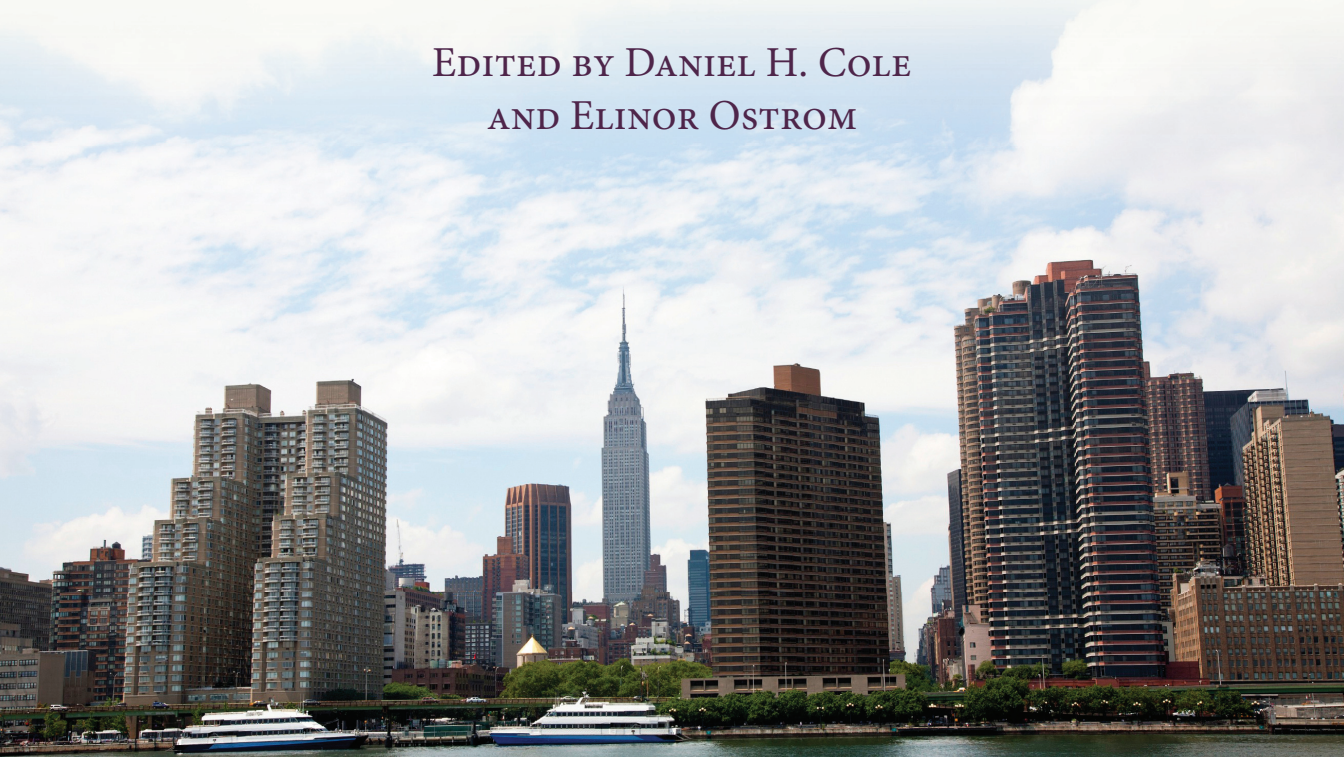
Property in Land and Other Resources

Edited by Daniel H. Cole
and Elinor Ostrom



Foreword by Douglass C. North

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Contents

Wildlife

Land and Water

Global Commons Issues

14

Climate Change

The Ultimate Tragedy of the Commons?

JOUNI PAAVOLA

The dominant view among scholars and policy makers has been that climate change governance should be based on international agreements that involve most nations (Hare et al. 2010). The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP) are cornerstones of this approach. These kinds of governance strategies face two key hurdles. First, wide participation has to be secured for any agreement to come into force. Second, all agreements need to be implemented through national policies. But top-down solutions relying on the central role of the state have been a false panacea in the governance of many resources (E. Ostrom, Janssen, and Anderies 2007). It is no surprise, then, that progress in governing climate change has been slow and that only modest results have been obtained in curtailing greenhouse gas (GHG) emission reductions.

More recently, the debates on climate change governance have centered on the comprehensiveness of feasible agreements (Kuik et al. 2008). The proponents of comprehensive international agreements remain at one end of the continuum (Hare et al. 2010). At the other end are those who would not rely on international action (Rayner 2010). In between are those who consider that progress is best made through regional, sectoral, and other less comprehensive governance strategies (Barrett and Toman 2010; Falkner, Stephan, and Vogler 2010; Schmidt et al. 2008; Sugiyama and Sinton 2005). Within each strand, the relative merits of different policy instruments are still debated, although carbon markets have already gained a prominent position (Bernstein et al. 2010; Kuik et al. 2008; but see Spash 2010). Another strand of literature has examined voluntary governance solutions that do not centrally rely on the role of the state (Bäckstrand 2008; Bulkeley and Betsill 2003; Kern and Bulkeley 2009; Newell 2000). Much of the existing literature believes that a feasible strategy for climate change governance does exist, but opinions differ on what it is.

This chapter investigates the potential of institutional diversity and polycentric governance in the area of climate change. The new institutional literature (Dolšak and Ostrom 2003; E. Ostrom 1990; 2005; E. Ostrom et al. 2002; Young 2002) and governance literature in general (Rhodes 1996; Rosenau 1995) consider the absence of coercive state power as the hallmark of governance. But governance is what governments do. The apparent juxtaposition of "governance" and "government" hinges

on the conception of government. But rather than being a monolithic external actor, the government can be understood as a set of arenas and instruments of collective action. This viewpoint helps construe governance as a continuum between state-based solutions and solutions that do not involve the state, with hybrid forms in between (Lemos and Agrawal 2006; Paavola 2007). That is, environmental governance can be understood broadly as the establishment, reaffirmation, or change of diverse institutions in order to manage the use of environmental resources.

New institutionalism has informed a significant body of research on local common-property arrangements and on international environmental conventions, but its potential is far from exhausted. Understanding the challenges of and solutions for governing large and complex environmental resources such as atmospheric sinks have been identified as key future tasks (Berkes 2008; Dietz, Ostrom, and Stern 2003; E. Ostrom et al. 1999). However, much of the literature still examines relatively simple single-level governance solutions, although the governance of large environmental resources is typically based on diverse solutions operating at multiple levels and across levels simultaneously. Thus, there is a need to develop analytic ways to address institutional diversity (E. Ostrom 2005; E. Ostrom et al. 1999).

In the related body of literature on polycentricity (E. Ostrom 2009; 2010a; 2010b; V. Ostrom 1972; V. Ostrom, Tiebout, and Warren 1961), polycentric order has been defined as "one where many elements are capable of making mutual adjustments for ordering their relationships with one another within a general system of rules where each element acts with independence of other elements" (V. Ostrom 1999, 57). Polycentric order is likely to emerge in a bottom-up way when diverse actors in a phenomenon like climate change seek to realize diverse benefits (or to avoid diverse costs) that accrue on different scales (E. Ostrom 2009). As Elinor Ostrom (2009) remarks, mitigation actions not only generate global benefits by reducing greenhouse gas emissions and the rate of climate change, but also create cobenefits such as better air quality, reduced reliance on fossil fuels, reduced exposure to their price fluctuations, and improved energy security. These benefits can be a sufficient motivation for mitigation actions, although perhaps not on a comprehensive scale.

Myriad voluntary climate change initiatives already exist. For example, the Cities for Climate Protection (CCP) program and the Cement Sustainability Initiative (CSI) attempt to address substantial GHG emissions, comparable to those of major emitting states. These initiatives have been successful in reducing GHG emissions or slowing their growth in comparison with business as usual. However, tentative evidence suggests that voluntary initiatives may do best at, or be limited to, realizing cost-saving emission reductions. Therefore, state-based and hybrid governance solutions may be needed to complement voluntary ones in order to stabilize the atmospheric concentrations of GHGs at a safe level. That is, institutional diversity is likely to characterize climate change governance, and it will emerge through both bottom-up and top-down processes.

Climate Change as a Problem

The Stern review considers climate change "the market failure on the greatest scale the world has seen" (Stern 2007, 27). The language of market failure and externalities

is indeed widely applied to climate change. However, this chapter examines climate change as a problem in the sustainable use of atmospheric sinks for GHGs by drawing from the literature on the management of common-pool resources (Berkes 2008; E. Ostrom 1990; 2005; E. Ostrom et al. 2002; Poteete, Janssen, and Ostrom 2010).

Atmospheric sinks for GHGs can be understood as a common-pool resource (CPR) just like an aquifer or a fishery (Paavola 2008a). Sinks are stock resources that provide a flow of sink services. Aquifers and fisheries have a relatively well-understood capacity to generate a flow of resource units. Watercourses, air basins, and global atmospheric sinks have a comparable capacity to absorb pollutants that is replenished by natural processes. Atmospheric GHG sinks fulfill the first condition of being a CPR because the use of units of sink services is rival or subtractable: a unit used by one user is not available to others (E. Ostrom 1990). A key challenge in governing atmospheric sinks for GHGs is the same as with all other CPRs: to constrain their use so as to prevent their destruction. A derivative task is to distribute the sustainable capacity to provide sink services among the competing users.

Atmospheric GHG sinks also fulfill the second condition of being a CPR because it is difficult to exclude unauthorized users from using them (Paavola 2008a). The users of GHG sinks range from large coal-powered electricity-generation plants to families driving a car or keeping cattle. The size of the sink, the range of activities that make use of it, and the large number of users make it difficult to monitor the use of the sink and to exclude users. The perfect mixing of emissions of GHGs in the atmosphere and absence of clear borderlines contribute to the difficulty of exclusion (E. Ostrom 1990).

Because of these resource attributes, atmospheric sinks may experience the ultimate "tragedy of the commons" (Hardin 1968). Users have incentives to use sink service units before other users make them unavailable, and it is difficult to prevent them from doing so. When everybody acts in self-interest rather than exercising restraint to conserve global GHG sinks, the tragedy is nigh. Although Hardin (1998) later became optimistic about the emergence of restraint in the use of global atmospheric sinks, progress to date has been modest.

When exclusion costs are low, challenges of rival consumption are typically resolved by establishing private ownership and deciding who is entitled to what. Markets can then allocate resources to their most valuable uses. But private ownership is not feasible when exclusion costs are high, as is the case with global atmospheric sinks and other CPRs. Alternatives for governing global atmospheric sinks are the same as for other CPRs and include collective ownership and management (which may involve the use of markets), voluntary agreements to constrain the use of atmospheric sinks for GHGs, and widely shared values with associated individual behavior change to reduce GHG emissions. These alternatives may coexist as parts of a wider polycentric governance strategy for climate change.

The challenges of governing atmospheric GHG sinks are also shaped by the attributes of their users, which determine the starting point for collective action aimed at establishing or modifying governance institutions, affect the costs of acting collectively, and influence what governance solutions can be agreed on. Political-economic factors and current patterns in the use of atmospheric sinks for GHGs affect the prospects of collective action. One of the most important aspects of the global

political-economic order is the role of states in representing users of global atmospheric sinks within their territories. The law on international relations treats states as equal, sovereign actors in international affairs. This formal equality contrasts with their unequal capacities and developmental attainments. Most developed countries have high levels of per capita income and strong, capable states. In the developing world, many states are weak and some are dysfunctional, and they have been unable to promote income growth and well-being among their citizens. Many developing-country states also have weaker capacity to advance their (and their citizens') interests in international negotiations.

States' economies exhibit different degrees of complexity, which affects their vulnerability to climate change impacts. Most developed countries have complex economies that offer many sources of income and are more resilient during periods of stress. The economies of many developing countries depend on primary production and are exposed to substantial climatic and economic risks. Because of underdeveloped financial and insurance sectors in those countries, people cannot insure their assets and stand to lose them when disasters occur (Paavola 2008b; Paavola and Adger 2006). In developed countries, income is not sensitive to extreme weather events such as the European heat wave of 2003, although it caused substantial asset losses. In contrast, extreme weather events such as hurricanes can tax more than 10 percent of the gross domestic product (GDP) of a low-income country (Linnerooth-Bayer, Mechler, and Pflug 2005). The differences in vulnerability are even more significant with regard to loss of life. For example, Hurricane Andrew killed 23 people in Florida in 1992, but a comparable typhoon killed more than 100,000 people in Bangladesh a year earlier (Adger et al. 2005). Brooks, Adger, and Kelly (2005) suggest that educational attainment, health status, and quality of governance explain much of the difference in mortality due to natural disasters among countries.

Heterogeneities in the global community such as the ones just discussed make it difficult to agree on how to govern the use of atmospheric sinks for GHGs. Developed countries have invested in energy-intensive lifestyles, technologies, and infrastructure, which make GHG reductions time consuming and expensive. But developed countries also have the capability to avoid adverse consequences of climate change, as well as to recover from them. Furthermore, they form a relatively homogeneous and powerful negotiation bloc that has experience from collective action in other contexts. Developing countries, particularly the least developed countries, have contributed little to climate change because of their limited energy use and reliance on renewable sources of energy, but their economic development requires increasing energy use and GHG emissions. They are also highly vulnerable to adverse climate change impacts. Finally, developing countries form a large and heterogeneous negotiation bloc whose members range from oil-producing countries to small island states that are threatened with inundation by rising sea levels.

There are, of course, more coalitions in climate change negotiations than just developed and developing countries, and the contours among and within the groupings are far more complex than the preceding discussion suggests. But even this narrow account highlights that in the light of the literature on common-pool resources, there are significant obstacles to collective action to govern atmospheric

sinks. The following account of progress to date in international climate change negotiations underscores this.

The Conventional View of Climate Change Governance and Its Record

Several lines of reasoning lead to the view that climate change governance has to be negotiated by states, codified as multilateral environmental agreements, and implemented through national legislation. First, research in environmental science has sought to understand phenomena such as climate change and the loss of biodiversity through lenses of global environmental change and earth systems science (Steffen et al. 2004; Vitousek et al. 1997). This kind of analytic globalization of environmental change easily leads to the view that feasible responses to global problems also must be global in nature.

Second, scholarship in international relations, particularly the realist tradition, provides a justification for "statism." Realism extends rational-choice reasoning to the "society of states." Other actors do not matter, and their involvement would be dubious anyway because it could violate the sovereignty of states. Self-interested states will agree to take collective action on an issue like climate change only if all parties to the agreement benefit either directly or via side payments or benefits made available by those who do directly benefit from an agreement (Barrett and Toman 2010; Sprinz and Vaahtoranta 1994). But all such international agreements lack mandatory power and need to be implemented through top-down processes that involve enactment and enforcement of national legislation.

Third, public finance reasoning supports "maximal multilateralism." From this viewpoint, internalization of an externality or the provision of a public good should take place at a scale encompassing all affected parties (Musgrave and Musgrave 1976; Tiebout 1956). In the case of climate change, the affected parties would be all who have to share the burden of mitigation, who benefit from mitigation actions, and who bear the burden of having to adapt to residual climate change impacts. That is, most, if not all, states should be involved in negotiations on climate change governance. There are, of course, counterarguments, which will be discussed later in this chapter.

Substantial mitigation of GHG emissions is possible. Technological solutions that are already known can deliver the GHG emission reductions needed to stabilize their atmospheric concentrations at 450 to 550 parts per million (ppm) (Pacala and Socolow 2004). These reductions can also be achieved at a reasonable cost. Stern (2007) argues that stabilizing the GHG concentrations at 500 to 550 ppm by 2050 would cost 1 percent of global GDP. In contrast, he estimates that "the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more" (Stern 2007, iv). About a third of the emission reductions needed to stabilize atmospheric concentration of GHGs at 450 to 550 ppm by 2030 would save rather than cost money (Enkvist, Nauclér, and Rosander 2007). But it has been difficult to reach an international agreement on GHG emission reductions.

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992 as the key international response to climate change. The Kyoto Protocol (KP), adopted in 1997, established emission-reduction commitments for carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride emissions for 37 industrialized countries and the European Community, or the so-called Annex 1 countries. Parties to the KP committed themselves to an overall 5 percent GHG emission reduction from 1990 levels during 2008–2012.

The GHG emissions of Germany, the United Kingdom, and Sweden were already 10 to 20 percent below those of the Kyoto base year in 2008 (EEA 2010). In the same year, GHG emissions of many countries of the former Soviet Union and of countries with economies in transition were 25 to 60 percent below their 1990 levels because of the collapse of their economies and manufacturing (EEA 2010). But GHG emissions were 32.2 and 42.3 percent higher in Portugal and Spain, respectively, in 2008 than they had been in 1990 (EEA 2010). Emissions also grew in Australia, Japan, and the United States by 15 to 25 percent from 1990 to 2004 (UNDP 2007). For comparison, carbon dioxide emissions of Brazil, India, and China, which were not parties to the KP, increased by 60 to 110 percent from 1990 to 2004 (UNDP 2007).

The "safe" level of below two degrees of global warming would require the stabilization of atmospheric GHG concentrations at 400 to 500 ppm (Mastrandrea and Schneider 2004), which would in turn require a reduction of 50 to 85 percent in GHG emissions by 2050 from 2000 levels (IPCC 2007). The KP cannot deliver this because too few countries participate in emissions reduction, because the targets of the countries that do participate are too lax (and are not complied with), and because too many sources of GHGs remain outside its scope. There have been calls to involve major developing economies in emissions reduction because of their substantial total emissions. But some major developing economies, such as China, Iran, and South Africa, also already have higher per capita GHG emissions than the globally available per capita emissions consistent with the stabilization of atmospheric GHG concentrations at a safe level (UNDP 2007). Land use and land use change, deforestation, aviation and marine bunker fuels, and carbon leakage associated with the consumption of imports from non–Annex 1 countries to Annex 1 countries are examples of issues that remain wholly or largely unaddressed by the current climate change regime.

Thus, the inclusive UNFCCC process has to date failed to generate solutions for tackling climate change. Barrett and Toman (2010), referring to research by Velders et al. (2007), suggest that the Montreal Protocol, which was adopted in 1987 to reverse the depletion of the ozone layer, has achieved GHG emission reductions four times greater than those of the KP. The Montreal Protocol was easier to negotiate because the depletion of the ozone layer involved fewer parties, mitigation costs were lower, and the same substances that deplete ozone layer are also greenhouse gases (Cole 2009).

Polycentric Climate Change Governance

Although climate change can usefully be understood as a problem of using a CPR, global atmospheric sinks for GHGs, the problem of the governance solution as a

whole is distinct from decisions on the quality of CPRs. A stable climate is a public good (just like water or air quality, where pertinent sinks are also CPRs) because its use is not rival, and because it is difficult to exclude users from it once it is provided. Samuelson (1954) suggested that markets do not make available an optimal amount of public goods, and that they should be publicly provided. But public provision of a stable climate is not trivial; it should happen on a spatial scale that encompasses all affected parties (Musgrave and Musgrave 1976). That is, the provision of a stable climate should happen globally.

However, there is no world government, so the provision of a stable climate requires collective action. Olson (1971) argued that collective action is more likely to be unsuccessful in large groups where actors deem that their impact on collective-action outcomes is small and as a consequence have a stronger incentive to free ride. This argument applies to climate change if it is considered as a problem for humanity as a whole. When a large proportion of actors assess their situation in the way described here, collective action will be undermined.

One way to overcome the problem is to mobilize collective action on a smaller scale. This helps reduce the incentive to ride free because the impact of each individual on collective-action outcomes increases. At the same time, smaller groups may increase the homogeneity of involved actors, which should also facilitate collective action. Coordination among groups can be achieved by establishing larger-scale solutions in which the groups are represented. Representation treats collective-action groups as individuals and reduces the original large-numbers situation to one of small numbers. That is, multilevel governance solutions are likely to emerge as instruments for facilitating collective action in large groups.

The system of states representing their populations is one possible solution of this kind. However, it is not the only one, and state-based solutions are not necessarily one-size-fits-all. Ronald Coase's (1937) work on the nature of the firm suggests that the scope of any governance solution (in his case, the firm) is determined by the relative transaction costs of carrying out transactions internally and externally. Transaction costs do not favor comprehensiveness to the extreme. Subsequent work in transaction-cost economics highlights that different governance solutions create different incentives and have differential abilities to govern different kinds of transactions (Williamson 1999; 2000; 2005). The implications of this finding for climate change governance are that different rationales may exist for different governance solutions and that they may have different, albeit potentially coexisting, scopes. That is, multiple noncomprehensive solutions are a more likely outcome than one, all-encompassing governance solution.

Theoretical explanations of the emergence of multilevel governance also suggest that diverse institutional designs should exist for the provision of public goods such as a stable climate (Paavola 2008a). Different governance functions, such as provisioning, monitoring, and enforcement (Paavola 2007), may have different economies of scale or different optimal scales of operation (V. Ostrom, Tiebout, and Warren 1961). Collective environmental decisions may be best made at a higher level, while provision of the resource may best be undertaken at a lower level, for instance. This is the rationale for many comanagement arrangements. Important here is that the governance cost approach points to different kinds of multilevel solutions than the

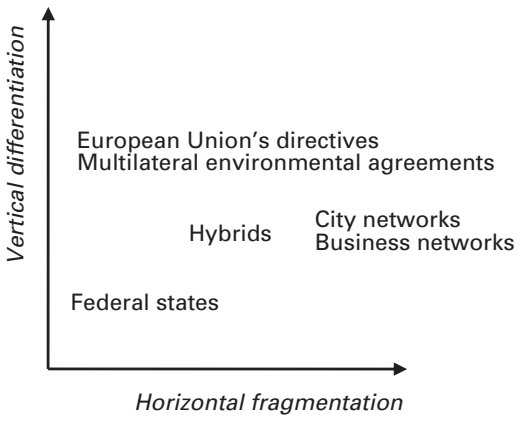
collective-action approach. The latter suggests nested governance solutions that are identical except for their different scale. The governance cost approach suggests that levels of governance may be functionally differentiated and complementary for a reason.

The literature on polycentricity offers additional insights for understanding institutional diversity in climate change governance. Vincent Ostrom and his colleagues originally proposed the notion of polycentricity to characterize complex metropolitan governance structures that had emerged after World War II for public service delivery in the United States (V. Ostrom 1972; V. Ostrom, Tiebout, and Warren 1961). These new complex structures did not have the single core that characterized conventional monocentric governmental arrangements. The scholarship on polycentricity sought to establish the rationale of such structures.

Until and even after Vincent Ostrom's seminal contributions and those of Buchanan (1965), Coase (1960; 1974), and Tiebout (1956), the government was considered the default provider of public goods and services. Market-failure reasoning provided the intellectual justification of this view. Against this background, the key interest of Vincent Ostrom was the horizontal dispersion of authority to govern. At that time, this was a novel phenomenon that the established notions of government and governance were not well equipped to account for. But vertical structuring of governance is also involved in the examples Ostrom and his colleagues discuss (V. Ostrom 1972; V. Ostrom, Tiebout, and Warren 1961).

The degree of horizontal dispersion of authority varies from monolithic governmental solutions to fragmentation of authority (figure 14.1). Hybrid solutions lie somewhere in between (Lemos and Agrawal 2006). Governance solutions range from those characterized by vertical symmetry to those that are vertically completely differentiated. Although individual governance solutions characterized by fragmentation of authority can be considered examples of polycentric governance, institutional diversity—the multitude of diverse governance solutions prevailing simultaneously—necessarily leads to polycentricity in a wider sense.

FIGURE 14.1
Horizontal Fragmentation and Vertical Differentiation as Dimensions of Polycentricity



Another important attribute of governance solutions is the way in which they emerge: from the bottom up as a result of voluntary collective action or bargaining, or as a result of top-down, mandated processes. As previously noted, polycentric order may emerge in a bottom-up way when actors seek to realize benefits or to avoid costs that accrue on different scales (E. Ostrom 2009). Top-down processes create other governance solutions, which increases institutional diversity.

There is thus more to climate change governance than international negotiations and state-based climate change policies. Solutions based on or involving non-state actors also exist and are likely to be networks, rather than hierarchies or markets, and to exhibit the dispersion of authority and vertical differentiation simultaneously. Hooghe and Marks (2003) suggest that these governance solutions are likely to be voluntary (negotiated) and temporary rather than permanent and to have overlapping rather than exclusive membership. Hybrid governance solutions can involve states and partly rely on their mandatory powers, but they can also grant important roles to other actors and voluntary action. They play a role in the portfolio of governance solutions alongside state-based and voluntary solutions.

Voluntary Initiatives and Climate Change Governance

Polycentric climate change governance can involve a variety of actors, such as local governments and communities, nongovernmental and church-based organizations, businesses, and governmental organizations in different combinations and roles. Some solutions are limited to one area of activity, such as local governmental activities or an industry, while others can be more general in nature. Many of these solutions are voluntarily adopted and have voluntary membership, although the act of joining can create responsibilities. The Cities for Climate Protection (CCP) program and the Cement Sustainability Initiative (CSI) are examples.

Cities for Climate Protection

Local governments have actively developed and implemented governance solutions for reducing the emissions of greenhouse gases from their jurisdictions. The pioneer in this area has been the International Council for Local Environmental Initiatives (ICLEI) with its Cities for Climate Protection (CCP) program. Others include Climate Alliance, C40, and the U.S. Mayors' Climate Protection Agreement (Gore 2010; Kern and Bulkeley 2009; Linstroth and Bell 2007; Román 2010).

The ICLEI launched its CCP program in 1993. It aimed to enlist one hundred municipalities worldwide with joint emissions of one billion metric tons of CO_2 (ICLEI 1993). The program also sought to strengthen local commitments to GHG emission reduction, to develop and disseminate planning and management tools, to research and develop best practices, and to enhance national and international ties among municipalities.

The CCP program expects members to develop a local action plan to reduce GHG emissions, to undertake measures to reduce emissions from municipal building stock and vehicle fleets, to institute public awareness campaigns on climate change, and to join procurement initiatives that seek to create demand for climate-friendly

products and services. Members are also expected to link with local governments in developing and emerging-economy countries to foster technological and financial transfers (ICLEI 1993).

The CCP progress report published in 2006 (ICLEI Local Governments for Sustainability 2006) highlighted that 550 local governments had joined the program since 1993. Their combined population was a quarter of a billion, or more than 4 percent of the global total. The combined GHG emissions from participating local governments were 1.85 billion tons of eCO_2 (carbon dioxide equivalent), or more than 6 percent of the global total (excluding emissions from land use and land use change). That is, GHG emissions of CCP members are comparable to those of large Annex 1 countries, such as Germany, Japan, and Russia. The participants reduced their joint emissions by 3 percent or 60 million tons of CO_2 between 1990 and 2006. These emission reductions brought substantial savings to participating cities that amounted to about $35 per reduced ton of CO_2 emissions (ICLEI Local Governments for Sustainability 2006).

Cement Sustainability Initiative

Another example of climate change governance is the Cement Sustainability Initiative (CSI), a program of the World Business Council for Sustainable Development (CSI 2002) that has been considered a model for the sectoral approach to climate change mitigation (Meckling and Chung 2009; Schmidt et al. 2008). The cement industry is a significant GHG emitter. Its worldwide CO_2 emissions are about 5 percent of the global total, comparable to those of Germany, Japan, and Russia in 2004 (CSI 2002; UNDP 2007).

The CSI was formed by 10 large cement manufacturers in 2002. Today, its members represent nearly two-thirds of the global cement-manufacturing capacity outside China (CSI 2009). The CSI aims to increase the cement industry's contribution to sustainable development and public understanding of that contribution. The agenda for action adopted in 2002 contained six key areas of work: (1) climate protection; (2) fuels and raw materials; (3) employee health and safety; (4) emissions reduction; (5) local impacts; and (6) international business processes (CSI 2002). The agenda invited other cement producers to join and committed to reporting on progress in three years' time.

GHG emissions of the cement industry originate from the chemical reactions of the key raw material, limestone (50 percent of the total), fuel used in the manufacturing processes (40 percent of the total), and electricity consumption, transport, and other sources (10 percent of the total). Thus, the industry's climate protection encompasses raw-material considerations, fuel mix (the use of renewable sources of energy or energy derived from waste), process technology and its efficiency, product quality (which influences the use of cement per output unit), logistics, and other factors (Damtoft et al. 2008).

The CSI developed a CO_2 protocol for use in defining and publicizing baseline emissions of involved companies. It facilitated the setting of targets by involved companies against their baseline emissions, as well as annual reporting of CO_2 emissions (CSI 2002). The data suggest that CO_2 emissions per produced ton of clinker decreased

6 percent between 1990 and 2006. Thermal energy efficiency improved by 14 percent over the same period. But the emissions of CSI members increased by 35 percent because their output grew by 50 percent in the same period.

The CSI data suggest that operational optimization has limited scope to influence CO_2 emissions because it is tied to the technological design of plants. Industry performance improves mainly through the addition of new, efficient plants and the decommissioning of old, inefficient plants. Alternative fossil fuels, waste, and biomass contribute to the fuel mix in different ways in different regions (CSI 2009). Raw-material mix, fuel mix, and product choices have substantial potential to reduce CO_2 emissions by the industry over the long run.

Key Observations

Climate change governance initiatives such as the CCP and the CSI can cover GHG emissions comparable to those of major Annex 1 countries. The CCP has also achieved GHG emission reductions comparable to those of major Annex 1 countries, and it has done so by providing cost savings to participants. The CSI has improved performance compared with business as usual in a period when the cement industry's output grew by 50 percent (CSI 2009). But voluntary initiatives such as the CCP and the CSI are most likely to be able to realize only those emission reductions that will yield cost savings. These are not insignificant—as Enkvist, Nauclér, and Rosander (2007) suggest, nearly a third of emission reductions needed by 2030 would actually provide a net benefit.

New forms of climate change governance may also have other, less tangible implications. The CCP and the CSI have established processes for assessing current performance and for setting targets and planning for their attainment. These processes make performance transparent and can create stakeholder pressure for further improvement. The CCP and the CSI have also identified and disseminated best practices and have pursued the creation of a market for new climate-friendly products and services. Over time, they may help bring down the marginal abatement costs of carbon and thus create new cost-effective measures for reduction of GHG emissions.

But because two-thirds of the GHG emission reductions needed by 2030 entail economic sacrifices, there clearly remains a role for conventional state-based solutions as part of a wider polycentric governance strategy. This raises the question: what should the division of labor among state-based, hybrid, and voluntary governance solutions be, and how do they interact? Voluntary industry initiatives such as the CSI are likely to benefit from the existence of political commitments because those commitments provide a basis for longer-term planning and investment. State-based governance solutions can also foster and facilitate the functioning of hybrid and voluntary climate change governance initiatives. For example, markets need backing by states, such as legal recognition and enforceability of contracts in courts, to be credible and to function.

From another viewpoint, hybrid and voluntary forms of climate change governance may play an important role in legitimizing and mainstreaming climate change to actors participating in them and to external political and economic decision

makers. That is, they may lower the threshold of participating in mitigation activities and increase pressure to make progress in conventional state-based forms of climate change governance. At the same time, voluntary and hybrid forms of climate governance as part of a wider polycentric governance strategy offer a decentralized, flexible, and incentivized way to learn, innovate, and experiment with promising ways of reducing GHG emissions and targeting research and development investments.

In light of the foregoing conceptual and empirical discussion, what could a wider polycentric governance strategy for climate change look like? As already suggested, bottom-up and top-down processes are likely to generate a mosaic of institutional diversity that includes state-based, hybrid, and voluntary measures that operate at levels from local to international and across levels (table 14.1). The international cornerstones of climate change governance will continue to play a role and will gradually cover more GHG sources, include more ambitious emission-reduction targets, and address adaptation and its financing. However, this is likely to happen in a piecemeal and incremental way rather than comprehensively. National policies on climate change and related issues will also develop, both to implement international agreements and to pursue domestic goals. In light of the multiple-benefits origins of polycentric governance, voluntary initiatives focused on adaptation to climate change are likely to emerge when the adaptation agenda gains force. Insurance and risk-sharing arrangements for adaptation are likely to demand public-private cooperation and to be based on hybrid solutions. Public-private cooperation and hybrid solutions are also likely to underpin mitigation-focused activities, particularly those related to carbon markets and experimental technologies such as carbon capture and storage. Regional and local governments will also increasingly

TABLE 14.1
Institutional Diversity in Polycentric Climate Change Governance

Type and Level	Conventional	Hybrid	Voluntary
Global	Kyoto Protocol; post-Kyoto targets; adaptation funding	Carbon markets; REDD	Business sector initiatives
Regional	European Union's emissions trading scheme (EU-ETS)	Regional carbon markets; insurance provision and underwriting	Adaptation clearinghouses
National	Climate change; energy; and other legislation	Carbon markets; public-private partnerships in CCS; insurance provision and underwriting	Adaptation networks of local governments
Local	Climate-proofed zoning; property tax regimes; joint mitigation and adaptation	Public-private partnerships	Carbon-neutral communities

be involved in the delivery of mitigation and adaptation through planning, regulation, and public service provision.

Although the discussion here has focused on the potential and promises of hybrid and voluntary forms of climate change governance, they can also have problematic implications. Collaborative industry initiatives may not in reality be open to all and may result in restraints of competition. Voluntary initiatives in general are not representative, and their accountability remains unclear. These issues are increasingly drawing attention in research (Bäckstrand 2008; Unerman and O'Dwyer 2006).

Fostering Polycentric Climate Governance

The governance framework for climate change is still largely in the making, but both new institutional arguments about polycentricity and the emerging empirical evidence suggest that institutional diversity will characterize it. The governance framework will partly be based on the UNFCCC and the protocols and decisions of parties made under it. However, national policies and regulations, subnational and local policies and plans, and a variety of hybrid and voluntary initiatives will also play a role in climate change governance. Together, these institutional responses will create a wider polycentric governance strategy for climate change that will disperse authority and responsibility.

Although the dynamics of different kinds of institutional solutions as part of a wider polycentric governance strategy largely remain to be studied, something can be said about them. Voluntary and hybrid governance initiatives can clearly be comparable to major Annex 1 countries in terms of GHG emissions and emission-reduction achievements. These initiatives will be at their best in realizing emission reductions that save money, but they can also help create markets for carbon-friendly products and abatement technologies and bring down the marginal abatement cost of carbon over time. However, climate stabilization will also require emission reductions that will entail economic sacrifices. This means that state-based governance solutions will remain a part of the wider polycentric governance strategy.

The question is: how different governance solutions within the wider polycentric strategy will interact? Voluntary solutions may benefit from political commitment which can provide a basis for longer-term planning and investment. State-based governance solutions can also foster hybrid solutions involving markets. Voluntary initiatives may in turn play a role in mainstreaming and legitimizing climate change to actors participating in them and to external political and economic decision makers. They can lower the threshold of participating in voluntary climate change measures and create pressure for making progress in state-based forms of climate change governance. Voluntary and hybrid forms of climate change governance also offer a decentralized, flexible and incentivized way of learning about low-cost and promising ways of reducing greenhouse gas emissions and targeting R&D investments effectively.

There clearly is an urgent need to improve the evidence base on the performance of nonconventional forms of climate change governance and the interaction of different types of governance solutions that form parts of a wider polycentric governance

strategy. The scholarship on common-pool resources and polycentricity is well placed to make a contribution in this area because it can draw on both a conceptual apparatus and comparable empirical evidence.

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