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**Local Commons and Global
Environmental Interdependence:
Tragedy of the Commons
or Opportunity for Institutions?**

ROBERT O. KEOHANE

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Local Commons and Global Environmental Interdependence: Tragedy of the Commons or Opportunity for Institutions?

ROBERT O. KEOHANE

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Table of Contents

Introduction	p. 7
I. Two Controversies about Conflict and Cooperation	p. 8
II. Successful Institutions and the Operating of Reciprocity	p. 10
III. Creating and Maintaining Conditions for Reciprocity to Work	p. 14
Conclusion	p. 17
Bibliography	p. 19
Biographical Note	p. 21

Introduction

This lecture has four main themes, which I will summarize at the outset:

1) Work on local commons issues – irrigation in Nepal or mountain pastures in Switzerland – is characterized by conflicts of views that are remarkably similar to conflicts over issues of global interdependence – in the environmental field or elsewhere. In both cases, a pessimistic, “inexorable conflict” school is pitted against a conditionally more optimistic, “institutionalist” school of thought. These similarities seem to be due to structural similarities in the nature of the problems.

2) Successful institutions do exist, both with respect to local commons issues and on international questions, which do rely on centralized coercion. Instead, they foster procedures and practices that can be summed up in a phrase: “making reciprocity work.”

3) When we look closely at the conditions for effective institutional action, however, we see that *reciprocity is not enough*. It is necessary but not sufficient. If the world environment is to be protected, there also needs to be enough concern – political mobilization – and sufficient capacity to act, what is variously called “social capital” or “national capacity.”

4) Hence, the quality of international environmental protection efforts during the next decades will depend on creating concern, capacity, and the conditions under which reciprocity can thrive.

I will proceed by first discussing two controversies about conflict and cooperation in different fields of political science: the study of common property resources (CPRs) and the analysis of world politics. I will argue that the controversies are structurally similar. In Part II, I will put forward the proposition that institutions can successfully deal with issues of common property, and of global interdependence but only on condition that conditions favor the effective operation of reciprocity. Hence, in Part III I turn to the question of how conditions that enable reciprocity to work can be fostered and maintained.

I. Two Controversies about Conflict and Cooperation

Two literatures discussing conflict and cooperation – those on common property resources (CPRs) and international relations – are both characterized by a sort of dualism of thought. On one side are those who see conflict as endemic, for structural reasons, apart from human agency; on the other, those who argue that well-designed institutions can promote cooperation, under certain conditions.

In the CPR literature, this controversy is epitomized by the differences between the view of Garrett Hardin (1968) and Elinor Ostrom (1990). For Hardin, when social stability enables population growth to occur, “the inherent logic of the commons remorselessly generates tragedy”, as a result of a contradiction between individual incentives and aggregate welfare. Each herdsman grazes too many animals on the commons because he only bears a small fraction of the negative externalities thus created. “Each man; is locked into a system that compels him to increase his herd without limit – in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own freedom in a society that believes in the freedom of the commons” (Hardin 1968: 1244-45). For Hardin, the only plausible answer is coercion: governmental power exercised to protect the environment and limit population size.

In contrast to Hardin's deterministic view, in her empirical work Elinor Ostrom finds a number of arrangements for governing commons that have lasted for centuries, such as mountain villages in Switzerland and Japan, and irrigation institutions in Spain and the Philippines; and she finds others that have persisted at least for decades. So she establishes a *possibility theorem for self-governance*: that “horizontal ordering” is possible. She does not refute the *general tendency* toward rent dissipation and the fragility of commons institutions that Hardin identifies – but her possibility theorem leads her to ask a different question: “under what conditions can successful self-governance occur?”

In the international relations literature, Kenneth Waltz makes an argument about the effects of what he calls “anarchy” in international relations – lack of common government – that is very much like Hardin's argument, with common roots in dilemmas of collective action:

"Each state pursues its own interests, however defined, in ways it judges best. Force is a means of achieving the external ends of states because there exists no consistent, reliable process of reconciling the conflicts of interest that inevitably arise among similar units in a condition of anarchy." (Waltz 1959: 238)

Waltz adds a twist missing in Hardin: the actors potentially threaten one another directly, not merely by appropriating common resources:

"When faced with the possibility of cooperating for mutual gain, states that feel insecure must ask how the gain will be divided. They are compelled to ask not, 'Will both of us gain?' but 'Who will gain more?'... Even the prospect of large absolute gains for both parties does not elicit their cooperation so long as each fears how the other will use its increased capabilities" (Waltz 1979: 105).

So for Waltz, conflict is endemic – intrinsic to the structure of world politics. He has less faith in coercion than Hardin does, but an equally bleak view of the consequences of "anarchy."

Yet those of us who study institutions and cooperation in world politics have found many institutions that in fact facilitate interstate cooperation for mutual gain – from GATT to the Montreal Protocol on Protection of the Ozone Layer (Haas, Keohane, Levy 1993). Such conflict should not be equated with harmony: on the contrary, it arises out of conflict and coexists with it (Keohane 1984). States, individuals, and groups quarrel about which values should be given highest priority, who should pay, and who should benefit. Sometimes institutions fail, or are at least quite ineffective (Keohane and Levy 1996). Yet, like Ostrom, against the inexorable/inevitable conflict theory we can establish possibility theorems: sustained and significant cooperation among states does occur, and it occurs through institutions.

What I want to point out here is that these controversies are structurally similar. Hardin and Waltz identify real dynamics of over-use and conflict, which fundamentally affect actors' behaviour. Yet in both domains claims of inexorability and inevitability seem problematic in light of the empirical evidence, since cooperation sometimes takes place. That is, cooperation takes on different values at different times, rather than always approximating zero. It is a *variable*, which needs to be explained.

In both cases, the key to cooperation seems to be the *ability of actors to make credible commitments*, which requires institutions that constrain their behaviour. The crucial analytical question in both cases is: under what conditions can institutions be created that make it possible for actors to make credible commitments, as well as to coordinate their behaviour – hence to cooperate?

This question is at the center of international relations theory, and it has a normative as well as analytical content: How is humanity to escape the “trap” outlined by the “tragedy of the commons” and by incentives for international conflict? How can we, through conscious effort, avoid Malthusian impoverishment, environmental degradation, and even a new, nuclear round of military conflict that might destroy the prospects for fulfilling human life more thoroughly, and certainly more quickly, either impoverishment or degradation? A social science not seeking answers to these questions would be a social science of irrelevance or despair.

II. Successful Institutions and the Operation of Reciprocity

We can start to identify causes of variation in cooperation by looking at some of the successful institutions that have been identified. These institutions, of course, are not representative; a rigorous analysis would have to begin with the explanatory variables of theory, then see what phenomena are associated with different configurations of such variables. Yet for the purposes of this lecture, successful institutions may tell us something about the processes that are associated with cooperation, on commons problems or issues of international politics. We are so familiar with the failures – instances of resource depletion, trade conflict, and war – that it may broaden our thinking first to reflect on some successes. From these experiences we can extract some common *principles of successful institutions*, which center on the concept of *reciprocity*. Such an analysis can provide us with hypotheses that could be tested by empirical work.

Some of Ostrom's most telling examples of successful cooperation are from mountain villages in Switzerland and Japan, which successfully managed their commons for centuries. The Japanese villages had elaborate rules for collecting plants from the commons, and hired “detective” to patrol it. In

Torbel, Switzerland, a rule dating from 1517 AD provides that “no citizen could send more cows to the alp than he could feed during the winter” (Ostrom 1990: 62). In this village, cows are counted at the beginning of the season and fines are imposed for those who break the rules.

On the international relations side, despite premature announcements of its death, GATT has been a highly successful institution, which has promoted lowering of tariffs; reductions in non-tariff barriers; and dispute-resolution among major trading countries. GATT has developed increasingly elaborate rules for trading behaviour, but at least until now has not had any centralized system of enforcement. Enforcement is by reciprocity: *authorized retaliation* by trading partners whose interests have been damaged.

In thinking about the institutional attributes that are associated with success, I have been impressed by a remarkable agreement between Ostrom's observations about local commons questions and my own work, and that of other colleagues, about international relations. Five institutional attributes seem particularly important:

1. *Clearly defined institutional boundaries*: knowing what is covered, what is not.
2. *Broad participation in rule-making*.
3. *Systematic arrangements for monitoring*.
4. *Graduated sanctions for violation*.
5. *The availability of conflict-resolution mechanisms*.

What these features do is to make *regulation by reciprocity* feasible. Although Ostrom derived them inductively from her studies of local commons issues, they apply to international institutional arrangements, such as GATT or the Montreal Protocol on Depletion of the Ozone Layer.

If reciprocity is so important, what does it mean, and how does it work? Reciprocity is an ambiguous term – like the “balance of power”, it can easily come to mean everything or nothing. As I. L. Claude commented thirty years ago: “Balance of power is to writers on international relations as ‘a pinch of salt’ is to cooks; ‘stellar southpaw’ to baseball writers; and ‘dialectical materialism’ to Marxist theoreticians” (Claude 1962: 12). The most general meaning of reciprocity refers to its essential features of *contingency* and *equivalence*. It refers to: “exchanges of roughly equivalent values in which the actions of each party are contingent on the prior actions of others in such a way that good is returned for good, and bad for bad” (Keohane 1989: 136).

In *specific reciprocity*, the identities of the other players are known: each player responds in kind to actions of the others in a way known as “tit for tat.”

Practicing specific reciprocity can affect the incentives of players in a way that promotes cooperation. In a sense, it can create gains from political exchange, analogous to the gains from economic exchange identified by Adam Smith and David Ricardo. Those who care about environmental harm in other states can attempt to make it worthwhile – positively or negatively – for other governments to do something about it. “Leaders” can prompt “laggards” to act – without the necessity for coercive, centralized government. The fact that others’ cooperation is contingent on one’s own provides incentives even to reluctant actors to maintain cooperation (Axelrod 1984). This does not mean that reciprocity always works effectively: conflicts of interest and values may be too great, or the expectation of future gains from cooperation may be reduced by uncertainty about whether the game will continue. But chances for cooperation are better than if each state faces the opportunity to be a “free-rider” – not to contribute to a collective good while others do so – without the prospect of punishment.

Examples of specific reciprocity in international relations are common, on trade and environmental issues, bilaterally and multilaterally. In the General Agreement on Tariffs and Trade (GATT), states not abiding by GATT rules do not necessarily get the benefit of mutual concessions negotiated by GATT parties. The United States, as the largest trading partner, employed reciprocal strategies in such sectors as steel, autos, and wheat flour (Rhodes 1993). States not adhering to the ozone accord could have faced trade sanctions (Parson 1993; Desombre and Kauffman 1996).

Reciprocity can have effects on domestic politics, even without formal derogations of sovereignty, since interests faced with adverse reciprocity may press for more cooperative policies for fear of retaliation. Exporters may oppose protection more vigorously than they otherwise would, and multinational firms in import-competing industries may not demand protection for themselves (Milner 1987). So for these reasons, reciprocity is a powerful practice. It is often employed by states, and sometimes has identifiable effects.

However, specific reciprocity encounters a number of serious problems in practice. Robert Axelrod (1984: 138) points out that “the trouble with TIT FOR TAT is that once a feud gets started, it can continue indefinitely.” Furthermore, “noise” – difficulty in interpreting information – can have destruc-

tive effects cooperation when strategies of reciprocity are employed (Signorino 1995). When more than two actors are involved, problems multiply. There is a second-order collective action problem: who is to enforce rules, when enforcement is costly and unrewarded? (Ostrom 1990). And as the history of international trade politics shows, when strict specific reciprocity is employed, each bilateral deal may render earlier bargains obsolete, insofar as the value of a particular concession depends on others not receiving it (Keohane 1986: 17-18).

These problems can to some extent be ameliorated by appropriate institutions, which provide information, establish norms that provide incentives to follow and enforce rules, and set up arrangements for the resolution of disputes. But for these institutions to work smoothly, they may need to be combined with practices of *diffuse* rather than specific reciprocity. Diffuse reciprocity means that actors comply with general norms in the interest of producing a joint benefit, but without expectation of specific rewards or punishments. Unconditional most-favored-nation treatment in trade – automatically extending benefits of reductions in trade barriers to any members of a club – is a prominent example of diffuse reciprocity. Many environmental agreements such as those on climate change also have this feature: a set of rules prescribing behaviour is established, with the understanding and pronounced noncompliance could lead to re-evaluation, but without making receipt of benefits contingent on specific reciprocal action.

Diffuse reciprocity has significant benefits, which are the obverse of some of the costs of specific reciprocity. There is no need for a complicated “adding-up” of benefits and contributions, which complicates multilateral cooperation (since there is rarely agreement among countries on these issues). Under diffuse reciprocity, problems of feuds and noise inhibiting cooperation do not arise. And when communities really form, as in some of the villages discussed by Ostrom (1990), norms become widely accepted and internalized, which lowers enforcement costs.

Unfortunately, however, actors practicing diffuse reciprocity can be exploited. So in the absence of strong norms of obligation (as in small communities) diffuse reciprocity is unstable. Hence overall patterns of diffuse reciprocity typically have to be maintained through the sanctions of specific reciprocity. As in the GATT, when reciprocity works in multilateral relations, diffuse and specific reciprocity work in tandem, each to some extent overcoming the others weaknesses.

III. Creating and Maintaining Conditions for Reciprocity to Work

How can reciprocity be made to work? Elinor Ostrom (Ostrom 1995, ch. 6) tells an interesting illustrative story. In Nepal, much agriculture employs irrigation. Since water runs downhill, each irrigation system has "head-enders" and "tail-enders." Head-enders get the water first. The political problem this raises is: when the marginal value of additional units of water is greater than zero, why should one expect head-enders to provide any water at all to tail-enders?

The answer has to lie in reciprocity. What can the tail-enders provide in return – what is their bargaining chip? With traditional irrigation technology, canals and waterworks require continual and extensive maintenance; hence the head-enders need the tail-enders provide labour to maintain the irrigation works. Tail-enders therefore play a reciprocity strategy: they provide labour contingent on receiving a prescribed share of the water.

Now comes the irony. Since the 1950s, the World Bank and other agencies have been building modern irrigation works in Nepal. Now the head-enders do not need the labour of the tail-enders; hence they grab all the water. The results are inefficient overall, since the marginal productivity of the water declines after some point; but from their point of view, such a strategy makes sense, since the marginal productivity of the additional water is greater than zero. Under these conditions, the tailenders dry-farm and do not work on the irrigation works. The consequence is that the modern irrigation works have *lower productivity* than the old-fashioned one. Ostrom's data (Ostrom 1994: 149) show that farmer-managed systems (with the old technology) have higher productivity than agency-managed systems (which employ the modern technology). The lesson is that both scholars and practitioners need to pay attention to "social capital" – the capacity of people to cooperate with one another – as well as physical capital, since social capital is at the basis of the effective operation of reciprocity, hence cooperation (Putnam 1993).

At the global level, successful institutions also need to be consistent with incentive systems that produce reciprocity. Two examples illustrate this point.

In the early 1980s, public concern about acid rain increased sharply in Europe, especially in Scandinavia and Germany. Agreements that had originally been created for largely symbolic purposes, to promote detente between

the Soviet bloc and the West, became principal vehicles for substantial reductions in sulphur dioxide emissions between 1980 and 1989 – to levels that were 58% below projections made in 1981. For some – not all – European countries the international agreements made a causal difference, through increasing knowledge about domestic damage or as a result of linkages among issues (Levy 1993: 114–119). Here is an example of the operation of diffuse reciprocity – embodied in norms for sulphur dioxide reductions – buttressed by specific reciprocity, in the form of linkages drawn by powerful states to other issues.

In 1987 a famous agreement – the Montreal Protocol on Substances that Deplete the Ozone Layer – was signed, and it has since been strengthened repeatedly, although only two years earlier it had been impossible to reach more than a framework agreement without specific content. The Montreal Protocol called for 50% cuts in production of basic chlorofluorocarbons (CFC's) by the year 2000; the rule now is that rich countries must totally end their production this year. The rules of the Montreal Protocol reflect diffuse reciprocity: general standards of behaviour are established. These standards are different for rich and poor countries: poor countries are given longer time periods for phase-out and provided with financial aid. But diffuse reciprocity is also buttressed by trade sanctions against violators. The financial transfer institutions have been set up and are working, although it is probably too early to be sure of their overall effectiveness (DeSombre and Kauffman 1996).

In general, effective international institutions seem to depend on three conditions, which my colleagues and I have elsewhere dubbed the “three C's”: 1) sufficient *concern* on the part of publics and governments about environmental problems; 2) a benign *contractual environment* – institutional arrangements in which reciprocity can work; and 3) sufficient *national capacity* to take effective environmental action (Haas, et al. 1993).

The importance of international institutions, and the conditions of concern, contracting and capacity that affect their operation, can be illustrated by looking not just at international environmental successes but also at failures. I will raise two examples from Eastern Europe: environmental clean-up (mostly air and water pollution) after 1989, and attempts to reduce reliance on unsafe nuclear power plants in the area.

Descriptively, the picture is not a pretty one (Connolly, Gutner, Bedarff 1996). In general, the level of funding to solve environmental problems in

Eastern Europe is low – not more than 10% of requirements come from international action, which totals only on the order of \$2 billion. Estimated needs run in the many tens of billions. Local governments in Eastern Europe have given these issues relatively low priority. Donors “tie” their aid so they get a large share of the benefits – consultancies, equipment sales, and the like. And the most serious problems are often ignored – local air pollution, for example – in favor of transboundary problems. National capacity is lacking.

Analytically, the “garbage can” model of organizational decision-making devised by Cohen, March and Olsen (1972) fits the evidence best: the various international organizations have ready-made “solutions” that look for problems. Solutions drive problems rather than vice versa.

Similar patterns are evident on the more specific problem of East European nuclear safety (Connolly and List 1996). Already in 1990, Soviet-built reactors were identified as dangerous – and poorly run. Cost estimates ran around \$20 billion. Not only has funding been relatively low – on the order of \$1 billion – but more important, the nuclear industry has defined the problem. Hence there has been an emphasis on providing more power, rather than on reducing demand for power in what is a very wasteful system. Finally, both public concern and national capacity to run plants safely has also been lacking in Eastern Europe. These governments have not made nuclear safety a priority, although some international programs have made a positive impact on national capacity to operate nuclear plants. Ironically, international action has sometimes provided technical “fixes” that make the nuclear danger somewhat less severe in the short run at the cost of providing incentives for governments to keep dangerous plants going longer. Hence reciprocity takes the perverse form of the East Europeans agreeing to incremental, partial action by the West to make their nuclear plants somewhat safer, in return for an absence of real pressure for fundamental change.

Analyzing ineffectiveness reinforces the significance not only of reciprocity and institutions that facilitate it, but also of concern and capacity. Some combination of specific and diffuse reciprocity is a necessary condition for effective international environmental action, in a world still characterized by sovereignty and state authority. But the channels of reciprocity can carry pollution as well as efforts at clean-up: domestic political mobilization on behalf of environmental goals – what I have called “concern” – is essential if the channels of reciprocity are to have environmentally benign effects. So is national capacity to implement what is agreed upon. When any one of them is lacking, the results tend to be pretty bad.

Conclusion

In concluding, I want to move from research-based findings to some more speculative arguments about the effects of the end of the Cold War on the ability of states to deal with international environmental issues.

One could argue that the Cold War created the willingness to work together in the West, with less concern than otherwise about specific reciprocity, much less about relative gains. The United States needed its allies more, or thought it did – like the “head-enders.” The allies certainly needed the US more. Hence the Cold War in effect created social capital. As long as the US took leadership, others had incentives to follow even if they weren't totally persuaded. Sovereignty became a secondary value, subordinate to some extent to security or even to prosperity.

So we can ask: After the Cold War, will we see a decline in the conditions for the operation of reciprocity or an increase in concern about sovereignty?

With respect to reciprocity, patterns of dependence will indeed change, hence the underlying configurations of power and interests on which international institutions depend. Undoubtedly, therefore, institutions will change, sometimes dramatically. But effective international institutions in the foreseeable future will continue to be built not on the model of world government but on increasingly complex and multi-level forms of reciprocity. Hence, creating and maintaining the conditions for reciprocity, and a context of concern and capacity in which it can operate, will be crucial for international environmental protection well into the next century.

With respect to sovereignty, I think that the costs of seeking to maintain extensive freedom of action without acceptance of legal and institutional constraints will continue to be very high. We live in a world of extensive economic interdependence, which forces governments to make continual trade-offs between maintaining their own *operational sovereignty* – legal freedom of action – and having more control over others' actions. Growing interdependence means that control over others' actions becomes progressively more important, relative to the value of maintaining one's own legal freedom of action. Hence, as long as economic and ecological interdependence grows, I do not expect the demand for sovereignty to make a great comeback among the stable, developed countries.

To return to my original theme, to Hardin, Waltz, and Ostrom: there is no inexorable "tragedy of the commons", or of "anarchy in international relations." There is the potential for tragedy – many opportunities to find it. But the fault lies not merely in our stars – or in the structure of the situation – but also in ourselves. We should understand the potential tragedy, but also observe that it opens up an opportunity for international institutions.

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April 1991, pp. 73

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International Political Economy,
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European Policy Formation
April 1991, pp. 58

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April 1991, pp. 25

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Integration,
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Agenda,
October 1991, pp. 87

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Deregulation,
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System - or Scandal?,
March 1992, pp. 49

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June 1992, pp. 42

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and the Nordic Countries - End
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Membership?,
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making: Confessions of a
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Disillusion,
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Professions. The State Beyond
The Nation-State,
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Maastricht
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Regime
March 1995, pp. 49

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Modelling Political Order in
Representative Democracies
June 1995, pp. 38

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The Fate of Non-Members of
Dominant Nations in Post-
Communist European Countries
June 1995, pp. 34

HORST SIEBERT
Eastern Germany in the Fifth
Year. Investment Hammering in
the Basement?
September 1995, pp. 45

CAROL HARLOW
Codification of EC
Administrative Procedures?
Fitting the Foot to the Shoe or the
Shoe to the Foot
September 1995, pp. 34

FRITZ W. SCHARPF
Negative and Positive Integration
in the Political Economy of
European Welfare States
November 1995, pp. 44

VINCENT WRIGHT
Industrial and Banking
Privatization in Western Europe:
Some Public Policy Paradoxes
November 1995, pp. 40

ROBERT O. KEOHANE
Local Commons and Global
Environmental Interdependence:
Tragedy of the Commons or
Opportunity for Institutions?
November 1995, pp. 21

REPORT OF THE
COMMISSION OF THE EUROPEAN COMMUNITIES
ON THE
PROGRESS OF THE
RESEARCH AND DEVELOPMENT
PROGRAMME FOR 1982

