

Des semences en commun pour gérer les maladies. Etude comparative de rizières dans le Yuangyang (Chine).

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Introduction: Global Environmental Commons: Analytical and Political Challenges in Building Governance Mechanisms¹

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The increased interdependency of *socio-ecological systems* and the increased reach of human activity on the Earth have led to major political and scientific challenges in the governance of environmental resources. Indeed, the dimension of these biophysical challenges and the pace of changes—which are characterized by discontinuity and irreversibilities—makes action urgent to avoid potentially catastrophic evolution in terms of climate change, depletion of resources, reduction in biodiversity, increases in pollution and sanitary crises, and so forth. However, the current political and socio-economic governance mechanisms are poorly equipped to handle these issues: they often do not include the relevant stakeholders; they lack the knowledge to address effectively the problems they face; and they are insufficiently agile. Together these factors indicate that the existing environmental challenges are not well met institutionally, so new governance principles and architectures are needed. The proper management of environmental challenges may well require a reshaping of how the human community, with all its established subgroups and diverse motivations and coalitions, can (1) devise better mechanisms for making collective decisions to manage its shared environment; and (2) implement mechanisms

¹ This introduction offers an overview of the field and of this book. For readers who are not familiar with particular economic concepts and the governance debate, the Glossary (at the end of the book) explains the relevant notions and gives the main references. Glossary terms are *italicized* in this introduction.

aimed at channeling individual behavior so that these collective goals are reached.

The common characteristic of the environmental issues at stake is the management of resources that are relied upon by wide communities for all kinds of activities. However, these *commons* call for levels of governance depending on the extent of the affected population. Some (such as climate) have an entirely global aspect; others (such as clean air) cross boundaries but remain fairly localized; and still others (such as biodiversity) are multilevel in character. This variety clearly challenges existing *governance regimes*, which are built on nation states and international conventions. Moreover, many “rights” regarding access to and use of these resources are only loosely defined, and many *externalities* (i.e. unmanaged interdependencies) result in the mismanagement of natural resources. Such mismanagement leads to depletion of resources and to the underproduction of collective services. These issues are exacerbated by scientific uncertainties and questions about the design of efficient policies, which creates a challenge for both natural and social sciences.

Since the publication of pathbreaking contributions on these issues in the early 1990s (Young 1989; E. Ostrom 1990; Carraro and Siniscalco 1993), a number of political initiatives have been taken, many governance experiments have been run, and a large and multidisciplinary field of research has arisen. The aim of this interdisciplinary book is to address new challenges in the provision of environmental goods by taking stock of the relevant but dispersed knowledge accumulated over the years. Our goal is to help construct a common knowledge base about the appropriate governance regimes for different types of global environmental goods.

Throughout this book, we show that three essential dimensions must be taken into account with respect to governance and the management of institutional change. First, we consider the issue of designing governance solutions: systems of rules, distribution of authority, levels of organization (from local to global), etc. These are the classical ways of tackling governance and institutional issues. The second crucial dimension of governance issues concerns implementability. Because there is no legally empowered global authority, possible instruments should not be considered merely from a design perspective: the negotiation process among stakeholders plays a critical role in reaching an agreement and in allowing *collective action*. In other words, implementability matters in a context where governance is shaped not only by games among nation states but also by the strategies of such nonstate actors as self-governed alliances, activists’ movements, and nongovernmental organizations (NGOs). Third, compliance must also be taken into consideration because there is no last-resort enforcer. By “compliance” we mean actual changes in behavior that are generated by adoption of institutional arrangements. Compliance depends on a combination of formal rules (enforced by

recognized authorities) and informal obligations, such as social and individual *norms*, whose violation is typically punished by private actors.

We begin in Section 1.1 by discussing the specificity and nature of global environmental challenges. Then we review the “state of the art” with respect to three main issues. First, in Section 1.2 we address the question of the optimal level of governance given that, in practice, environmental goods have wide variation in scope and can be produced according to various *aggregation technologies*. This leads us to the problem of multilevel governance and the efficient organization of federal systems. In an international context, it is also worth discussing the economics of treaties and coalition building, in addition to the interplay between *formal and informal* instruments and *norms*. Second, in Section 1.3 we argue that the design of governance instruments and regulation should be based on a relevant conception of human *motivation* and rationality. Too naïve a vision may, for instance, lead to *incentive mechanisms* that actually deter contributions to providing *public goods* (the *crowding-out* effect). More fundamentally, the exploration of human motivation, and especially of social preferences, raises important questions about how targets should be established when providing global environmental goods. The need to manage the constraints of participation, the consequences of inequalities, and the required intergenerational transfers makes it difficult to design policies that would be both effective and fair. Third, in Section 1.4 we revisit the governance toolbox and consider different modes of governing. In particular, we identify the costs and benefits of alternative tools—namely, property rights and incentives—by considering not only their characteristics (once established) but also the economics of their design and implementation. We conclude in Section 1.5 by briefly discussing the potential of polycentric and networked governance, as well as the need for more integration at the global level.

1.1 GLOBAL ENVIRONMENTAL AND GOVERNANCE CHALLENGES

Not all environmental goods raise the same challenges with respect to governance. According to this book’s contributors, three factors must be taken into account: scale, time, and uncertainty. The many possible combinations of these dimensions affect how crucial are the environmental issues at hand and also the difficulty of their governance.

Let us consider each of these dimensions in turn. Scale (Section 1.1.1) determines whether a given environmental issue can be treated most effectively as a set of (linearly) cumulative local problems or rather as a global issue of

linked problems requiring an approach in terms of systems (i.e. taking relationships among components into consideration). Timing (Section 1.1.2) contrasts processes of rapid systemic and possibly irreversible changes with the slow, partly reversible processes of evolution. Finally, uncertainty (Section 1.1.3) enters the picture as follows. Some environmental issues are characterized by risk; several (but not necessarily all) possible future scenarios can be imagined, and we do not know for certain which will transpire. In contrast, there are situations of (radical) uncertainty in which future scenarios are beyond the capability of human cognition—either because our understanding of the current situation is incomplete or because future developments are too complex to be predictable.

Each of these dimensions, taken in isolation, has an impact on the choice of the mode of governance, and in combination they severely complicate the task of choosing the best way to govern the global *commons*.

1.1.1 Scale effects, polycentrism, and coordination

The standard economics of federalism states that governance issues must be dealt with by the jurisdiction that covers all stakeholders affected by the potential externalities (for surveys, see Oates 1999, 2005). In the case of issues that have a transnational or even global dimension, the principal issue is how governance solutions are implementable at the appropriate level. After all, there is no actor to create an integrated order or to serve as guarantor in agreements among sovereign states. These conditions lead us to focus on the effectiveness and stability of decentralized solutions. *Environmental federalism* maintains that the provision of many environmental goods can be performed on a decentralized basis, especially since many natural resources are localized in particular regions. Solutions based on Frey and Eichenberger's (1999, 2001) concept of functional, overlapping, and competing jurisdictions (FOCJ)—where each *public good* is managed by a specific jurisdiction established at the right scale—tend, however, to be too costly in terms of *transaction costs* (owing to the number of jurisdictions and consequent multiplication of governance efforts and structures), as well as being quite unrealistic from a political standpoint, since existing governments are generally reluctant to delegate sovereignty to new levels of government.

Hence there is a theory (and a practice) of optimal devolution of the provision of *public goods* to the proper level of governance, a level that depends on natural characteristics (watersheds, forests, etc.) as well as societal ones (in particular, political organization, a shared culture, and integration of the economy). In fact, well-established *institutions* for the traditional governance of natural resources have demonstrated the possibility of sustainably managing common resources at the local level. As pointed out in particular by

the Nobel laureate Elinor Ostrom, efficient alignment of individual motivations and the use of specific knowledge have allowed self-organized communities to outperform public agencies consistently. The question is thus whether and how the features characterizing these successful, decentralized, resource management schemes can be scaled up to address problems at the global level. The biggest challenge seems to be establishing larger units that do not supersede the medium- and smaller-size units that facilitate citizen access to neighborhood-level public goods and common-pool resources. One approach is to encourage experimental efforts at multiple levels. When decision making is structured in this way, the level of public goods provision can be tailored to the specific circumstances—the tastes of residents, the costs of production, and other unique local characteristics—of each jurisdiction.

Difficulties in governing the provision of public goods generally arise either when one ecosystem supplies services that benefit people at different scales or when ecological and jurisdictional boundaries do not coincide. Coordination mechanisms at higher levels and new, regional, collective entities may be needed to create the best fit between governance mechanisms and the problems being considered.

An understanding of *aggregation technology* is required to determine where the balance lies in optimal integration of governance at the global level. This notion captures how individual contributions to the *collective good* determine the quality of the good available for consumption (Hirschleifer 1983; Cornes and Sandler 1984). With so-called summation goods, each unit contributed to the public good adds an identical and cumulative amount to the overall level of the good available for consumption. For example, any reduction in the emission of greenhouse gases corresponds to the aggregate (summed) cut-backs of the polluter countries. Other important types of aggregation technologies are: weakest-link public goods (e.g. pest eradication), where the smallest contribution fixes the quantity of the public good for the entire group; best-shot public goods (e.g. a cure for some disease), where the overall level of the public good equals the largest single individual provision level; and weighted-sum public goods (e.g. the cleanup of polluted sites), where different contributions can have different impacts. However, it is widely recognized that many global environmental issues involve opposing logics—for example, separability and systemic scaling effects—that call for hybrid solutions in the matter of governance.

If an environmental issue is characterized by summation in terms of *aggregation technology*, then local decision making and decentralized management are preferable within a framework of global coordination. Experience shows that informal rules and community pressure play a strong role in ensuring compliance at the local level, which explains why a decentralized context is favored for cost-efficient provision of public goods. Moreover, locally emerging rules reach the better fit with the nature of the problem

and with the collective preferences. Thus, from a design perspective, the main governance implication of local and disjointed environmental problems (such as biodiversity or fisheries) is the significant efficiency gains that are possible in a decentralized governance framework. Yet these are trumped by cognitive and informational issues, since governance that is insufficiently connected may deprive a community of the information or knowledge needed to address an issue it faces. This highlights the need for cooperation and information sharing among independent governance devices.

On the one hand, stable agreements should follow from bargaining in small groups on local issues combined with coordination at a global scale. Externalities would not always be avoided, since there are often discrepancies between the scope of an environmental issue and that of a political jurisdiction. In this case, the issue becomes one of discovering and designing appropriate coordination among (decentralized) governance regimes.

On the other hand, systemic interdependencies at the global level may require multilevel governance arrangements, including an independent global entity of last resort. Affected here are environmental goods whose production exhibits a “weakest link” or “threshold” structure in terms of *aggregation technologies*, which means that the contribution of some stakeholders is useless when not combined with others’ contributions. The issue here is the effectiveness of (generally hard-to-reach) international agreements. In many cases, the global entities and intergovernmental organizations that result from these negotiations lack their own financial resources and powers of implementation. A second-best solution in such cases is to delegate financing and enforcement to the nation states within the framework of a negotiated multilateral convention. However, global agreements—whether leading to framework conventions or to a global organization (e.g. the International Treaty on Plant Genetic Resources for Food and Agriculture)—raise the issue of stability (see Section 1.2.1.). Given the greater heterogeneity and size of the communities, compliance with the adopted agreements can be expected to increase in the presence of formal rules that strengthen the calculated or instrumental motivation for compliance. Hence, a dilemma pointing out the necessity to better understand the dynamic of international negotiation (which will be explored further in Section 1.2 below).

1.1.2 Abrupt changes and long-term monitoring needs

Political processes leading to the formation of an environmental regime are slow, and they have difficulty dealing with nonlinearities and strong uncertainty. This stands in sharp contrast to the reality of interactions between ecological and socio-economic systems, which evolve at a rapid pace and are difficult to predict. In fact, biophysical systems are characterized by processes

of evolution that tend to be nonlinear, subject to abrupt changes, and irreversible. A case in point is species extinction, which occurs when a population reaches a critical threshold or tipping point and then crashes. This dynamic also characterizes regime changes, sanitary crises, depletion of resources, ecological disequilibrium, and so forth.

Systems that are subject to abrupt and radical changes need an early-warning mechanism in addition to a balance between mitigation and adaptation measures for dealing with change. Building such management and monitoring capacities in polycentric and decentralized systems is expected not only to increase the fit with local circumstances but also to increase the speed and diversity of available solutions. A global governance arrangement might increase the effectiveness of coordination, but reaching a global agreement is more difficult in situations of rapid change. Under such circumstances, appropriate methods of reaching stable agreements include well-designed contractual regimes (with *ex ante* agreements on negotiation procedures) and strong leadership. Thus we can reasonably expect the effectiveness of governance systems to be increased by the involvement of a leading political actor (typically the European Union (EU)) or a formal global collective organization with clear delegation of authority.

For environmental problems that extend over a long time horizon, a global governance arrangement is feasible and should increase efficiency; meanwhile, a certain level of network governance should improve compliance. Issues such as nuclear waste require investments in governance systems with long-term monitoring capacities. Also, bargaining should be organized to tackle the distributional issues that are unlikely to be addressed spontaneously through decentralized mechanisms—even when there is a strong *norm* of altruism.

Managing long-term issues requires that questions about the viability of long-term formal agreements be clarified. Indeed, over time there might be strong calls for renegotiation to reflect the evolving distributional consequences of compliance with the rules. To ensure compliance, it may therefore make sense to invest in establishing *social norms* (see Section 1.3 below).

1.1.3 Risk, uncertainty, and incomplete knowledge

The management of well-defined risks (i.e. situations of limited uncertainty) can be tackled by global governance arrangements, within a multi-actor network, to achieve efficient risk sharing. For specific goods that are characterized by well-defined risks (e.g. toxic waste), stringent limitations are required on a transnational scale. Such regulations call for the creation of international epistemic communities, with a clear institutional mandate, that can provide consensual knowledge on the state of the art to policy makers.

Combining regulation, legal liability, and *social norms* is crucial to ensuring high levels of compliance.

For goods characterized by strong uncertainty or controversy over the level of risk (e.g. nuclear energy, climate change, genetically modified organisms), there are advantages to taking a precautionary approach within a centralized framework. Strong uncertainty opens the door to value judgments, which therefore play a key role in the bargaining and decision-making processes. In order to reach stable arrangements, scientific knowledge must be balanced against value judgments. The need for extended peer review processes thus implies recourse to polycentric and decentralized arrangements for social learning about values in different local and regional settings. At the same time, effective governance of these risks requires coordination of (scientific and social) expertise, of risk assessment, of the setting of outcome targets, and of rule making. Compliance with precautionary measures will increase more in response to formally specified outcome targets than in response to liability (given the difficulty of attributing responsibilities) or *social norms* (which lead to ambivalent results). Substantial efficiency gains should result from a decentralized regime of licenses and permits aimed at reaching the outcome targets.

The biophysical properties of various environmental issues, their spatial and temporal scales, the available knowledge to consider them, and their supply technology together create challenges for existing governance regimes that seek to provide environmental goods. All the named factors must be better understood and matched with more precise knowledge about the effectiveness of alternative governance solutions. From a political standpoint, this conclusion suggests that policy making be (1) highly responsive when exploring how socio-economic systems can deal with the environment; and (2) highly flexible when adapting our governance solutions to the progress of knowledge and evolution of the challenges. The fundamental purpose of the rest of this introduction (and the book) is to explore key analytical points that guide the building of effective governance arrangements.

1.2 ADDRESSING GLOBAL ISSUES BY ARTICULATING GOVERNANCE FRAMEWORKS

For public goods that must be provided at the global level, the problem is that no global government exists. There is not even an established legitimacy of global politics. It is essential, then, to understand how international agreements can be reached and enforced (Section 1.2.1), to identify the main obstacles to their stability (Section 1.2.2), and to discuss potential improvements (Section 1.2.3) in the process.

1.2.1 International agreements among sovereign nations

Federalism reveals its limitations when it comes to the international level. In international relations, there is no last-resort enforcer and seldom any actor overseeing the players or promoting agreements. The ability to establish common rules and common (compatible) principles to deal with providing public goods at the global level eventually comes up against the harsh logic of interplay among self-interested actors.

In early contributions to the analysis of bargaining about the global *commons*, interaction among countries is characterized as a prisoner's/*social dilemma*, inevitably leading to a call for the establishment of a globally recognized sanctioning authority (Hampton 1987) or its equivalent, a set of global formal contracts (Snidal 1985). Yet even though the prisoner's dilemma does characterize some global commons issues, it does not describe all of them; in practice, there are many different game structures and related institutional solutions to consider (see Section 1.1). It is also important to recognize that, in most cases unanimity is not possible. The greater the heterogeneity among the players, the more difficult it is to reach a consensus. At the same time, a consensus is not a necessary condition for action: the actions of specific players (e.g. the EU) can have a substantial "demonstration" effect. Today this is true, for instance, of product safety regulation worldwide.

In fact, many large-scale environmental agreements have been signed and have remained relatively stable over time. Two important differences distinguish these arrangements from the prisoner's dilemma. First, it is possible to modify the conditions of the game through policy measures (and thus to enlarge the stable coalition) by implementing transfers or side payments, linking issues, and/or designing negotiation rules (e.g. establishing a minimum number of participants) (Carraro 2003: xvi–xviii). The second difference is that most real-life games in this context are actually "mixed" games that combine features of *social dilemmas* (a conflict over the use of the common resources, which means that the cooperation is not stable without external intervention) and those of *coordination dilemmas* (as when cooperation is stable but is not a dominant strategy absent an appropriate distribution of information).

A convenient way to assess the impact of global scale on the bargaining process is to consider the differing impact of scale on cooperation and coordination games (Snidal 1985). The impact of scale on the prisoner's/*social dilemma* has been studied extensively. The effect is negative, since cooperation is much easier in small coalitions. Cooperation in large groups seems to require asymmetry between players (so that leadership and minimal coalitions can play a role) and most frequently occurs when a benign hegemon imposes it on the other players. In the absence of such a hegemon, increasing the

number of players makes cooperation more difficult in most circumstances. Thus, it seems that reaching an agreement through voluntary cooperation leads to stable coalitions only if they are small ones (see, e.g., Carraro and Siniscalco 1993; Bloch 1997; Ray and Vohra 1999).

In contrast, a greater number of players enhances regime stability in coordination dilemmas. The reason is that stability involves adherence to a convention—that is, a convergence of mutually reinforcing strategies (see Schotter 1981; Greif 2006). Although some environmental goods should be provided on a local scale, increasing the number of players that bargain over standards or other coordination issues enhances the intrinsic stability of the regime.

1.2.2 Why it is difficult to reach an international agreement

In negotiations, the parties reach an agreement when uncertainty is low, when differences in expected costs and benefits across constituencies are small, and when the aggregate benefits of collective efforts exceed the costs. Yet there are strong *free-riding* incentives, since it is difficult to convince others that they should give up part of their current wealth for the sake of uncertain gains in the future. In short, there are only weak political and economic drivers for entering an agreement and for attaining and maintaining its goals.

1.2.2.1 Heterogeneity and the difficulty of sharing a common burden

Reaching an agreement is especially difficult when there is considerable heterogeneity in costs and benefits among countries with respect to a global externality. Stronger inducement mechanisms may be required—for example, large transfers or incentives that involve punitive aspects. The underlying problem is always that of agreeing on an appropriate standard for sharing the common burden. For example, it is hardly surprising that developing countries do not regard 1990-level emissions as an appropriate basis for allocating rights to the global atmospheric sink; nor that they prefer population-based standards, which industrialized nations are unlikely to accept in a pure form.

That being said, some aspects of heterogeneity can be helpful. In particular, trading thrives on heterogeneity. When low-cost abatement resources are located outside the system, there is a common interest in making these resources part of the system. This principle is the basis of the Clean Development Mechanism (CDM) credits employed in the EU's Emissions Trading System (ETS). In this instance, heterogeneity is useful in setting up the conditions for participation, although it is still important to find an equitable basis for participation so that large differences can be bridged.

Inequalities tend, however, to make it more difficult to reach an agreement. In the relationship between the most developed and the less developed nations, in particular, cooperation is of more benefit to the former than the latter because the developed economies are more capable of exploiting the surplus generated by cooperation and the public good itself. Compensation payments fail to address this fundamental distributional problem of dividing up the cooperative surplus because such payments do not affect the distribution of assets. Not only is the world trapped in an inefficient equilibrium, but this equilibrium typically worsens in response to the game the poorest nations might play to enhance their bargaining positions. It is indeed rational for them to threaten destruction of their resources that are needed by developed countries. Yet suicidal strategies leading to the mass destruction of environmental goods, including some nonrenewable resources, threatens the dynamic of international cooperation on their provision. The failures of the Cancun and Copenhagen summits certainly resulted partly from such (negotiation) strategies.

This is why long-term stable regimes should be based on a better recognition of the actual inequalities of asset distribution between the North and the South. Inequalities in the ability to negotiate and to benefit should be taken into consideration—say, by overcompensating the South in the short run and, in the long run, having the North contribute to developing the South's stock of human capital. Thus, compensation for inequalities generated throughout history is not only a moral imperative but is also essential for any long-run guarantee of providing global public goods (GPGs). The governance of GPGs is thus far from a simple issue of *mechanism design*. The agenda must include distribution challenges, inequalities among nations, and the consequences of past wars and colonialism.

1.2.2.2 The negative impact of uncertainty on consensus building

The costs that individuals, firms, and governments have to bear in adjusting their behavior to protect GPGs are very uncertain. This uncertainty about the potential results of *collective action* is generated by incomplete and imprecise information on the effects of international action, the costs involved, and compliance. The volatility of all estimates depends greatly on variables—such as population, productivity growth, technological improvement, and patterns of consumption—that are difficult to predict in the long run. Uncertainty in calculating aggregate net gains and their distribution, when combined with asymmetric information, results in divergent views of the best overall solutions for addressing the externality and sharing the costs.

Uncertainty thus complicates the design of compensation schemes and encourages conflicts over the size, nature, and direction of compensation. In

that context politicians may doubt their constituents' support for bargaining over an externality.

1.2.2.3 *Dynamic effects*

Abrupt change—for example, in conflicts over the use of resources—generally makes cooperation more difficult (Snidal 1985). Indeed, the structure of the game changes, and bargaining over the new regime's exact nature is usually intense. Only well-established governance regimes can orchestrate a successful transition without disrupting any ongoing cooperation. Well-designed contracts (including agreements on the negotiation procedures for dealing with adaptation) and strong leadership can address these challenges.

For extremely long time frames, the set of possible game forms to deal with resource conflicts or coordination problems is dramatically reduced. For instance, alleviating *collective action* dilemmas via face-to-face communication or bilateral contracting is impossible in intergenerational conflicts over the use of resources. Researchers have shown that altruistic norms in favor of future generations are an important motivational factor for the adoption of efficient behavior in that matter (see Fischer et al. 2004). However, altruistic norms per se can have counterproductive results. If the strategies of the different players are substitutes, then the optimistic belief that most people care about future generations diminishes each individual's perceived need to contribute. This question will be discussed further in Section 1.3.

1.2.2.4 *The limits of enforcement among peers*

There are good reasons for skepticism regarding the effectiveness of agreements, since many international organizations charged with overseeing such agreements are weak (Haas et al. 1993). Where monitoring or verification is difficult or impossible, compliance will be harder to achieve. For this reason, most agreements establish obligations that are easily monitored. This is one advantage of treaties that focus on actions (policies and measures) rather than outcomes (emission-level targets) (Barrett 2001). However, that emphasis is also a major reason why such treaties might not be effective.

Again, the limits of the formal mechanisms aimed at curbing *extrinsic motivations* call for an exploration of other logics—in particular, grounded in “moral” beliefs and care about others—that might lead to agreements and compliance. The discussion on these issues is introduced in Section 1.3 below.

1.2.3 . . . and why some international agreements are successful

A few factors explain why, despite many obstacles, some treaties seem more stable and effective than others. In each case, the role of “third parties” seems central to channeling the behavior of decision makers.

1.2.3.1 *The role of independent watchdogs*

Although evidence from game theory suggests that international cooperation is difficult, there are instances of cooperation even in crisis situations. One recent example is the financial crisis, which—like several environmental problems—is globally systemic. It is important to recognize the conditions underlying cooperation in this specific context, which rely in particular on central bankers. Most of central banks are independent of (or at least insulated from) the executive and legislative branches of their country's administrations; most individual bankers share a similar view of how the monetary system works; they have previously interacted with each other, although they have not necessarily coordinated their activities directly; the players frequently meet behind closed doors, which facilitates consensus; they care about their reputations within the group as well as outside; and many are interested in their reputation for the history books (since they need not worry about being re-elected). These conditions characterize the role of watchdogs and thus also the institutional requirements for establishing analogous environmental agencies with the proper incentives and capabilities.

1.2.3.2 *Public opinion*

Another player to consider in coordination games is the public at large. Received wisdom suggests that the presence of special interest groups reduces the public's influence over the provision of public goods. However, competition among politicians will cater to the public interest and, in so doing, will cause politicians to reach out and learn about the public's values (Denzau and Munger 1986). Governments may, for instance, sign and adhere to an environmental convention—even when, in purely economic terms, the payoff from *free-riding* is higher—because they fear being labeled as opportunistic or uncooperative (Hoel and Schneider 1997).

Given this, and since citizens' value structures may not be stable, especially under conditions of uncertainty, the media and some leaders might have the opportunity to shape public opinion so as to press governments to address more effectively global environmental issues (while, as pointed out in Alston et al. 2010, it might be the reverse). In addition, psychosocial interventions are essential to effecting widespread changes in *social norms*, which will be needed

to initiate the changes in lifestyle and the economy that are essential to addressing these issues

1.2.3.3 Mechanisms for reaching consensus: scientific and multistakeholder forums

Many researchers have addressed the problem of uncertainty's role in decisions made about environmental issues. Two general but important lessons emerge from this literature. First, in order to be effective, scientific assessments should produce knowledge that is legitimate, salient, and credible (Clark et al. 2002). Second, an assessment's effectiveness is enhanced if the assessment body (1) has a clear institutional mandate for knowledge production, and (2) has a certain independence from the policy arena (Haas 2004).

Thus, despite the many factors hindering cooperation at the international level, some levers are available to modify the logic of the "game" played. That, said, as suggested here and there in this section, the actual structure of the problem of environmental good provisions needs to be explored more deeply by getting a better understanding of the motivations of stakeholders in front of environmental, and more generally, collective and societal issues.

1.3 SOCIAL PREFERENCES, INTRINSIC MOTIVATIONS, AND THE DESIGN OF INSTITUTIONS

The debates about sustainable development and the construction of norms and policies for providing environmental public goods are usually set up according to Hardin's (now) standard economic approach to the so-called *tragedy of the commons* (Hardin 1968). The desirable "natural" or "physical" characteristics of a certain good explain its underprovision because individual selfishness collides with the nonexcludability of such goods. This argument draws on a rather erroneous vision of how individual and collective preferences are built.

While the traditional approach to public goods provision relies on simplifying assumptions, it should not be "thrown out with the bathwater" because its "baby" can drive useful results—for example, political recommendations that would enable better alignment between individual incentives and collective needs (see Section 1.4). However, implementing exclusion mechanisms that are grounded in property rights, or incentives based on relative price manipulations may prove to be counterproductive. The *crowding-out effect* is the best-known example: implementing incentives to contribute may deter voluntary contributions, leading to an overall reduction in the good's provision.

Identifying these problems suggests that our models (of the human mental processes underlying most economic reasoning) may be too crude to yield a relevant analysis of the issues related to the provision of public goods—and in particular to the provision of environmental goods, which are likely to be impure public goods. More precisely, two sets of issues have been highlighted. First, organizing *collective action* to ensure the provision of public goods requires some definition of collective objectives; this raises the question of how social preferences are formed. Second, after goals have been established, collective action may require the implementation of tools that seek to influence individual behaviors. Aligning individual preferences requires an understanding of them. Therefore, both sets of issues underscore the necessity of understanding individual and collective preferences when advocating and establishing environmental policies. This link between preferences and policies is the subject of important research and discussions on their relationship. These debates are introduced in the balance of this section. The notion of *social preferences* is developed in Section 1.3.1, and its role in the formation of collective preferences is discussed in Section 1.3.2. Then, in Section 1.3.3, we tease out the consequences for the design of governance mechanisms.

1.3.1 Reciprocity and future-oriented social preferences

Over the past two decades, experimentalists from various social sciences have accumulated a large body of evidence supporting the universality of social (other-regarding) preferences. Clearly, we must reconsider the standard behavioral hypothesis of *homo aeconomicus*: selfish rational agents. In contrast to that model's assumptions, most people care not only about their own material resources but also about other people's resources. This view has been advocated by leading economists since Adam Smith (1759), including Becker (1974), Arrow (1981), Samuelson (1993), and many others. In particular, most people express a preference for preserving resources for future generations. Parental altruism is a popular illustration of this preference type. Other, more general social preferences include desire for reciprocity, aversion to inequality, and preference for fairness. After taking such preferences into account, the predictions (and policy recommendations) of economic models can change radically. For example, estimates indicate that most effects of global warming will be felt *after* the death of the current generation. This means that actions taken now to deal with global warming will mainly benefit future generations—although their cost is sunk for the present generation, which actually may not profit (even partially) from these actions. This imbalance raises substantial problems. When deciding about collective actions, for example, what weight should a society attach to the welfare of future generations?

Social preferences are based on the assumption that individuals' satisfaction are interrelated. For instance, large differences between own and others' material resources may induce guilt or envy, respectively (for a general overview of social preferences models, see Fehr and Fischbacher 2005). At this point, two questions arise. First: how can we understand social preferences, such as *altruism*, and how do they relate to the selfish dimension of preferences? Second: what link (if any) is here between *institutions* and social preferences? In other words, do social processes play a role in forming individuals' preferences?

There are several ways in which social preferences can be understood. One way is to view them as a ranking of others' different states of welfare that individuals compare with their own welfare. Hence altruism and care for others is commensurable with individual preferences, which implies that both own and others' material payoffs carry value for the individual. This understanding is compatible with the standard economic model of choice. An alternative to this interpretation originates in sociology and classical institutional economics. From this perspective, social and individual preferences pertain to different orderings. On the one hand, social preferences are learned norms and so acting socially is to follow the relevant norm (i.e. acting appropriately). On the other hand, private preferences stem from the individual's own welfare and so utility maximization applies.

These two interpretations lead to different analytical models, and they also correspond to different visions of the interplay between individual and collective preferences. In the former view, individual and collective preferences are independent. In the "different orderings" view, these preferences conflict for much of the population—which is an impetus for changing the norm.

The second issue is whether social preferences are individual characteristics or rather social constructs (i.e. learned and hence endogenous). Societies educate each member by emphasizing values and *norms* that are central to them. These values and norms are embodied in commonly accepted rules about how to treat other people. Hence, they are social constructs that individuals internalize in the process of becoming socialized. But what is the very origin of such collective norms? According to the "individual" interpretation of preferences, we are imprinted with motivations to support other people because the human kind endogenizes the interdependencies among its members.² In contrast, the "different orderings" interpretation argues that we learn certain ways of acting applicable to certain situations and that following this prescription is, in fact, what gives meaning to the situation.³

² Note that there are controversies on how this process of endogenization occurs: by a process of selection or of learning.

³ It may be that institutions (such as norms) exert influence in ways other than establishing social preferences. For example, they may also help us distinguish between different situations—

1.3.2 Establishing norms for sustainable development

Social preferences raise a major challenge for *preference aggregation* and for defining a collective objective function. The central issue is whether people's preferences regarding others' satisfaction should be taken into account in the planner's objective function, or whether only the selfish part of their preferences should be counted. The standard view is that each generation should be treated equally (leaving the discounting issue aside). But if the current generation cares about the next generation's well-being, then the latter's well-being will be double-counted in the social planner's objective function. Thus, whether (or not) the altruistic component of individuals' preferences is taken into account will affect the ranking of options in matters of collective choice.

The traditional view is that the altruistic component should not be counted, since altruists could simply make cash transfers to those toward whom they feel altruistic. In this view, the other-regarding component of preferences should be excluded because it is inconsistent with utilitarianism. The main argument here is that each person should count for one and only one. More recent critiques of double-counting (e.g. Bergstrom et al. 1986; Milgrom 1993; Yew-Kwang 1999; Bernheim 2002) have also adopted this point of view. For example, Milgrom (1993) argues against incorporating altruism into cost-benefit analyses on grounds of allocative efficiency. Others argue that altruism violates impartiality. Similarly, Yew-Kwang (1999) suggests that informed preferences should be used instead of actual preferences or "happiness." This approach, he argues, would lead to the exclusion of external preferences. But are altruistic preferences not fully informed?

One could well argue that there is no good reason to exclude altruistic preferences from cost-benefit analyses. The Kaldor-Hicks principle simply states that a given change is desirable whenever its benefits for the winners can (potentially) balance out the losers' losses. This principle can easily account for both altruistic and selfish benefits and losses. On this basis, other-regarding preferences could be taken into account.

Another issue raised by other-regarding preferences is the existence of evil preferences. If one argues in favor of including the preferences of all others, then on what grounds can evil preferences—or, more generally, the "dark side" of social preferences—be excluded? Can we legitimately consider only positively oriented social preferences while ignoring negatively oriented ones? If

as when some contexts are defined as individual while others are seen as social. Thus the market, the firm, the community, and the family are characterized by different expectations concerning the balance between individual and social interests. Shifting between such institutional contexts can be viewed as shifting between different preference orderings, which in turn implies changes in the utility function's parameters.

we take an impartial view of aggregation then we should, of course, be fair to everyone: all preferences should count, even the selfish ones. Yet one objection to that view is based on the freedom of choice. Consider the case of envy, which is a negative response to others' well-being. Envious people derive positive utility from reductions in the endowments of those whom they envy; for example, envious people feel better when the freedom of others is *reduced*. Altruists respond differently: they feel better when the freedom of others is *increased*. If we can agree on some moral principles—for example, that the freedom of others should never be reduced—then evil preferences will be filtered out in the aggregation. The question is thus transformed from “which preference types should be counted” to “which principles should be adopted in carrying out the aggregation.”

Choosing an aggregation technique for individual preferences helps us to disentangle selfish and altruistic preferences as well as to discount altruistic preferences (and thereby preclude the “dictatorship of the future”). Some techniques overweight the well-being of future generations with respect to that of the present generation. In contrast, other techniques allow the interests of the various generations to be properly balanced. Aggregation, however, raises another important issue: on what ground does the social planner have the legitimacy to decide which generation/social group (if any) should be sacrificed? Research on these issues is still in its infancy, and it raises important philosophical issues, beyond the development of discounting and aggregation techniques.

1.3.3 Individual motivations and institutional design

Social preferences constitute a major challenge to the design of environmental policy. Current policy instruments and targets are based on the standard behavioral assumptions (i.e. selfish preferences) of welfare economics. If other-regarding preferences are widespread and if the socially oriented component of individual preferences is nonnegligible, then standard policy instruments will seldom reach their objectives because private costs and benefits will be misrepresented. Furthermore, if people have other-regarding preferences then “economic incentives may be counterproductive when they signal that selfishness is an appropriate response” (Bowles 2008). If standard *incentives* are implemented in such a context then people will, over time, come to adopt a more self-interested viewpoint at the expense of their *intrinsic social motivations*.⁴ For example, agents with a strong altruistic orientation will bear costs

⁴ Even worse, standard incentives may generate irreversible effects on individuals' preferences—in other words, effects that persist even after the incentives have been withdrawn (see, e.g., Gneezy and Rustichini 2000b). Thus, incentives designed for selfish rational agents may

and enjoy benefits in excess of those deriving from the selfish dimension of their preferences—provided their motivation is not undermined by economic incentives. But if social preferences are misrepresented or contradicted by antagonist signals, then the outcomes of standard policies may be counterproductive (as when *lower* contributions to the provision of a public good result from “incentives” designed to increase them; see Section 1.3.3.1). However, this crowding-out effect is often attenuated because individuals' motivations for contributing to environmental public goods, and the systems that influence individual behavior, are far more complex than those considered in the theory or the laboratory (Section 1.3.3.2).

1.3.3.1 The threat of crowding-out

The idea behind *crowding-out* is that government spending on public goods provision may, partially or totally, squeeze out private contributions. A standard result on the voluntary provision of public goods (Warr 1983) states that, for any arbitrary exogenous income, any redistribution among contributors is neutral with respect to the aggregate supply of public goods. This neutrality theorem has been extended by Bergstrom et al. (1986) and by Iritani and Yamamoto (2004). Bergstrom and colleagues show that redistribution from the rich to the poor might even reduce the total amount of public goods provided. Another neutrality result—public debt neutrality, also known as the Ricardian equivalence theorem—applies to intertemporal resource allocation. The idea, developed by Becker (1974) and Barro (1974), is that any attempt by the government to reallocate resources across generations is offset by a compensatory reshuffling by households via their altruistic bequests.

How do other-regarding preferences affect private contributions? Do altruistic agents provide more public goods because they care about the impact of public goods provision on the well-being of others? The tentative answer is “yes.” If agents have altruistic preferences, then their marginal utility from providing the public good is greater and so they will make a larger contribution to the public good. Nonetheless, crowding-out still occurs since the contribution of agents is influenced not only by their own utility but also by others' altruistic utility. In short, it remains unclear just how social preferences affect voluntary contributions to public goods.

Suppose crowding-out is complete. Then policies designed to increase provision of a global public good will fail to achieve that objective if they are based on income transfers between agents. Hence the question becomes: “When can we neglect crowding-out?” There are at least two conditions

crowd out the intrinsic motivations of socially oriented agents, who consequently amend their preferences to more nearly match those of the selfish rational agent.

under which crowding-out will be limited: when impure altruism (or “warm glow”) is a factor and when nonlinearities are present in production of the public good. The first case has been extensively investigated in the theoretical and experimental literature (see Andreoni 1989, 1990, 1993; Bolton and Zwick 1998; Eckel et al. 2005). Impure altruism means that agents derive utility from the act of giving itself: they care less about others’ utility than about their own utility gain from giving (which thus can be interpreted as a private good). So even if they have a lower income and others have more, these agents still contribute to the public good because they derive utility from doing so. Such impure altruism leads to partial crowding-out, an outcome that is compatible with most empirical findings from the field and from various types of experiments. Also, if the government’s production technology differs from that of private individuals, then crowding-out still occurs, but only at the margins (Hattori 2003). Empirical evidence of insignificant nonlinear crowding-out is reported in Gibson et al. (2006).

To conclude, crowding-out exists, but its magnitude and therefore its actual impact on policy tools needs to be explored further.

1.3.3.2 Altruism, long-term thinking, and compliance

More generally, taking the complex motivations of individuals into account leads to a better understanding of how actual policies should utilize various imperfect tools to manage the processes of institutional design. For instance, the presence of a strong altruistic norm in favor of future generations might be used to establish constitutional rights for those generations. Survey data indicate that voters or members of a collectivity who are unwilling to exhibit restraint when their income is immediately affected might nevertheless vote for a general rule. In other words, the norm of altruism makes it possible to change a situation of conflict into a coordination problem.

Also, other’s regarding preference might impact on compliance. Promoting altruistic norms will have a positive effect on the stability of any coordination equilibrium that arises. As suggested earlier, then, compliance with principles derived from the logic of sustainable development can be achieved only by combining the enforcement of formal rules with adherence to informal norms of behavior. For this reason, the adoption of new institutional arrangements frequently requires an actual change in behavior. Yet characterizing compliance as pure obedience would miss the broader point that agents commonly share and accept the rules, thus making these rules their own. This internalization of the norm encourages actors to accept the common good’s primacy over their individual objectives (Tyler 1998: 271).

There is an important distinction to be made between calculated and normative motivations for compliance (Burby and Paterson 1993; Winter and May 2001). In the former case, an agent’s willingness to comply is

determined by calculating the expected positive or negative outcomes from following or disobeying a rule. The main factors in this calculation are the likelihood of being detected while breaking the rule, the size of the punishment or reward, and the credibility of the threats of punishment. There is overwhelming empirical evidence (see Nadeau 1997) that strengthening enforcement produces higher compliance in such calculating agents. Also, increasing the formality of rules leads to greater compliance because it increases both transparency and the probability of being convicted (Almer and Goeschl 2010). In the latter case of normative motivations, concern about gaining respect or incurring opprobrium from other group members also plays a role in encouraging compliance. We should also mention the impact of self-esteem when complying (or not) with the socially imprinted rules that establish, for most individuals, what is right and what is wrong.

In sum, managing environmental policies more efficiently will require a much deeper understanding of factors that explain the co-evolution of *norms* and *institutions*. More generally, the nature of our environmental *commons* makes it worthwhile for the social sciences to explore further the nature of individual preferences—and especially the processes by which they can be articulated to build the social preferences required for viable decisions about the commons.

1.4 DESIGNING INCENTIVE MECHANISMS WHEN CONSTRAINED BY A SOCIO-POLITICAL GAME

In the presence of externalities, letting agents decide how to use a resource leads to the impacts on others being ignored. Two solutions to this problem have been envisioned: implementing *property rights* (Section 1.4.1) and designing mechanisms to correct incentives (Section 1.4.2). However, with either approach the possible choices are constrained by the role of complex motivations and the logic of socio-political games. We insist here, and in this book, on the impact of the later on the implementability of these solutions.

1.4.1 The difficulties and dilemmas of creating a property rights system

Because they internalize or eliminate externalities, *property rights* can be a viable way of solving some problems of the global commons. Of course, the privatization of resources can generate a welfare loss because some parties are thereby deprived of access to the public good. But if perfectly defined and

enforced, property rights allow decision makers to balance the social benefits and costs so that excessive extraction, pollution, or harvesting does not occur. Property rights can evolve bottom-up under international law; but where *transaction costs* preclude this process, property rights can be created top-down. Property rights involve issues of allocation, measurement, boundaries, and enforcement.

1.4.1.1 *The political economy of property rights design and distribution*

The assignment of property rights to address open access enables the most direct and transparent assignment of benefits and costs, yet it requires costly policies to implement them. Any meaningful property right involves exclusion, which has the potential to produce distributional conflicts. Furthermore, a property right may increase in value (for any number of reasons), in which case new wealth, status, and political influence is conferred on those who secure that right. Such changes alter existing social and political positions, inciting controversy that may be costly to politicians. Finally, constituencies that benefited from the previous regulatory arrangements are likely to be disadvantaged by any new rights system. Even inefficiencies can generate constituencies for maintaining the status quo. Demsetz (1967) suggests that property rights could emerge gradually with the rise in resource values, thus offsetting the costs of definition and enforcement. However, experience has indicated that the process of institutional change is more complex than Demsetz envisioned. Allocation is contentious because of the assignment of political influence and distribution of wealth associated with exclusive property rights. Political conflicts and negotiations determine the arrangements that ultimately emerge as well as their timing and effectiveness. For this reason, the political creation of property rights attracts rent-seeking efforts to influence their distribution—efforts that are costly in themselves.

1.4.1.2 *Three allocation mechanisms*

As emphasized by Coase (1960), allocation rules are always important for distribution and will affect efficiency in the presence of *transaction costs*. Worldwide, “prior use” is the dominant method used to establish property rights: it assigns ownership to the entities that implicitly and freely exercised the right prior to the scarcity created by the introduction of the new policy. Prior-use rules are attractive because they recognize incumbent parties, who will be important constituents in any distribution of property rights (given in particular their concern about past investment in specific assets); incumbents are typically the highest-valuing users once a new policy is initiated. Moreover, prior-use rules do not undermine efficiency. Instead they create opportunity

costs, which will lead recipients to treat these rights as a valuable asset and to use them judiciously—including experimentation with ways to increase the efficiency of resource use in response to the new cost. Another advantage of prior-use arrangements is that the pre-policy market determines the optimal claim size. In contrast, assignments under other allocation systems are determined by bureaucratic or political considerations. If the results are not compatible with optimal production size then further trade is required, and if *transaction costs* are high then such exchange may be limited.

Rules based on equal sharing bypass distributional procedures based on prior use and better reflect egalitarian goals. If there are no restrictions on the subsequent exchange of property rights and if *transaction costs* are low, then equal sharing has few efficiency implications because the resource still migrates to high-value users. In addition, a uniform allocation avoids the costs associated with verifying claims about past production or use and can also avoid the inefficiencies—in particular, overinvestment in the race to capture property rights—that result when a forthcoming allocation rule is known to be based on prior use. A lottery is one example of a uniform allocation.

A third allocation mechanism is the auction. Auctions put assets directly into the hands of those who place the highest value on them, thereby avoiding the *transaction costs* of reallocation. Auctions also generate resources for the state and avoid “windfall” profits, which could be divisive if viewed as being unearned. Auction returns can be used to cover the costs of defining and enforcing property rights and other costs of resource management, as well as to fund a wide range of other social policies, including the reduction of distortionary taxes on factors of production. As with lotteries, auctions work best for new, unallocated resources for which there are no incumbent claimants. Incumbents naturally resist auctions for the allocation of rights: they do not wish to pay for something to which they consider themselves already entitled by virtue of their prior use. Auctions can be employed in conjunction with other allocation arrangements to provide an “adjustment margin,” as may be needed when some parties are not allocated enough property rights for efficient production yet the *transaction costs* of increasing them are high.

1.4.1.3 *The timing dilemma*

Our discussion of allocation mechanisms suggests that there is an underlying *collective action* problem associated with the definition and assignment of property rights. The main issue is that establishing property rights involves high resource and political costs relative to their expected gains, at least in the short term. The issues become even more problematic when multiple parties claim a stake in the resource. Then an open-access equilibrium is often self-sustainable from a political standpoint despite entailing inefficiencies and resource depletion.

Even if collective action has previously been impossible, it can become more likely when a crisis occurs. New information emerges about the severity of the problem, which decreases uncertainty and measurement costs while reducing information asymmetries. The resource becomes more valuable (perhaps owing to its greater depletion), and this increases the benefits of action. New techniques or technologies are developed to lower the costs of closing the externality. Finally, the number of involved parties declines to reflect the decline in private returns to exploitation.

It should be clear that, just as in the national political arena, politicians have incentives to delay action until there is a crisis. The open-access problem is serious enough to generate the information needed to clarify the distribution of costs and benefits across and within countries and constituencies. Only then will politicians be able to mobilize political support for action that requires costly production adjustments as well as transfers, both internal and external, to mobilize collective efforts.

The point is that establishing property rights may result in serious shortcomings. There is often a war of attrition between the various stakeholders, each of which wants the others to pay for the privatization process. This is why property rights might not be established until *after* the resource has already been overexploited and mismanaged. Note also that, to shore up their support, politicians influence the assignment of property rights so as to weaken the regime's ability to manage the considered resource more efficiently.

1.4.2 Mechanism design: playing off the cushion

1.4.2.1 Incentive mechanisms

The property rights approach rests on the possibility of excluding agents from the benefits of a good unless they have a specific right to enjoy it. But excludability is often not possible because it is too costly or difficult to implement. In such cases, outside intervention is necessary. An externality can be viewed as an unpriced commodity, so another option is to create a market for the externality. This approach is known as the "mechanism design" solution.

This idea has led to a broad literature on the use of economic *incentives* to reach environmental goals. The term "economic" is usually reserved for incentives that specify a particular goal but leave it for market participants to decide (via financial incentives) how that outcome is reached. Thus, environmental taxes and emission trading are normally considered to be examples of market- or incentive-based instruments. Yet if this notion is taken literally then the more traditional legal policy instruments (such as liability rules and regulation) are also incentive-based because they incentivize

market participants to reach a particular policy goal (such as reducing specific emissions). The main differences between the two instrument types are the amount of flexibility allowed and the sanctions applied if a particular goal is not reached.

We should, however, consider still another perspective. It is based on the idea that most environmental goods are jointly produced in that they draw from ecological systems, which from a production perspective are multiproduct and multiprocess by definition. The provision of clean, drinkable water to an increasing urban population can employ natural filtration techniques, which require natural spaces and especially forested areas. Forests are carbon sinks as well as reservoirs of biodiversity. Therefore, revenues generated by the provision of water to cities (and to agriculture) can and should be "socialized" to fund reforestation and support populations living in forested areas. In the spirit of the Rio convention on biodiversity, the provision of many (public) goods could be cross-subsidized by marketing jointly provided goods for which exclusion is manageable. Of course, this in turn would raise the issue of monitoring cross-subsidies to avoid mismanagement of resources and could also cause other socio-political distortions.

1.4.2.2 The issue of compatibility

When considering multilayered governance, we must not overlook a key issue: the possibility of interplay between policy instruments that are implemented at different levels. These instruments may even be in conflict and destroy each other's effectiveness. The solution to this problem is multilevel coordination; the issue has been partially addressed in the literature, and there are three main strands. The first concerns policies that have a harmful impact on the environment, usually because their effect on pollution has been completely ignored (OECD 2007). The second strand is devoted to fiscal policy and explores how implementing a carbon tax may be suboptimal unless pre-existing taxes are taken into account (Wendner and Goulder 2008). Third, some studies have examined the interplay between supranational regulations (e.g. markets for tradable permits) and national fiscal policies. It has been shown that such interactions are sources of inefficiencies and that promoting higher-level regulation *without* lower-level harmonization may not be optimal. See, for example, Santore et al. (2001) on the US sulfur dioxide market and Bréchet et al. (2007) on the EU's Emissions Trading System.

Important elements of continued compatibility include regular assessment of the contributions of each implementation mechanism as well as democratic debate about these evaluations. Also critical are forms of reflexive governance that involve communities and social networks in the implementation frameworks.

1.5 CONCLUSION: THE CHALLENGES OF POLYCENTRIC AND NETWORKED GOVERNANCE

Taken together, the distinctive features of the governance of environmental issues call for innovation in systems of governance. We will explore in particular two promising trends—decentralized networked governance in federal systems and global environmental governance—that developed in response to the shifting demands on governance. We also ask a series of questions about the capacity of these governance forms to handle a range of issues involving scale, time, and uncertainty.

Decentralized (or polycentric) networked governance has been extensively studied (Reinicke and Deng 2000; E. Ostrom 2001; Hajer and Wagenaar 2003; Haas 2004; Slaughter 2004). It can be characterized as an attempt to take into account the increasing importance of NGOs, the private sector, scientific networks, and international organizations in performing various governance functions. The aim of networked governance is to foster synergy between different types and sources of knowledge in order to deal with complex and interlinked problems. From this perspective, governance is best accomplished through decentralized networks of private and public actors associated with international, national, and regional organizations.

However, we have seen that such a mode of governance is insufficient in cases of systemic change. Here, interdependencies may dictate that individual networks act in ways that run counter to the actions of others. Under the Montreal protocol, for example, China could start producing CFCs even as other countries were cooperating to reduce their production. Global environmental governance is the answer to problems raised by functional interdependencies on a global scale.

These trends are illustrated by an especially interesting example of global governance: the Earth System Science Partnership (Biermann 2007). In 2001, four global change programs—DIVERSITAS, the International Geosphere-Biosphere Programme, the World Climate Research Programme, and the International Human Dimensions Programme on Global Environmental Change—joined forces to intensify their cooperation through the establishment of an overarching Earth System Science Partnership. The research communities represented in this partnership contend that the earth system now operates “well outside the normal state exhibited over the past 500,000 years” and that “human activity is generating change that extends well beyond natural variability—in some cases, alarmingly so—and at rates that continue to accelerate” (Biermann 2007). To cope with this challenge, the four global change research programs have called urgently for “an ethical framework for global stewardship and strategies for Earth System management” (Steffen et al. 2004).

Both global environmental governance and decentralized or polycentric networked governance are emerging as responses to the *collective action* problems raised by environmental goods and the need to address them. These governance modes share two important features: (1) recognition of the role played by hybrid networks composed of state actors and nonstate actors (civil society, community organizations, nonprofit organizations, industry associations) in providing different types of collective goods; and (2) assignment of new roles to government (Delmas and Young, 2009).

In the case of decentralized or polycentric networked governance, the new role of governments is to facilitate network dynamics. Previously, the government’s role in regulating networks was restricted to managing negative externalities—as generated, for example, by the capture of rents in network industries. The rents and the externalities remain, but network activities are increasingly situated in a complex web of interdependencies that entail both positive and negative effects. In this new context, governments must not only manage negative externalities but also facilitate the generation of positive network effects, such as the provision of collective goods. Governments have consequently become more involved in such activities as stimulation of social learning, building of adaptive capacities, support for research into standardization, and other issues of common concern.

In the case of Earth system governance, global arrangements are created that place new constraints on member states. These constraints can take the form of new independent authorities of last resort (e.g. independent dispute resolution authorities), global funding schemes, or a set of instruments designed to relay information and improve coordination. In this context, states become intermediary players between the demands and constraints of lower-level constituencies on the one hand and, on the other hand, the global order consisting of different state and nonstate actors.