



An Evolutionary Approach to Governing Global Problems Climate Policy After Paris

1. Making the Case for Plan B

The need for collective action is everywhere in the international system. The logic of global public goods demands global coordination to solve free-rider problems. The logic of tragedy of the global commons demands coordination to reconcile the interests of those who use the common goods. It is hard to see how solutions will emerge to the planet's most pressing global problems—such as climate change—without highly effective and sophisticated systems for coordinating national policies.¹

Coordination can emerge in different ways. It can result from integrated, purposeful efforts to align the behaviors of key players—that is, top down. Or it can emerge in a more decentralized fashion—bottom up—from a myriad of more localized and focused efforts at problem solving, some of which prove effective and diffuse and can be scaled up into encompassing structures that encourage further initiatives.

The top-down world has long been assumed as the first best strategy for solving serious global problems. It takes for granted which players should be at the table and that those players know their interests and capabilities. When the United States and the Soviet Union set out to cap the volcano of strategic armaments, they didn't rely on lots of decentralized actors to figure out what might work. Instead, elites from the two governments sat down and bargained directly. The results were integrated, top-down treaties focused on aligning interests where possible and enforcing key obligations where necessary. In some areas, the tasks needed for coordination were so simple and straightforward that formal agreements were not needed.² Or the agreements were simple yet highly effective—such as the hot-line agreement, quickly finished after the Cuban Missile Crisis, which underscored the benefit to both countries from secure and reliable communications in times of crisis.

Similarly, the keystones in international economic coordination all emerged from top-down bargains that governments could readily craft. Most famously, at Bretton Woods, 733 delegates from 44 countries literally sat around tables for 21 days and crafted major economic institutions that have



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endured from 1944 to today. Since then, most trade negotiations have followed similar models—with each round of talks beginning with an agenda and each participant agreeing, ultimately, to a single, integrated undertaking. The biggest impacts of trade liberalization have come from the simplest agreements that were relatively easy to reach and largely self-enforcing because they were conspicuously in the self-interest of the major countries. Big reductions in tariffs and the extension of most-favored-nation treatment to all members of trade agreements were enforced by reciprocity; violations were relatively easy to spot and understand.

While prized as the best way to solve global coordination problems—because it is strategic, comprehensive, and integrated—top down is very demanding. It can only succeed if the key actors know, in advance, where the system should be headed and how best to get there. That requires that they understand their interests and can agree on some distribution of costs and benefits where interests are not aligned. Where critical information is lacking or the complexity of deal making is overwhelming, essential players may be unwilling or unable to coordinate their behavior. Thus bottom-up strategies have long been a fallback position in international cooperation. When the United States and Soviet Union could not agree top down to stop atmospheric nuclear testing, a fallback, tacit bargain to stop that behavior emerged. For example, the Soviets and then the Americans just stopped testing for a time. In trade, as big rounds have become more complex and difficult to reach, a host of regional and other smaller agreements have been forged to fill the gaps.

Most diplomats habitually seem to treat strategic bargaining with a common, integrated purpose as Plan A. Failing that, a distant Plan B envisions that countries and other key players cobble together what they can, where they can, and progress. But habit aside, the ranking of plans should depend on the context. Integrated bargaining makes sense in settings where uncertainty is low—advance knowledge of means, ends, and preferences is reasonably complete—and bargaining costs are correspondingly low. That kind of bargaining requires, as well, that negotiators be able to represent reliably the interests of their constituents and make deals they can implement reliably at home. By contrast, where uncertainty is high, the key actors, unsure of what outcomes are possible, cannot reliably specify their own interests. Nor can they accurately predict and shape with penalties and rewards the interests of others. In such settings, cooperation requires active efforts to reduce uncertainty and to learn what is feasible. Experimentation through policy trials and evolution are better means of advancing.³ In Plan A the proverbial bargaining table is one that can take many different shapes. In Plan B, the

bargaining table is an evolutionary process through which the key actors learn the shapes and possibilities through trial and error.

This same debate has unfolded in climate change over the last 25 years. Following the logic of Plan A, diplomats have sought a strategic, integrated, legal, binding agreement focused on the problem of global warming. This approach treats the United Nations as having a monopoly on legitimacy and relies on the UN-sponsored Framework Convention on Climate Change (UNFCCC) as the exclusive venue for diplomacy. The governments and other stakeholders that want serious action on climate change have invested massively in Plan A. Many theorists have gone along for the ride. At first they tried to explain the conceptual attractions—indeed necessity—of global, top-down coordination. As those schemes failed, increasingly they have sought to demonstrate why the misalignment of incentives meant that diplomatic efforts were bound to fail.⁴

For many years, the faults of Plan A have been surfacing—most strikingly at the 2009 UN Climate Change Conference in Copenhagen, when countries even failed to agree formally on a plan for further negotiations.⁵ Climate is hardly alone. In trade, the aim for an integrated global agreement—launched in 2001 at a meeting in Doha—has led to gridlock as well.⁶ Plan A efforts at grand treaty making on sustainable development, human rights, and other topics are also running into trouble.⁷ There have been some successes in, for example, financial coordination, but only in the face of massive financial failure.⁸

Plan B, a bottom-up strategy, has emerged to fill the resulting vacuum. For most governments and policy advocates deeply steeped in the politics of climate change, this new approach is more a fallback position than a strategy. It is seen as a local intimation or imitation of the stalled global solution. It is defined more by what it is not—the failed top-down effort—than a clear understanding that decentralized governance, fostering on-the-ground problem solving and learning, may be able to address problems that more-encompassing, integrated policy regimes cannot. Plan B is a default after two decades of efforts around Plan A have failed; it is not understood as the best route for informing and changing the politics of bargaining such that more effective agreements become possible with effort. Nor has it helped that early instances of bottom-up diplomacy on climate change have been advanced by countries whose underlying intentions around real problem solving were suspect or manifestly pretextual—such as when the administration of US President George W. Bush tried to cobble together a coalition of willing supporters for an Asia Pacific Partnership after he hastily withdrew from the Kyoto Protocol in 2001, just months after taking office.⁹

This essay and a book project we are developing in tandem make the case for Plan B.¹⁰ We focus on the case of climate change, arguing that decomposing the grand, sprawling challenge into discrete problem-solving efforts that engage ground-level actors could be highly effective—indeed, much more effective than bargaining around integrated global agreements. We see this bottom-up, decomposed effort not as a backstop Plan B but as the proper, central strategy for responding to the global problem. It is not a consoling alternative to failure—a device adopted late in 2015 in Paris at the Conference of the Parties to the United Nations Framework Convention on Climate Change to avoid a repeat of the Copenhagen debacle—but as a superior way to coordinate action in the face of massive uncertainty about the interests, capabilities, and intents of the key players. It is not a time-consuming detour on the way to the main goal but rather the only viable path to achieving radical transformations in national policies that lead to deep cuts in emissions.

Thus, in our research, we cautiously celebrate the first steps toward a bottom-up approach in Paris. Many of the elements for an effective evolutionary system were formally built into the final agreement from the Paris climate change conference. Countries were encouraged to make their own pledges—known eventually as Nationally Determined Contributions (NDCs)—and to document what they learn. A system of review would check progress periodically, and a regular stocktaking would help adjust overall goals and expectations. But we worry that bottom up is today's favorite flavor out of despair, not because the parties have grasped why and how a decomposed, bottom-up approach would be best under current circumstances. Indeed, while many of the elements of a successful system were adopted in Paris, it is disconcerting that most of the difficult choices—such as how to impart rigor into the NDCs and the review mechanism—were deferred until later.¹¹

Our goals are not just to focus on climate change but also to outline a theory of how evolutionary governance through experimentation helps societies solve complex problems. We will articulate the conditions that must be satisfied and thus help, we hope, diplomats and other stakeholders that want to make more effective this new approach to managing climate change.

The fallback position is on the agenda—indeed in Paris became the agenda—because climate change is marked by two intertwined sets of characteristics that make integrated, top-down bargaining all but impossible. The first is political: the fragmentation of power and authority in the international system, and the corresponding absence of a hegemon that can reliably impose order on actors with sharply divergent interests. Insofar as there was any real

dominant power in climate change diplomacy, for the last two decades it has been the European Union (EU), a group of countries that has reliably made climate change central to its foreign policy agenda. But the EU has had a hard time speaking with a single voice. And EU leadership has mainly focused on attempts to create integrated top-down treaty systems. The EU has invested mightily in a treaty system that might work well for the EU but fails for most of the rest of the world.

The second barrier to integrated, top-down bargaining is cognitive: uncertainty about the feasibility of achieving policy outcomes, such as lower emissions, at acceptable costs. This uncertainty explains the inability of any country or firm that takes deep decarbonization of emissions seriously to identify in advance what behavioral, technological, and regulatory commitments will actually prove most effective. The big challenges to cooperation on climate change are not merely that countries have diverging interests and some are not willing to pay any cost for collective action. It is that even the clubs of countries that favor action don't know what it will cost or how it can be organized in ways that stay aligned with shifting national interests.

This shroud of uncertainty about the actual burdens of various commitments exacerbates the bargaining problems that arise as diplomats seek to coordinate national policies. Those bargaining problems, in turn, heighten the sense of uncertainty as key parties cannot anticipate—and must fear—how counterparts will react to the frustration of expectations. If it is unknown at the time of bargaining which commitments really can be fulfilled and how others will respond if some are not, bargaining among parties with sharply different interests will be highly complex and cautious to the point of paralysis. Risk-averse players will prefer deadlock and inaction more than a risky codification of ambitions that may prove too costly or simply unattainable.¹² Or they will prefer shallow agreements—those for which compliance is trivial even without an active change in behavior—as happened with the Kyoto Protocol.¹³ By focusing on legally binding contracts—treaties—these tendencies toward deadlock or pabulum are further enhanced since most countries take their legal obligations seriously and do not willingly join such contracts with no coherent plan for compliance.¹⁴

Decomposition, we argue, is an essential first step in breaking this vicious circle. An active strategy is needed to decompose the global problem into component problem areas. The global problem is so complex that it is unmanageable and daunting. But it can be reduced into more-discrete problems—such as reducing the deforestation associated with increased cultivation of palm oil, or cutting the emission of greenhouse gases produced by vehicles, or

demonstrating the viability of new forms of electric power plants that have low or negative emissions—that are easier for governments, firms, and nongovernmental organizations (NGOs) to understand and implement. In practice, this means focusing on sectoral and regional governance arrangements that encourage disciplined, inclusive problem solving by competent actors.

We draw from the idea of experimentalist governance (XG) to show how actors facing uncertainty can institutionalize a process that allows them to work practically on these decomposed problems. They experiment with solutions; the bolder the experiments the more uncertain the outcomes. As they learn what works and scale up those solutions, they also learn how to manage the uncertainty in the international bargaining process. More-complex deals become feasible; more-effective and deeper cooperation emerges.

Put differently, XG is an iterative process that allows actors to jointly explore the practicalities of realizing their overarching, framework goals, adjust the latter when necessary, and, in this very process, update priorities about what is feasible and who is reliable in light of evidence.¹⁵ XG emphasizes that regulator and regulated alike rarely know what is feasible when they begin to tackle a problem; it prizes a diversity of efforts rather than monopoly. It identifies and continuously improves solutions that work, and pushes them to scale, while siphoning resources away from those that don't.

XG is not a starry-eyed utopia in which regulators and regulated entities always learn and apply the right lessons. Rather, it is a view of regulation animated by fear of worse outcomes. Centrally, XG relies on a penalty default—such as prohibiting access to a market or threatening to impose onerous regulations—that can induce cooperation and exploration where it is not spontaneously forthcoming by threatening outcomes no actor is likely to prefer to a jointly elaborated one. Penalty defaults can arise through public decision making, such as threats from governments to sanction firms or remove access to markets if a problem is not solved. Or they may emerge from private initiative, such as threats of boycotts of branded products or private branding initiatives. In our book, we will show that the line between public and private is a fuzzy one and that the most likely sources of effective penalty defaults vary with the structure of industries.¹⁶ Penalty defaults can emerge through agreements by clubs of actors or by the unilateral decision of a powerful actor. Whatever their origin, penalty defaults create strong incentives for innovation of possible solutions, experimentation, and then widespread application of the solutions that prove most feasible and efficient. The persistent shadow of penalty defaults helps keep the process of innovation focused on outcomes that actually help solve problems.

The concept of XG was developed in other areas, notably the study of the response of firms and public administration in the United States and EU to uncertainty. One of the central contributions of this essay and the larger book project is to build on work and extend the logic of XG to international governance.¹⁷ We explain how experimental, fragmented governance schemes could be the first best approach to addressing climate change internationally, rather than an unwelcome surrogate. Whether it actually becomes that first best approach to governance depends on whether international institutions are designed to promote experimentation by governments, firms, and NGOs, and whether that experimentation is designed for learning and scaling. Using the Paris outcome as a framework, we describe how those conditions can be met and what they imply for the future of intergovernmental bargaining.

In Section 2 we explore how XG works in theory and illustrate from studies that have detailed XG systems in practice. We explain how decentralized governance can respond to uncertainty when integrated, monopolistic, global approaches cannot. Effective XG begins by setting provisional goals and authorizing actors with relevant knowledge to devise ways of meeting them. It also begins with credible penalties for administrative authorities, firms, and other relevant actors if they fail to participate in this problem solving. The initial goals are then revised in light of a review of the findings, and the cycle begins again.

Because the goals are avowedly provisional—more in the nature of rebuttable presumptions than unconditional obligations—they are easier to agree on and revise. Moreover, practical, on-the-ground problem solving can canvass more possibilities than synoptic review by experts, not least by empowering and making visible new actors, outside the circle of incumbents, with little to gain from the status quo and much to gain from innovation. In this way collaborative investigation advances the frontier of feasibility, improving our sense of where we are going and how to get there. Advances in one sector suggest analogous solutions in related ones.

The theory and practice of XG thus helps explain how decentralized or piecemeal problem solving generates individual and collective value. Working on decomposed, practical problem solving yields immediate value to the actors who face penalties for failure. It also contributes parts of an overall solution as well as the public good of practical regulatory knowledge. Providing this information addresses, centrally, a cognitive and political challenge for societies that are trying to manage complex regulatory problems. It enlarges the actors' sense of what is doable and can come to be; it offers practical lines of sight for nascent interest groups that want to form to advance new regulatory solutions—whether

they be new industries that seek competitive advantage through regulation or NGOs that seek social goods that such regulation affords.

Applying this logic to climate change, decomposition of the global problem into local problems may prove a crucial step toward improving the informational and political landscape that shapes the kinds of global agreements that will be feasible in the future. Paradoxically, whereas most attention to international climate diplomacy has focused on governments' power to set incentives as the key to stringent and effective global agreements, the way to actually achieve that outcome may well be to first use public authority to encourage decentralized cooperation among firms, trade associations, professional groups, and NGOs of many kinds.

Some of today's gridlock on global warming arises because while many important parties agree that they share a common and urgent interest in addressing climate change, uncertainty about the costs to each of doing so would limit participation in a binding agreement to the richest and most committed. Decomposing climate change into problems that engage the local knowledge of those who know them best, and making that knowledge more explicit and generally applicable through the institutions of XG, allows rapid identification of feasible paths of improvement, and so overcomes the reluctance of the rest to enter demanding agreements. As practical solutions are identified in some areas, and as interest groups emerge to defend and advance those solutions, then the same process can spill over and extend to others.¹⁸

In Section 3 we look to history to explain how XG has worked in settings that are analogous to the problems that must be solved to make progress on climate change. XG is an unfamiliar kind of institution—built more on discussion and deliberation among the actors than markets, but also on critical exchanges across higher and lower levels of activity that violate the top-down principles of hierarchy. It might be dismissed as a hothouse flower, a byproduct of some particular settings in the United States or the highly developed regulatory apparatus of the European Union. In Section 4 we explore how XG works in practice and explain why there is reason to think it applies in other countries and to international governance.

Our focus in Section 3 is the Montreal Protocol on Substances that Deplete the Ozone Layer, the treaty system that has helped countries phase out most ozone-depleting substances (ODS) globally. In the conventional telling, the Montreal Protocol stands for the idea that it is prudent and expeditious to begin consensus building with general but easily modified framework agreements, and then proceed to target setting and program design as science brings solutions into focus. We show in Section 3 that the conventional

telling in this case is incorrect. Policymakers knew much less, in advance, than outsiders have assumed; uncertainty was high. Success was far from assured. Getting that history right is particularly important since the Montreal treaty system has been the model for the first two decades of efforts to manage climate change. It is fashionable today to contrast the "easy" case of Montreal with the "hard" case of climate change, but that was surely not the actors' view when the protocol was crafted or extended to new classes of ODS.¹⁹ In the early 1990s, most observers learned from the Montreal Protocol that integrated top-down institutions would be effective. But they ignored the right lesson, which was that integrated top-down agreements became feasible through the Montreal Protocol only after experimentation and learning revealed just how quickly ODS could be phased out and at what cost. The right lessons are about institutionalizing the process of experimentation and learning.

The claim here is not that all environmental success is built on XG foundations, but only that the logic of XG is well suited to understanding how solutions to the climate change problem may emerge. Moreover, we claim that that logic—although unfamiliar to students of international law—is more present in history than has been understood. (In the larger book project we look at other iconic cases of regulation—from California's Air Resources Board to sulfur trading to agricultural policy in the EU and land-use policies around the world—to show that XG is omnipresent. It is as if the world has been speaking prose all along without knowing it.)

In Section 4 we apply this logic to climate change, focusing on the ways experimentalist decomposition of the problem can be encouraged nationally and internationally. This mode of governance builds on self-interested dispositions to take action where they exist as well as possibilities for constructing penalty defaults where they do not. Those motivating forces help explain the onset of XG-cooperation in climate change, and wise institutional design can help achieve linking and scaling up these components into an eventual global system of regimes.

We argue that for very many internationally traded goods—whether agricultural commodities such as palm oil or sugar or industrial products ranging from cement to automobiles—the opportunities for inducing active problem solving are familiar and straightforward. Because the dominant actors in these markets are typically few and often sensitive to the risks of reputational damage, they can be moved to action by direct self-interest as a way of avoiding the risk of regulation and entrenching their position within markets. In some cases these motivations are purely self-interested as firms seek to establish environmentally friendly efficiency improvements into regulatory systems (the case of cement). In others, an external motivating force is needed, such as from NGOs'

threats of embarrassing publicity (the case of palm oil and sugar) or by trade restrictions that make access to a large market conditional on active participation in reducing emissions (e.g., the California Air Resources Board's efforts in California or the EU's efforts to stem illegal logging). The logics are similar across cases, but the scale and organization of the key elements—the setting of provisional goals, the threatening of penalty defaults, and the institutionalization of learning and scaling—vary with industry and government.

Applying this logic to international institutions, countries would initially be asked only to organize (with external technical help when required) a process for setting priorities, facilitating the work of the actors responsible and willing to undertake them, and reporting in a uniform way on results. The most active and innovative participants would thus be able to identify and learn from each other; and such mutual support would be the springboard to alliances that begin to impose obligations first on the immediate participants, then, as feasibility is demonstrated, on others. The interim result would be a plurilateral system of coordination of international and national regimes operating loosely under the UNFCCC as an umbrella, with the prospect of incrementally extending the breadth and depth of that regime into an integrated undertaking. Exactly all these building blocks were installed—or envisioned—in the Paris agreement.

Using the Paris building blocks effectively requires efforts on several fronts. One is a shift in mind-set that sees this new style of governance as the best strategy for managing complex, uncertain problems. This shift is needed so that XG is not just seen as an epistemic solution to climate governance but also one that can rewire the underlying political interests in ways that are more favorable to cooperation over time.

In addition to a shift in mind-set—the elements of which are already present as more analysts and governments embrace the bottom-up approach agreed on in Paris—new strategies are needed to create the right nuts and bolts for an evolutionary, experimentalist system of climate governance. Today's world has arrived at Plan B accidentally and thus has not paid close attention to the policies and institutions needed to make it work effectively. For all the success of Paris, we note that the list of tasks not completed in Paris—deferred until later, when no credible deadline looms—is long.²⁰ Particularly neglected is the need to build effective mechanisms for pledging commitments and experiments as well as effective review mechanisms so that the learning process can proceed. Attention is needed, as well, to not blocking—and ideally encouraging—countries and groups of countries to impose penalty defaults that urge action.

2. The Logic of Experimentalist Governance

Climate change is marked by two intertwined sets of characteristics that make integrated, top-down bargaining all but impossible. The first set is political: the fragmentation of power and authority in the international system, and the corresponding absence of any clear leader to impose order on actors with sharply divergent interests. The second is cognitive: uncertainty about the feasibility of achieving policy outcomes, such as lower emissions, at acceptable costs. This uncertainty explains the inability of any country or firm that takes deep decarbonization of emissions seriously to identify in advance which behavioral, technological, and regulatory commitments will prove most effective. Lack of reliable knowledge about the effort needed exacerbates the problems of bargaining. In turn, complex and unreliable bargaining heightens the sense of uncertainty as key parties cannot anticipate—and must fear—how counterparts will react to the frustration of expectations. If it is unknown at the time of bargaining which commitments really can be fulfilled and how others will respond if some are not, bargaining among parties with sharply different interests will be highly complex and cautious to the point of paralysis. Risk-averse players will prefer deadlock to codifying ambitions that may prove too costly or simply unattainable.²¹

Decomposition can help break this vicious circle. An active strategy is needed to decompose the global problem into natural component problem areas—such as reducing the deforestation associated with increased cultivation of palm oil, soy, or sugar, or the emission of greenhouse gases produced by combustion in vehicles of electric power generation—that governments, firms, and NGOs have begun to understand. In practice, this could mean focusing on sectoral and regional governance arrangements that encourage disciplined, inclusive problem solving by competent actors.

XG shows how actors facing uncertainty can jointly explore practical ways to realize their goals. And through this iterative process, the underlying interests and preferences of the actors shift toward more cooperation while goals are adjusted in light of evidence about what is feasible.²² XG emphasizes that regulator and regulated alike rarely know what is feasible when they begin to tackle a problem under uncertainty; it prizes a diversity of efforts rather than monopoly. It identifies and continuously improves on solutions that work and pushes them to scale while siphoning resources away from those that don't.

This approach to problem solving arises when there is a thin consensus among actors regarding an urgent problem: no sharp disagreement over fundamentals (that this particular problem exists, and is urgent), but no capacity to formulate

a comprehensive and detailed plan of attack, to say nothing of monitoring it. In other words, the actors recognize a problem but also that it is so fraught with uncertainty that familiar problem-solving strategies cannot be applied to it. Collaborative exploration is therefore preferable to inaction. In addition, there must be civil society actors—such as firms and their trade associations, NGOs of various kinds—as well as regional or municipal public officials with local knowledge of the problem and at least inchoate ideas about solutions or where to look for them. In other words, there must be actors with practical knowledge of the problem based on continuing, immediate experience—knowledge not yet captured in consolidated theory or reflected in prices.

Even the thinnest consensus on problem definition suffices for articulation of an initial, provisional goal. At the limit, the aim can simply be to make significant progress on solving the problem; agreement is all the easier to secure because the actors know that the feasibility of the target is subject to careful review in which they will have a part. In the next step, various groups of ground-level actors are given responsibility for achieving the goal. They are authorized to search for and develop solutions as their experience suggests, but on condition that they report results to the convening authority. The results are then compared through various forms of peer review so successes can be quickly identified and if possible generalized, failures rejected early on, and faltering efforts corrected in view of the advances of more-promising ones. Where experience warrants, the goals themselves are revised—targets tightened, relaxed, or extended to new domains—and the revised goals are the starting point for the next round of local exploration.

How can a process such as this gain traction if there are veto players that might not, on their own, want successful solutions to emerge? And why won't XG simply lead to a chaos of decentralized efforts and partial solutions that could be worse than no effort at all? The logic of XG offers answers to these questions on two fronts.

Costs of Inaction

One front concerns the costs of inaction. The engine that drives XG is not a starry-eyed assumption that actors want solutions. Instead, participants in XG processes have an incentive to cooperate and find practical solutions because they want to avoid a penalty default: a draconian sanction—such as exclusion from a valued market or denial of an indispensable permit or license—imposed for persistent violation of the regime's norms. The existence of a penalty default forces the actors to choose between refusing to cooperate and losing control of their joint fate or cooperating to determine their fate jointly with regulators and other policymakers. Facing such a choice puts a strong premium on cooperation, especially where there are high levels of

uncertainty and viable outcomes are unknown. In such settings, cooperation means not just bargaining to mutually agreeable terms but pooling of available information and joint exploration of new possibilities. With joint exploration comes the possibility of the redefinition of interests through deliberation. Regulators and regulated alike can thus rethink the problem they are trying to solve. Avoidance of penalties can also open new markets and opportunities. Penalty defaults are, therefore, at the same time information forcing and deliberation enhancing.²³

Analytically we can distinguish three sources for penalty defaults. First, they can be imposed by normative pressure, typically when firms react to the moral concerns of their customers. While consumers will often pay only an insignificant premium for "ethically" produced goods, they will often turn away from firms caught flagrantly violating environmental or labor norms. International brands with reputations for respecting such norms are particularly vulnerable to and careful to avoid such reactions. Normative pressure that emerged around deforestation helps explain, for example, why the EU threatened to exclude from its markets palm oil from production methods that caused deforestation. In turn, the credible threatened loss of that market led palm oil traders to require producers to adopt new methods that didn't cause deforestation.

Second, penalty defaults can be imposed hierarchically, by law. Under the US Clean Water Act, for example, development surrounding a body of water must stop if the inflow of pollutants exceeds a total maximum daily load. Development can proceed only if affected parties establish a mitigation plan acceptable to the regulator. The ground-level actors elaborate on the actual solution but are induced to do so only by concern that they will lose their autonomy if they do not. Hierarchical penalties imposed by governments are perhaps the most familiar form of penalty default. They are, of course, harder to imagine in the international system, where governance is weaker than within national legal systems. However, such penalty defaults do often emerge—for example, when important governments ban imports of non-compliant products, as the EU has done for wood from illegal logging. And in some areas of international governance, there are mechanisms that are somewhat effective at creating top-down penalty defaults—for example, credible threats of trade sanctions for behavior that violates the rules of the World Trade Organization (WTO).

Third, and closely related, is the ability of powerful actors to impose penalty defaults on weaker actors. Large wholesalers or retailers, for example, can impose their requirements contractually on global supply chains, a practice that is ubiquitous in high-value consumer goods and spreading to food and other areas. Often a country or other jurisdiction will use

its public regulatory authority in combination with power asymmetries to set standards for outsiders. The United States protected dolphins (ensnared as the by-catch of tuna fishing in the eastern tropical Pacific) under the Marine Mammal Protection Act, initially by requiring countries exporting to the United States to adopt the same protective measures used by the US fleet.²⁴ California has used its regulatory authority to set stringent standards—corrigible in light of progress in implementation—for emissions for vehicles sold in the state.²⁵ These standards now directly apply to one-quarter of all the vehicle miles traveled in the United States—the so-called California effect. There is an analogous Brussels effect as the EU increasingly imposes environmental conditions on the production of imports, with the explicit provision that foreign producers may meet the requirements by means adapted to their particular circumstances.²⁶ The EU also provides technical and capacity-building support to help countries and companies meet its standards.²⁷

Integrated Solutions Over Time

On the other front, XG helps explain why decomposition can lead not just to action but to integrated solutions over time. This second front is important because the building-blocks and clubs literatures related to climate change tend to emphasize decomposition but not the need for reintegration.

To see the integrative potential of XG, note first that it isn't a purely bottom-up strategy. Our approach to climate change is bottom up compared to the current top-down regime; but XG is actually a blend of the two. In XG, higher-level or more-comprehensive understanding is corrected in light of local experience and vice versa. XG regimes therefore require an institutionalized center, even if its role is facilitative—organizing the discovery, pooling, and evaluation of information—rather than directive.

The requirement to articulate reasons for decisions across levels makes it necessary, moreover, to articulate assumptions that would otherwise remain unspoken in the background. So XG, unlike Elinor Ostrom's work on governing the commons and many other institutional arrangements that rely on local knowledge, does not operate tacitly.²⁸ Instead, it actively fosters explicit learning. Invoking the philosophy of American pragmatism, we call this form of governance experimentalist precisely to underscore the way it uses the impact of problems to reveal shortcomings of habits and routines and to prompt exploration of alternatives.

Individually and together, these features, especially against the backdrop of penalty defaults, increase the dynamic capacity of XG regimes to extend their scope. Organized centers, adept at superintending joint exploration, develop economies of scope: The more they move from domain to

domain, as new problems appear, the easier it becomes to move yet further afield. Reason-giving requirements produce explicit learning, some generalizable. A growing stock of generalizable knowledge and flexible, institutionalized capacity for practical problem solving lower the cost of policy action even in the face of increasingly difficult problems, reducing the risk of defection as coordination becomes more demanding.

Thus while XG stresses decentralized decision making and evaluation of costs and benefits as in the clubs and building blocks literature, it differs from these in three ways. The first concerns the nature of the relevant incentives. Clubs form when private actors conclude that provision of some good has benefits to each in excess of costs.²⁹ XG stresses, in contrast, that actors often "volunteer" to participate in joint activities only when faced with the threat of draconian penalty defaults, such as exclusion from a valued market.

Second, where the theory of clubs presumes that the nature and benefits of club goods are self-evident—firms that choose to abate can in principle adhere to a code specifying how to do so, and their choice is motivated by the known returns to adhesion—actors in XG face uncertainty regarding both: XG organizes joint exploration of how to abate; this exploration yields information about possibilities, including especially costs, unknowable in advance; and these findings can reshape calculations of interest.

Third, the institutional endowment of XG regimes offers an explicit theory for how cooperation that might begin in small groups focused on decomposed problems will spill over to wider and deeper cooperation as new information makes regulatory action easier and the benefits more apparent. Most of the building-blocks and clubs literature has not offered a dynamic theory to explain how bottom-up cooperation does not get stuck at the bottom.

In Section 3, we look at a particularly successful and expansive XG regime that serves as a prototype of the category.

3. Getting History Right: The Montreal Protocol

In a larger project from which this essay is drawn, we have looked at an array of iconic cases of international cooperation and regulation. In all these cases, it has been assumed widely that solutions emerged by centralizing authority around powerful regulators. Perhaps the most important of these prior examples is the Montreal Protocol on Substances that Deplete the Ozone Layer—perhaps the most highly effective global environmental treaty and widely seen as a model for the top-down strategy reflected in the UNFCCC and the Kyoto Protocol.

The earliest targets adopted in Montreal largely codified what countries were already planning or could reliably implement. Most chlorofluorocarbons (CFCs) were cut in half. For the United States, where a ban on many CFCs had already mobilized regulators, this was easy to deliver. For most of Europe and Japan, where no ban was in place, reductions were easily achieved once the US experience had shown what was feasible.³⁰

But for Montreal to go beyond this first step, the institution needed to (a) ratchet down existing commitments at a rate that countries would tolerate, (b) identify new reduction targets, especially for the most-offensive chemicals in the atmosphere, and (c) address developing countries' concerns about the costs of abatement.

The institution solved these problems by marshaling ground-level technical expertise. To set reductions feasible for countries and key firms, governments quickly created essential-use exemptions and established Technical Options Committees (TOCs) in sectors such as solvents, refrigerants, and halon fire-extinguishing agents. The TOCs determined the availability of substitutes or the capacity to develop them. They operated through working groups of users and producers to evaluate alternative ODS-free processes, examine improved logistics, and pilot projects involving new substances. The essential-use exemptions assured there was a safety valve if alternatives didn't appear quickly enough as reductions became prohibitions.

Developments with metered dose inhalers (MDIs)—a drug delivery device that initially relied on ozone-depleting chemicals as the propellant—illustrate this process. Exemptions for MDIs were set for each country selling the devices and reviewed annually by technical experts (some from industry, others independent) to determine whether alternative MDIs could adequately deliver each of the drugs concerned. Once two or three alternative models were established as safe, the exemptions were quickly removed. By creating an incentive for innovating firms to provide accurate information while reducing the ability of any individual firm to corner the market, this approach reduced the uncertainty that often plagues regulation.³¹

The TOCs also played a central role on the second front: expanding and deepening the regulatory scope of the regime. Each round of target setting began with a technical assessment of the feasible level of regulation as well as the impact of possible regulations on what ultimately mattered: levels of chlorine and bromine (the main ozone-destroying agents) in the atmosphere. This helped the regime move beyond the "easy" chemicals and uses for which there were ready substitutes to chemicals, such as methyl bromide, where the politics of regulation would be much harder to manage.

The experimentalist approach of setting provisional goals and focusing on feasibility through real-world experience was perhaps most important on the third front: engaging developing countries. Had developing countries refused to join the agreement, the efforts by industrialized nations would have been offset (and then some) by growth of ODS production in the rest of the world.

Developing countries were concerned about cost. They were brought into the Montreal Protocol by an offer to compensate them for the full cost of compliance. They were also threatened credibly with trade sanctions if they refused to join or did not comply.³² That penalty default created an incentive for developing countries to find low-cost, constructive regulatory solutions while also assuring developed countries that their efforts would not be undermined by free riding.

Politically, this arrangement transformed the politics of cutting ODS from a contest between industrialized countries (that cared a lot about the ozone layer) and developing countries (that professed to care little) into a much simpler problem of targeting income transfers that, to date, total about \$3 billion.³³ Making that transformation a reality required a focus on exact costs and systems for accountability: the TOCs, along with a special multilateral fund that made sure the money was spent wisely, turned that promise into a reality.³⁴

Though it figures prominently in many detailed accounts of the operation of the Montreal Protocol, the importance of the review mechanisms has been largely overlooked in studies of the politics of climate change. The conventional view of the Montreal Protocol is that it succeeded because the ozone problem was "easy" to address or because governments set ambitious targets and the market found ways to comply. Of course, the ozone problem has been structurally easier to address than climate change—the total costs are lower, the full compensation of developing countries for compliance costs made membership easier, and the desire of major producers to have their products regulated all made substantial contributions.³⁵ All that said, a close look at the history shows that Montreal worked because the regulatory system was closely connected to technical assessment and extensive review of how technical rules were implemented.³⁶ As Edward A. Parson, a leading scholar of the ozone regime, writes:

"Although the Protocol's adoption of concrete international CFC controls represented an important first step, these provisions for repeated review and modification of its control measures represented the most central contribution to the ozone reduction regime's subsequent adaptation and ultimate success."³⁷

A ratchet was important in Montreal. Keeping the ratchet connected to reality was even more important.

4. Implications for Building Blocks and Climate Change

There are large differences between the national regulatory systems—where the workings of XG were first observed and then explained theoretically—and the international system where it may have its greatest promise in helping societies manage problems like climate change. Those differences include the means by which penalty defaults are created and applied in the international system. Moreover, the structures for engaging all the relevant actors are generally more fragile at the international level. Within modern bureaucratic states, there are extensive administrative procedures that facilitate the gathering of information and the engagement of firms and NGOs. Despite the emergence of a form of global administrative law, those structures are less elaborate and reliable at the international level.³⁸ Particularly important is the fact that international governance has been dominated by intergovernmental bargaining; yet one of the most important insights from XG when applied to problems such as climate change is that the most important actors are usually not agents from foreign ministries that are omnipresent in intergovernmental bargaining. Real experiments and learning engage other ministries and levels of government as well as nongovernmental actors, notably firms. An effective XG approach to international governance must be mindful of these differences. We will address this topic in depth in our book. One of the practical implications of these differences is that it is important to identify the sectors and countries where XG could apply first and how experiences can then spill over into a broadening scope and deepen the content of international governance.

The chief value of XG is that it institutionalizes decentralized, bottom-up efforts to control global warming emissions. It lowers the risks of paralysis and indecision that have been evident as governments have sought global, top-down solutions. But left to themselves, disconnected, decentralized efforts at problem solving can be aimless and impotent. XG creates institutions that encourage and support local exploration but also coordinate and generalize its results. XG breaks the vicious cycle of cognitive and political causes of bargaining deadlock practically. By facilitating rapid improvements in the understanding of what can be done, experimentation and learning narrow the zones of uncertainty and make risks more manageable; that in turn helps parties better understand their political interests and offers stepwise solutions to initially insurmountable political barriers. Put another way, this approach lowers the costs and increases the returns to exploration, incentivizing participation in areas of focal concern

and creating demonstration effects and other spillovers that propagate successes.

Here we apply the logic of XG—as a decentralized system of problem solving—to climate change. Decomposition of the global climate change problem into building blocks is the first step. In many respects, the process leading to the Paris conference has achieved that outcome. While policymakers are focused on the grand, global challenge of addressing climate change—with ambitious (probably unachievable) goals, such as stopping warming at less than 2° C—most of the effort in the run-up to Paris focused on discrete aspects of the climate problem. Nearly all countries made pledges to cut emissions, with highly varied strategies. Collectively, some countries also worked on slowing deforestation. Still others worked on short-lived climate pollutants such as soot and methane. The broad, aspirational goals to address climate change as a whole attracted a lot of attention in Paris, but most of the real work was done on decomposed elements of that big, overall problem.

To be effective, decomposition must be organized in a way that induces firms and regulators to search for and identify effective solutions and then apply those solutions to other areas and other countries. The theoretical logic of XG and the practical application in the Montreal Protocol offer some insights into how this might be done. We start with the limits of the current approach to climate change, centered on the UNFCCC. Then we point to new institutional innovations, rooted in the idea of XG, that could help the existing system work more effectively.

XG depends on an institutionalized process for setting provisional goals, then reviewing, revising, and generalizing them as efforts at implementation warrant. The present system of climate change diplomacy is capable of none of this.

Currently, countries articulate their efforts to realize the goals of the UNFCCC in pledges, known formally as Intended Nationally Determined Contributions (INDCs). Those INDCs are being transformed simply into NDCs as countries formally join the Paris Agreement.

Some proposals for bottom-up diplomacy use these commitments as a starting point. But at present, the INDCs (and NDCs) are a mess. Absent any standards or format for presenting goals and results in INDCs, countries mostly use them to celebrate their plans and accomplishments. Few bother to do even that. Nearly all the INDCs are being submitted late, with no opportunity for real learning and comparison. A stronger system of pledging should be a top priority after Paris.

The system for reviewing pledges within the UNFCCC is no better. Going into Paris, there were proposals to create a strong review mechanism.³⁹ But agreeing to an effective

alternative within the UN system is no easy task so long as agreement requires, as now, unanimity. Not surprisingly, in Paris, countries agreed that this was an important topic but set aside any useful agreement on the architecture for review systems until later.⁴⁰

Given these limits, there should be greater emphasis on what forerunner countries are doing outside the UN process. Countries (and sectors of industry or agriculture) that see their actions as good examples for others to follow and do not fear—indeed want to learn from—searching review could volunteer themselves for extensive peer review and active XG-style learning. Candidate countries include, among many others, Denmark, Ireland, Norway, and Uruguay, all of which are leaders in applying XG methods to environmental problems. The EU is likely to play an especially prominent role, as it is a leader in both the application of XG to environmental problems within its borders—for example, through the Water Framework Directive and REACH regulation of hazardous chemicals⁴¹—and, as noted, the use of penalty defaults to achieve extraterritorial effects.⁴²

China could play a pivotal role in allowing its INDC to be reviewed and exploring ways to implement further actions. While China will be wary of doing that in a UN forum, other venues might be more comfortable, such as the recently established US-China arrangements on climate change. In return for tangible benefits, China will subject its national policies to international scrutiny, as it did with accession to the WTO and, less conspicuously, by inviting the World Bank and the International Energy Agency to review its economic and energy policies.⁴³

NGOs could also play an important role in building review mechanisms of their own as complements and backstops to the intergovernmental process. Many NGOs are gearing up to assess the INDCs. NGOs already actively monitor important areas of climate policy such as REDD+ and FLEGT initiatives on land use and forestry, and industry-oriented initiatives to control methane emissions.⁴⁴ NGOs can perform reviews and, under some circumstances, threaten penalty defaults against firms and governments that don't participate.

These efforts to improve goal setting and review should go hand in hand with exploration of new institutional designs, particularly for funding efforts by developing countries. As with the Montreal Protocol, the best way to fund projects is not clear in advance. As mechanisms such as the Green Climate Fund take shape, it will be important to encourage experimentation, perhaps with a separate funding window to test and evaluate experimental schemes. Many innovations in funding, such as the World Bank's new reverse auction for funding projects to cut methane, can make finance much more effective over time.

Stronger and more-credible penalty defaults will be essential as well. Future pledges of action should include vows by countries to impose costs on those that don't make equivalent efforts at abatement. The current INDCs, by contrast, studiously ignore this vital incentive for deeper cooperation. Indeed, asymmetries in power can be enormously helpful in advancing the goals of the regime.

Trade sanctions and border tariff adjustments will be a particularly important incentive to discourage free riding and encourage deeper cooperation. Experimentation will be needed to identify practical ways to use trade measures. Several studies have shown how existing trade law would allow the use of trade measures.⁴⁵ But the law is ambiguous on many critical issues, such as which kinds of trade measures are legal and how broad a coalition of sanctioning countries is required for the effort to be treated as legitimate.⁴⁶ Indeed, a central challenge in developing and implementing practical trade measures will be to take advantage of the ability to sanction in small groups, which can create an incentive for climate clubs to deepen their efforts, while also tempering the risks of unilateralism. One lesson from the Montreal Protocol experience is the need to link trade measures to practical technical assistance according to the principle of common but differentiated responsibilities—to offer carrots to countries that want to cooperate and sticks to those that refuse.

5. Conclusion

For most governments and analysts steeped in the politics of climate change, bottom up has been more a fallback position than a strategy. It is typically a local intimation or imitation of the stalled global solution. It is defined more by what it is not—the failed top-down effort—than by a clear understanding that decentralized governance, by fostering on-the-ground problem solving, may be able to address problems that more-encompassing regimes cannot and thereby change for the better the politics of comprehensive bargaining. It has not helped that early instances of bottom-up diplomacy on climate change were advanced as pretexts or diversions, as when the Bush administration tried to cobble together a coalition of willing supporters for an Asia Pacific Partnership after withdrawing from the Kyoto Protocol in 2001.

This essay has made the case for decomposing climate change into discrete problem-solving efforts, engaging ground-level actors, not as a backstop Plan B but as the proper, central strategy for responding to the global problem. The key to success of this bottom-up or building-block strategy is the institutionalization, through XG, of learning to reduce uncertainty and thereby increase the possibilities for extending local successes, not least through penalty defaults.

For decades, scholars who have studied strategies for making deep cuts in emissions have emphasized the importance of learning in technology. With more investment and experience, technologies undergo a learning process through which they improve and take larger market share. In many respects, XG is a theory of institutional learning. Through experience and investment, managed wisely, institutions can improve. Bargaining problems that were previously impossible to solve become more manageable. As the technologies for cutting emissions improve in tandem, costs decline and political concerns about impacts on economic competitiveness decrease. New interest groups that favor new technologies emerge. This, fundamentally, is the dynamic that will lead to practical solutions to the climate change problem—a dynamic that emphasizes institutional learning and evolution alongside technology.

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- We thank Bob Keohane, Nat Keohane, Scott Barrett, Michael Oppenheimer, Dick Stewart, Tana Johnson, Todd Edwards, Jennifer Smyser, Keith Porter, Johannes Urpelainen, Bryce Rudyk, Jim Bacchus, Steve Charnovitz, Alan Alexandroff, Joanne Scott, Detlef Sprinz, Dustin Tingley, Rory O'Donnell, and Jonathan Zeitlin for comments on a draft as well as drafts of related studies. Bob Keohane, Grainne de Burca, and Rick Locke organized an exceptionally helpful seminar at the Watson Institute of Brown University on experimentalist governance in November 2014 out of which this paper emerged and thanks to participants at a Princeton University seminar in June 2015. Special thanks to Linda Wong and Jackson Salovaara for extraordinary research assistance. Chuck Sabel and David Victor acknowledge support from the Stanley Foundation. David Victor is also supported by the University of California, San Diego, the Electric Power Research Institute, and the Norwegian Research Foundation.

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- ¹⁶ This point is familiar to students of corporate social responsibility and other behaviors of firms motivated by fear of penalty outcomes. Brand-conscious firms are affected by fear of private consumer action. Firms in commodity industries are less motivated by such concerns but can be influenced by public decisions such as threats of sanction or loss of market.
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