible and mutually harmful; or they could be somewhere between these extremes. A regime whose components are compatible and mutually reinforcing is coherent. Where compatibilities exist they encourage linkages that make it easier to channel resources from one element of the regime complex to another—such as from a national emission-trading program to

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an international scheme to protect forests or compensate developing countries.

2. *Accountability*. The elements of the regime complex should be accountable to relevant audiences, including not just states but non-governmental organizations and publics. Accountability means that "some actors have the right to hold other actors to a set of standards, to judge whether they have fulfilled their responsibilities in light of these standards, and to impose sanctions if they determine that these responsibilities have not been met."[39] Accountability helps create legitimacy (which may be in shorter supply in the absence of a single unified regime) and can also help create shared information that lowers uncertainty.
3. *Determinacy*. A climate change regime complex should be determinate in the sense that the rules have "a readily ascertainable normative content."[40] Determinacy is important both to enhance compliance and to reduce uncertainty in general. It can also help build confidence that despite a broad and shifting distribution of interests, important actors are making efforts to coordinate policy and manage the climate problem. Where rules are determinate it will be easier for governments and firms to invest resources in putting those rules into practice—for example, by building low-carbon energy systems—and once in practice those rules can more readily encourage others to make similar investments.
4. *Sustainability*. Sustainable regimes have components that reinforce one another and may also build in redundancy, to withstand shocks. Sustainable regimes are superior since they reduce uncertainty, in this case about future rules. Most of the policies and investments needed to reduce emissions and to adapt to climate change are very long-lived; governments and private firms especially are unlikely to make them without confidence that the regulatory system is durable.
5. *Epistemic quality*. Like comprehensive regimes, regime complexes can vary in epistemic quality, particularly in the consistency between their rules and scientific knowledge. Epistemic quality is important for legitimacy as well as effectiveness.[41]
6. *Fairness*. Since multilateral institutions always reflect disparities of power and interests, they never perfectly reflect abstract normative standards of fairness, and should not be evaluated on the basis of whether they achieve this utopian objective. But they should provide benefits widely, and not discriminate against states that are willing to cooperate.

In general, conflicts of interests and values and asymmetries of power that are endemic in world politics mean that one cannot expect international institutions to rate well on the basis of these normative criteria. Even taking that reality into account, however, the climate change regime complex of 1997–2010, dominated by the institutions established by the Kyoto Protocol, does not get high rankings on these six criteria. The division of countries under Kyoto into industrialized ("Annex I") and developing ("non-Annex I") countries implied a regime of low coherence and accountability in which the absence of binding rules for some states was of questionable fairness, reduced incentives for others to accept such rules, and made it impossible to hold many states accountable for their actions. The Kyoto treaty and its parent, the UNFCCC, contain no credible compliance mechanisms and (unlike the WTO) no mandatory dispute-settlement institutions, which reduce their determinacy. The dissatisfaction of the United States and other large emitters (and therefore powerful players) such as China threaten its sustainability. The difficulty of changing the rules in light of new information and interests has limited the epistemic quality of the regime complex. In light of these defects, it is not surprising that the Kyoto system, itself, has lacked much real impact on the climate problem. Developing countries joined because membership required little effort; many rich countries were reluctant to make and keep commitments to it except where those commitments largely aligned with what those countries were already willing to implement.

Specific Implications for Policy

Finally, we draw several implications for policy. We focus on actions that leading governments, NGOs, and firms could pursue in efforts to make a regime complex more effective.

First, a regime complex could favor more strategic use of international emission trading. Trading has become the policy instrument of choice for nearly all governments that are implementing the most demanding policies. Well-designed trading systems could be very important because they leverage large amounts of capital and because some of that capital could flow to developing countries through "offsets" such as the CDM. The CDM, for all its flaws, has already generated emission credits worth perhaps ten times the value of classic government-to-government funding.

Attempts to create an integrated UNFCCC/Kyoto regime have yielded only one set of accounting procedures and offsets rules to govern which kinds of international trades get formal credit (i.e., the CDM). A more competitive system, with a multitude of rules, would be more effective. Governments in industrialized countries that are most interested in controlling emissions could set their own offset rules—tighter than the CDM—and open trading windows to any other country with equally strict (or stricter) offset policies. Rules requiring buyers to be liable for the quality of the credits they purchase would create additional incentives for quality, as well as new pricing

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mechanisms so that markets could assess and reward the highest quality trading—making it much easier for investors in projects that yield bona fide reductions in emissions to earn a reliable return. A diversity of offsets rules would yield a much wider array of real experience that could inform future efforts to create common rules and common "floor" standards. Within a regime complex there would be many different trading systems with different prices, trading rules, and transaction volumes.[42] International offsets could become the arbitrage points that link those trading systems. Market pricing that reflects quality would make the climate change regime complex more accountable, and by allowing fungibility through the pricing mechanism coherence can be maintained even as many different arrangements are tested.

Second, a loosely coupled system could create special opportunities for innovation around offsets for land use and forestry. Land use is a large source of warming emissions and also potentially a very low cost way to absorb extra emissions from the atmosphere. However, in Kyoto these issues were so controversial that governments could not agree to allow much investment in land use and forestry projects—the forested nations, especially, feared intrusion on their national policies. Now that the CDM has demonstrated that capital flows through offsets are credible, those same nations—notably Brazil and Indonesia—have reversed course and favor special offsets rules for forestry and land use. We welcome that shift and the development of so-called "REDD+" rules that will encourage countries rich in forests to protect and plant. We caution, though, that at this stage the best rules are still unclear and there are (as with offsets generally) advantages to encouraging a diversity of approaches. Getting serious about land use change will improve the epistemic quality of cooperation on climate change since these are major, largely unregulated, sources of emissions. And since many of these emissions come from especially poor countries, this also offers an opportunity to improve the fairness of the climate change regime complex.

Third, a regime complex, in contrast with efforts to build a single integrated regime, could more readily manage conflicts and synergies that arise at the joints between climate change and other areas of international cooperation, which would lead to more coherent and determinate regulatory arrangements. Raustiala and Victor hypothesized that much of the institutional innovation in regime complexes would arise at the joints between regime elements.[43] In climate change, one of the most pressing issues at the joints is accommodating border tax adjustments (BTAs). Many analysts are wary of such schemes and other trade measures because they fear that BTAs could lead to trade discrimination that, in turn, will undermine successful cooperation in other areas, notably the WTO and other trade liberalization agreements. We share some of that concern, but we note that border tariffs make it possible to create private goods, thus increasing incentives for countries to dock into a carbon trading system to avoid imposition of BTAs. Furthermore, BTAs could be politically important in countries that were considering establishing and maintaining carbon trading systems, by providing assurances that regulatory efforts at home will not erode investment and jobs. Hence from a political perspective—both international and domestic—BTAs are attractive instruments. Yet BTAs are only feasible within a regime complex since opposition to such policies by developing countries assures that any formal effort to negotiate BTAs as part of an integrated, comprehensive climate regime would be vetoed.

Properly designed border tax adjustments could be consistent with obligations in other institutions, notably the WTO.[44] To do so, legal scholars suggest they must meet three conditions: (1) a close connection between the means employed and essential climate change policy; (2) nondiscriminatory application, so that the measure does not serve as "a disguised restriction on international trade"; and (3) respect for administrative due process, as has been required on other issues by the WTO Appellate Body. We suggest that policy-makers within the most active climate clubs devise rules for BTAs that are consistent with these guidelines, in an effort to avoid conflict with WTO rules. We suggest that the WTO itself help prepare the ground rather than waiting for this issue to arise through formal disputes. The inclusion of BTAs is an example of a nascent coupling that could exist between efforts to manage climate change and the large, integrated institutions that govern trade.

Finally, a regime complex offers the flexibility for cooperation on other topics, such as investments in research and development, that could complement the central task of cutting emissions. Under the UNFCCC/Kyoto Process there have been some halting efforts to promote technological innovation, but these efforts have not had any practical effect on national technology policies. Smaller clubs of leading governments could agree to coordinate and amplify their policies aimed at advancing innovation in low-emission technologies. While the incentive to craft and coordinate technology policies in the UNFCCC/Kyoto system is weak, within a club the benefits would be more visible as would the potential for creating private goods such as intellectual property and revenues from exclusive markets for low emission technology.[45]

Success in the formation of innovation clubs would eventually make most aspects of the climate change problem easier to solve and politically more sustainable. Successful innovation of inexpensive low-emission technologies will lower the cost of emission controls. Indeed, the central cause of success in the ozone layer regime was the appearance of new technologies at very low (sometimes essentially zero) cost. Difficult problems in managing common pool resources are made much easier when low-cost

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technologies blunt the incentives to defect and when new technologies offer many local benefits (e.g., improved energy security and lower local pollution). Furthermore, the emergence of a belief system around the prospects of "clean tech" revolutions and green jobs could also help mobilize new interest groups that favor effective climate policy. But this belief system will only be sustainable, and worthwhile in the long run, if it is seen as realistic and a reliable source of private benefits.[46]

As a practical matter, keener interest in technology would require the leading innovators to coordinate much larger national investments in innovation. While new knowledge is a global public good, systems of innovation are organized at the national and sectoral levels. The good news is that an innovation club should be relatively easy to organize since only six countries account for about 85% of all research and development investment.[47] The bad news is that spending on energy technology has not even recovered to the levels seen in the early 1980s. Spending is now rising, but some of that new money is linked to economic stimulus programs that are coming to an end. A new technology strategy is needed that would include both coordination of national investment levels and sharing of experiences about the best organization for innovation and implementation.[48]

Even though a coherent, effective, and legitimate comprehensive regime seems politically unattainable, the UNFCCC would still have an important role to play in a climate regime complex. But within a regime complex the UNFCCC is only one component, albeit a major one.

The Framework Convention could be used as an umbrella under which many different efforts proceed. It would supply functions that are best provided on a universal basis, such as standards for reporting on emissions, providing a forum for negotiating broad decisions, and perhaps instructing technical bodies (e.g., the IPCC) to gather and assess information. It could perhaps become a means to ensure that the various components of a regime complex are coherent and mutually supportive, although so far very little of the political investment in the UNFCCC has been mobilized around this umbrella function. However, there are dangers lurking in every monopoly, and countries that are most keen to slow global warming could make it clear that if the Framework Convention does not provide this useful umbrella role, there are other institutional options available.

Over time, the UNFCCC might evolve into a deeper institution and perhaps the core of an integrated regulatory system. The array of "club" efforts under way presently could perhaps come to be governed by common rules—akin, perhaps, to most favored nation status and reciprocity in the GATT/WTO system, which have helped ensure that particular club deals crafted on trade are generalized to a larger number of countries. But we caution against policy efforts that would move too quickly in that direction. Managing common-pool resources is unlike the more reciprocal task of reducing barriers to trade in good and services. Since it is especially difficult to internalize the benefits from actions on common pool resources, the exclusivity that comes from clubs is a particularly important incentive for first movers to invest in building institutions.

Conclusion

The international institutions that regulate issues related to climate change are diverse in membership and content. They have been created at different times, and by different groups of countries. They have been crafted in a context of diverse interests, high uncertainty, and shifting linkages. They are not integrated, comprehensive, or arranged in a clear hierarchy. They form a loosely-linked regime complex rather than a single international regime.

The infeasibility of a strong comprehensive regime makes climate change a very difficult international problem to manage. And surely it would be better if the domestic political systems around the world were generating a strong demand for action in ways that were potentially consistent with one another. Indeed, there is reason to be pessimistic about whether global emissions can be reduced in time to prevent very damaging climate change.[49] Yet we argue for making the best of this situation rather than continuing to pursue the elusive goal of a comprehensive, integrated regime—a goal that is both unattainable and distracts policy-makers from more effective strategies. We have suggested that regime complexes have some distinctive advantages over integrated, comprehensive regimes. They should be viewed not as ideal constructions but outcomes that emerge from real-world political, organizational, and informational constraints. Regime complexes can be much more flexible and adaptable than integrated-comprehensive regimes. Indeed, the Clean Development Mechanism and the Kyoto "docking" rules illustrate the counterproductive rigidities that are often built into comprehensive regimes.

Whether loosely-linked climate regimes will be more effective than efforts to craft a single integrated regime depends in part on how well they meet the six criteria we have put forward: coherence, accountability, determinacy, sustainability, epistemic quality, and fairness. More generally, an effective climate change regime complex would generate positive feedback: incentives for a "race to the top." In a well-functioning regime complex, efforts by one set of countries to take stronger action would generate imitation by others, rather than actions designed to "free-ride" on others commitments.[50] Although a comprehensive global trading system is unlikely, much emissions reduction could be achieved through a linked set of national and regional trading systems, in which offsets would help generate incentives for laggards to raise their own standards in order to benefit from these financial flows. A

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loosely-linked regime complex could allow for experimental innovation with respect to land use forest offsets, as in present initiatives to reduce deforestation. It could also enable border tax adjustments to be used in selected situations, and to be linked to the broader benefits of WTO membership. Finally, technology innovation clubs could use private incentives to leverage research and investments that would make limiting emissions more feasible and less costly.

In such a regime complex, the UNFCCC would continue to play an umbrella role and provide the framework for a number of essential functions, including serving as a legal setting, providing information, and constituting a forum for negotiations. Over time, if convergence in policy preferences took place and if a large number of reinforcing linkages were to appear, the UNFCCC could yet evolve into an integrated and comprehensive policy regime. At the present juncture, however, both political reality and the need for flexibility and diversity suggest that it is preferable to work for a loosely linked but effective regime complex for climate change.

Notes

1 Raustiala and Victor 2004, 295. Our paper had been written, titled and submitted for publication before we saw a similarly-titled working paper of the Council on Foreign Relations (Michonski and Levi 2010). That paper is quite different from ours; it is a useful policy-oriented survey of international institutions that are relevant to climate change.
2 Alter and Meunier 2009. For an additional perspective on the causes of integration or fragmentation, with application to climate change, see Biermann et al. 2009. A similar line of thinking—focused on explaining the allocation and fragmentation of governance decisions—is in the literature on "multi-level governance," such as notably Hooghe and Marks 2003. And on nested regimes see, for example, Aggarwal 1998.
3 Although this paper is focused on the international regime complex, we recognize that international efforts of all types face severe barriers in the form of domestic politics.
4 Keohane and Nye 1977.
5 Goldstein and Keohane 1993; O'Neill 1999.
6 Keohane 1984.
7 For more on the different species of regime complexes, see Alter and Meunier 2009 and the symposium they introduce.
8 Parson 2003.
9 Young 1997, 10.
10 Pierson 2000.
11 Braithwaite and Drahos 2000, 29. See also Busch 2007.
12 Keohane and Nye 2001; Kahler and Lake 2003. On club goods and uncertainty, see Cornes and Sandler 1996. The club argument can also be extended to relationships among sub-units of governments, which can form governmental networks. See Slaughter 2004. There is less analysis of clubs in the study of international environmental cooperation, but on this point see, for example, the study of the Arctic regime by Young and Osherenko 1993. Applied to climate change, see Victor in press.
13 Alter and Meunier 2009.
14 Raustiala and Victor 2004.
15 Victor forthcoming.
16 For an early discussion, see Victor 2001.
17 Lesage, Van de Graaf, and Westphal 2010, 140–143.
18 "The Pittsburgh Summit: Key Accomplishments," http://www.pittsburghsummit.gov/resources/129665.htm (accessed 1 October 2010).
19 For details on the potential reductions from a wide array of Indian policy initiatives, including this one, see Rai and Victor 2009.
20 Velders et al. 2007.
21 See Ramanathan and Carmichael 2008, among many other papers by Ramanathan and colleagues.
22 See, e.g., World Bank 2008 and World Bank Independent Evaluation Group 2009.
23 At time of writing, the California system (see section 96400 in California Air Resources Board 2009) seems more robust. The RGGI is struggling to remain relevant because it has oversupplied emission credits and its auctions now yield extremely low prices.
24 We will focus on the many different international cooperation problems. However, in many other respects "climate change" is not a single problem to be "solved" but a lens through which many scientific, cultural and political disagreements refract. For more on that, see Hulme 2009.
25 We use the term "geoengineering" loosely here. There are many forms, but the type of geoengineering that is most relevant is known as "solar radiation management"—for example, making the atmosphere more reflective to cool the planet quickly. Victor et al. 2009.
26 UNFCCC 2009.
27 Simon 1959.
28 Ibrahim 2009.
29 Clarke et al. 2009.
30 Schneider 2007; Wara and Victor 2008; Wara 2009.
31 Governments that are the largest buyers of CDM credits and thus in the strongest position to reform the system also have the highest compliance costs—for example the EU and Japan. Thus firms in those countries are especially keen to keep a large supply of CDM credits because that is the only way they can be sure to comply without costs exploding.

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32 Petsonk 2009; Wagner et al. 2009; Grubb et al. 2010; Stavins, Jaffe, and Ranson 2009.
33 Petsonk 2009.
34 The Minister for Climate Change and Water of Australia, Penny Wong, made this argument in a speech at New York University, September 21, 2009.
35 E.g., Michalopoulos 2002.
36 Victor 2009.
37 UNFCCC 2009.
38 We are indebted for this point to Liliana Andonova.
39 Grant and Keohane 2005, 29.
40 Franck 1990, 52.
41 Buchanan and Keohane 2006, 424–433.
42 Victor, House, and Joy 2005. Biermann et al. 2009 are more skeptical of non-integrated regimes out of fear that a multiplicity of institutions will create conflicting rules, although they have not looked in-depth at particular rules, nor at the example of emission trading.
43 Raustiala and Victor 2004.
44 WTO-UNEP 2009. See also Hufbauer, Charnovitz, and Kim 2009.
45 Victor, in press, ch. 5.
46 We are mindful that the widespread belief that spending on green technology will yield jobs and economic growth is still to be proven. For a skeptical view, see Kahn 2009. Moreover, while green jobs will surely appear, many of them will occur in the global economy where it is difficult to concentrate in the jurisdictions that are first movers.
47 This list includes the United States, Japan, China, and a few European countries. China is on the list today and is rising rapidly; a decade ago, it was a bit player in innovation.
48 Measuring research and development effort is difficult, and there are no reliable data on the world effort in energy. For total world spending on all forms of research and development, see OECD 2008, which ranks the top spenders at US, Japan, China, Germany, France and the UK. (If the EU is summed as a whole then it ranks second behind the US). On the research and development problem in energy, see Dooley 1998 among others. For a seminal warning about pork in large energy demonstration projects see, Cohen and Noll 1991.
49 See National Research Council 2010.
50 We are indebted to Scott Barrett and Marc Levy for making this point, in different terms, at a seminar at Columbia University, September 29, 2010.

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