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Institutional Interplay
Research Questions

A Report For
Institutional Dimensions of Global Change
International Human Dimensions Programme
on Global Environmental Change

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September 20, 1997

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1. Introduction

Institutions do not act alone and in isolation. They interact with, affect, and are affected by other institutions. In an increasingly turbulent, crowded institutional world, it is indisputable that institutions impinge on one another in a variety of ways, overlapping, conflicting, or reinforcing institutional goals, domains, and operation. These interactions affect institutional performance, effectiveness, and survival. Institutional conflicts at the same or different societal levels, may have negative, unanticipated consequences for new arrangements designed to address global environmental problems. One institution can inadvertently or deliberately block or interfere with the operation of another. Interactions among and between institutions can occur as unintended consequences of mission and operation or linkage may be deliberately included in institutional design. Inadvertent interaction, positive, negative, or neutral, may be a feature of institutions that have evolved over time whereas deliberately designed, positive linkages could be a feature of designed institutions as a response to emerging global environmental imperatives. It may be possible, from an analysis of institutional interaction, to derive design principles to promote positive, mutually reinforcing linkages among institutions at different or the same level or scale. Social scientists in a variety of disciplines have identified and isolated individual institutions to study their dynamics and assess their impacts. While this approach has led to increased understanding of institutional process, it has ignored the sometimes messy and bewildering reality of those multitudinous institutional interactions that are increasingly a significant feature of international environmental regimes. Often, simply identifying or distinguishing amongst the variety of interdependent institutions operating on or affecting an environmental problem or a natural system is fraught with difficulty. If our institutions reflect the systems and problems they are designed to address, it follows that these institutions, at the global, national and local levels, will be increasingly complex, multifaceted, interdependent and interactive. If we are to understand fully the role of institutions in affecting human behavior that in turn impacts natural systems, clearly we need to include all institutional dynamics and processes in our analyses. This paper explores the potential research questions raised by issues of institutional interplay. First, some clarification of terms may be helpful.

Definitions:

This paper was written in response to a request for a background paper to provide a basis for discussion by the social science community to develop a research agenda related to the problem of institutional interplay in the context of institutional dimensions of global change (**IDGC**) for **IHDP** (International Human Dimensions Programme on Global Environmental Change). IHDP is part of the larger **IGBP** (International Biosphere-Geosphere Programme) and has initiated a number of core projects—Industrial Transformation (IT), Land Use and Land Cover Change (LUCC) and Land Ocean Interactions in the Coastal Zone (LOICZ) which are designed to explain human behavior and its impacts in these substantive problem areas in the context of global environmental change. The IDGC program would add to that understanding of substantive problem areas, an understanding of the role of institutions as a cross cutting theme.

Institutions are defined as “constellations of rights, rules, and relationships that define social practices and guide interactions among those who participate in them”. (Young and Underdal, 1997) Institutions are “sets of rules of the game or codes of conduct that serve to define social practices, assign roles to the participants in these practices, and guide the interactions among occupants of these roles.” (Young, 1994, 3) Following the usage of regime analysts, I refer to institutions related to natural resource use and management as ‘regimes,’ resource or environmental regimes, or institutions addressing

specific or particular environmental issues. “**Regimes** are social institutions composed of agreed-upon principles, norms, rules and decision-making procedures that govern the interactions of actors in specific issue areas. They are the rules of the game that determine the character of recognized social practices.” (Young, 1989, Osherenko and Young, 1993, Krasner, 1983, Rittberger, 1995) As part of the IHDP mandate to add to knowledge of the human dimensions of global change, the goal of the IDGC program is to promote understanding of the ways in which institutions affect behavior and outcomes which cause or respond to global environmental change. The IDGC is designed to stimulate research that will help to account for the variance in those collective outcomes for which institutions are responsible. In their IHDP Scoping Report: *Institutional Dimensions of Global Change*, Young and Underdal suggest that institutions are 'important determinants both of anthropogenic activities giving rise to large-scale environmental changes and of human responses to environmental changes. They define **institutional interplay** as “the relationship (of an institution) to and interactions with one or more other institutions”. (Young and Underdal, 1997, 32) “Interplay involves interactions occurring between or among institutional arrangements operating at the local level, the national or societal level, and the international level.” (Young, 1997,2) Interplay includes a variety of linkages and interactions among and between institutions at the same (**horizontal** linkage) or different societal levels (**vertical** linkage). Young asserts that “all institutional linkages involve politically significant connections between or among institutional arrangements that are differentiable in the sense that they have distinct creation stories and ongoing lives of their own”. Young and Underdal identify two types or dimensions of institutional interplay, “functional” and political”. **Functional links** “exist whenever the establishment or operation of one institution directly affects the effectiveness or robustness of another, through some kind of inescapable interconnectedness”. “Functional linkage between institutions typically reflect (inter) dependence relationships existing in the biophysical contexts or social settings.” **Political linkages** are politically constructed linkages that “exist whenever actors decide to consider two or more institutions as parts of a larger complex or package”. (35) I also refer to this type of linkage as **structural** linkage.

In this paper, I shall review emerging theoretical perspectives and methods that may prove useful in study of institutional interplay in the context of global environmental change, and then examine a variety of ways of investigating institutional interplay, including characteristics and dynamics of institutions, characteristics and consequences of institutional interplay, and some questions related to the potential for deriving institutional design principles from such an analysis. It may be possible and useful to characterize institutions across a range of dimensions (centralized/de-centralized, societal level: local (micro)/domestic or national (meso)/ international or global (macro)) to describe interactions between and among institutions (horizontal, vertical, functional, political, coercive, collaborative, asymmetrical etc.) and to analyze outcomes or consequences of those interactions (conflicting, reinforcing, positive, negative, impacts on effectiveness, robustness, flexibility, institutional learning etc.) In addition, we can identify and characterize obstacles to and promoters of interplay and finally we may be able to identify design principles derived from the study of all of these institutional interplay dynamics. After reviewing some of the theoretical and methodological perspectives, approaches, and challenges relevant to the study of institutional interplay, (a more extensive review of the literature is presented in Appendix A) I shall investigate and attempt to implement some of those categorizations of institutions and institutional interplay in order to clarify potential research questions and approaches.

2. Theory Development: A Multidisciplinary Perspective on Approaches to the Study of Institutional Interplay

Research, concepts and hypotheses contributing to theory development and research questions relevant to institutional interplay in the context of global change, can be found in many fields, ranging from sociology, anthropology, and social psychology (the study of social networks) to such applied fields as policy analysis, planning, organizational development, and communications (the study of policy networks, intercorporate, collaborative planning, inter-organizational development, network organizations, communications networks.)

Sociologists and social psychologists have developed sophisticated quantitative techniques for describing social networks. Most of that work has focused on actors, individual and organizations, as opposed to institutions as defined above. Moving from interaction among actors to interaction among institutions, economists, political scientists and other social scientists have recently begun to attend to issues of institutions in the “new institutionalism” and to institutions related to tenure and common property resources in the emerging fields of environmental and ecological economics. Common property researchers have recently begun to consider the “outside” as well as the inside common property regimes and the problems of embeddedness. Scholars in political science and international relations have addressed concepts of interplay in the national and international arenas (regime formation and analysis) and from different theoretical perspectives (rational choice, behaviorism, new institutionalism). Researchers focusing on environmental issues particularly at the global level have studied and evaluated the impacts of international law and policy and international organizations as well as problems related to the governance of the “global commons” and compliance with international environmental agreements as well as effectiveness of environmental regimes. The literature review in Appendix A surveys these fields in an attempt to trace the history (over the past three decades) and convergence of ideas related to interplay and to identify the most pressing questions on which to build a research agenda for the study of institutional interplay in the context of IHDP, the core projects of IGBP, (IT, Lucc and LOICZ) and in the context of the problems of scale and fit identified (along with the problem of institutional interplay) in the IHDP Scoping Report. Below, I shall identify the major issues in that literature and their implications for the study of interplay in the context of global environmental change.

From the literature review in Appendix A it will be apparent that there are a wide range relevant concepts and often conflicting views of institutions, institutional interplay, and the ways in which institutions and their interaction influence actors in the global arena.

Of the fields surveyed in the literature review, three areas or approaches appear to have provided or are moving in the direction of contributing concepts, methods and theoretical perspectives relevant to and useful for the study of institutional interplay. They are the theoretical perspectives of institutionalism and the tension (often classified as a theoretical divide) between the rational choice and the new institutionalist paradigms, in economics, (and I would include the emerging field of ecological economics) sociology, and political and policy sciences, the body of work on common property regimes, and finally, global environmental regime analysis conducted by analysts in political science, international studies and environmental studies.

New Institutionalism

The recently emerging focus on institutions or the “new institutionalism” has been felt in many fields including planning (Healey, 1997), policy and organizational analysis (Powell and DiMaggio, 1991) but perhaps most extensively, in economics (North,

Rutherford, Maki, Thompson) and political science. New institutionalism is referred to as new to distinguish it from the old economic institutionalism of Veblen and Ayres, Commons, Samuels, and Mitchell or the focus in Political Science in past decades on formal, legal institutionalism. (Drobak and Nye, 1997, Young, 1994, Rutherford, 1994). As with the old institutionalism, new institutionalism incorporates a variety of approaches and meanings and defines institutions both broadly and narrowly. Most new institutionalists share the broader meaning of institutions as articulated by North: "institutions are simply the rules of the game". Most definitions in economics include rules, regulations and transaction costs. The sociological perspective is summarized by Scott, who expands the definition to "consist of cognitive, normative, and regulative structures and activities that provide stability and meaning to social behavior." For students of organizations, institutional theory "...is mainly concerned with how the institutional environment, comprised of socially created beliefs and cognitions, widely held in society and reinforced by corporate actors, affects organizations". (Singh et al, 1991) Economists study institutions such as markets or exchange systems, political scientists and scholars in international studies investigate institutions such as emerging environmental regimes on climate change, ozone depletion, marine resources etc. and a growing number of researchers in sociology, anthropology, economics and political science are looking at systems of property rights, but all of these approaches share some basic understandings and questions regarding institutional process. Thus institutionalism is emerging as a multi and interdisciplinary field that can encompass a variety of approaches. Young and Underdal summarize the common basis for the institutionalist approach:

".. Its hallmarks are a focus on rules in use in contrast to formalistic perspectives on institutions and a clear distinction between institutions construed as social practices and organizations treated as material entities with offices, personnel, equipment, budgets and so forth. The leaders of this movement have sought to shed light on 1.the processes through which institutions form or become established (2) the effectiveness of institutions or the extent to which they impact the course of collective outcomes in various social settings, and (3) the dynamics of institutions or the forces determining both the robustness of social practices and ways in which they change over time." (Young and Underdal, 1997, 13)

Why should researchers study institutional linkage, interplay in this context? Why are institutions and more particularly, institutional interplay, important in explaining human behavior that causes environmental change and responds to it? Why is institutional interplay a problem, and a challenge for social scientists? Actors, individuals or organizations at national, international and local levels, are influenced by many different, sometimes distinct, sets of rules or norms governing their actions. As researchers, we may choose to focus on the actors, individuals, organizations, governments and government units. non-governmental organizations and so on, or we may choose to focus on those factors that influence and guide the actions of those actors. Theorists of the "new institutionalism" focus on the latter, while researchers using the rational choice approach focus on the former - both almost as a matter of definition. Some analysts such as Ostrum have attempted to bridge the gap between the two approaches and to integrate them in the study of institutions and their impacts on human behavior. Ostrum and her colleagues have combined institutional approaches with game theoretic models to provide a framework of institutional choice for the analysis of local institutions for managing common pool resources. (Ostrum, 1990) The IDGC program will obviously have a primarily institutional focus, but that does not mean that there will be no room for rational choice approaches. What, for example one might ask, can the study of institutions explain and predict about the behavior of individual actors, and how can the institutional context in which choices are made by individuals be incorporated

into the rational choice approach and what can the study of individual actors explain about that institutional context in which they make their choices?

Institutions may be part of other institutions, institutions may be narrow in scope, may be small and local, or they may be international, with broad, overarching reach. Institutions at the same and different levels overlap, conflict with or reinforce one another and may have conflicting, overlapping, reinforcing influences on actors in the system. It may be considerably easier to study the actors who are more readily differentiable, but the challenge for researchers is to gain as complete an understanding as possible of the system -institutions, actors and the social and natural systems on which they act--as a whole. Ostrum identifies and responds to gaps in current theories including “the need to reflect the incremental, self-transforming nature of institutional change, the importance of the characteristics of external political regimes in an analysis of how internal variables affect levels of collective provision of rules, and the need to include information and transaction costs. Almost all of these “gaps” relate to institutional interplay and make existing models simplistic and not terribly useful as a basis for either explanation or prediction in the context of the complex processes and problems with which environmental regimes must deal.

To summarize, the arena of institutional interplay may provide an outstanding arena for bringing two heretofore disparate theoretical approaches together. If several different rules of the game overlap and conflict or reinforce one another, this give rise to a whole new area of complexity and uncertainty within which rational choice models may not provide adequate or accurate explanation. Institutionalists on the other hand, could be served by rational choice models to explain those aspects of human behavior not related to institutional influence, or in circumstances in which individual actors choose not to follow the rules of the game, or even to explain choices in designing or creating the rules of the game. For these reasons and others, some theorists are now suggesting that the two approaches may be compatible or complementary. (Dowding, 1993 Ostrum, 1991,

“The synthesis likely to come from this confrontation will involve a view of human action that is both rule-governed and rational. To be rule-governed, the rational individual must know the rules of the games in which choices are made and how to participate in the crafting of rules to constitute better games.” (Ostrum, 1991)

Both the rational choice and the institutionalist perspective thus have potential for contributions to the study of institutional interplay - rational choice might consider the way in which actors' responses to institutional influences or individual behavior affects environment while institutionalists may consider the dynamics and attributes of institutions and the ways in which those attributes influence actors motives and behavior. -on the one hand focusing on the actions of actors (shaped at least in part by institutional forces), and on the other focusing on the institutions themselves. Both perspectives can contribute to understanding institutions and institutional interplay and the real challenge theoretically and methodologically may be to those who could bridge the gap between them.

Regardless of the approach used to study institutions, institutional interplay is likely to gain more salience for researchers and practitioners in future. “It is apparent. . .that in a world involving the operation of many distinct institutions at the same time, there is a need to recognize the existence of a variety of linkages among institutions that are differentiable from one another but that affect each other in significant ways. Because institutions are complex, students of these arrangements have exhibited an understandable tendency to focus on specific institutions as if they were stand-alone arrangements. But it is clear that institutional linkages - both intended and unintended constitute an increasingly important phenomenon that will require increased attention in the future”. (Young, 1996, Young and Underdal, 1997, 7)

The complexity and interdependencies of problem domains related to natural systems, increasing regime density, the number of different actors and levels in environmental institutions and the need to manage pervasive externalities, all ensure that institutional interplay will increasingly be a concern and a research priority for researchers and theorists from many different schools of thought. This arena should prove to be an attractive and productive testing ground for many different approaches in the social sciences.

“It is already clear that this movement (new institutionalism) offers an attractive vehicle for analysts from all the social sciences to work together on a research program that is of interest to all but that is the property of none. It follows that the “new institutionalism” can provide a helpful framework for organizing our efforts to understand the role of institutions as determinants of anthropogenic drivers and human responses to global environmental changes.” (Young and Underdal. 1997, 13)

Common Property

As detailed in Appendix A, common property researchers have developed a body of empirical data that adds a great deal to our understanding of local institutions affecting land use and natural resource and environmental management at the local level, particularly in third world settings. Decades after Hardin first formulated his “tragedy of the commons” hypothesis, (Hardin, 1968) environmentalists and students of international politics began noting that the tragedy could not only affect local resource management but may also apply at the global level and many people assumed that the tragedy would play out at both the local and global level. Researchers have shown that under some documented circumstances, local common property regimes can and have avoided the tragedy through local institutions that govern access, harvesting and management of common pool resources. (McKay and Acheson, 1987, Berkes, 1989, Pinkerton, 1989, Ostrum, 1990, McKean, 1992, Bromley et al, 1992.) Linkages were formed between common property researchers working at the local level and those studying international institutions, particularly international resource regimes.

Investigators of common property regimes have recently begun to recognize that one of the major problems threatening such successful common property regimes is their embeddedness in larger systems that negatively affect the ability of common property institutions to regulate access and sustainably manage common property resources. The impact of CITES on CAMPFIRE communities in Zimbabwe is an example (see below) of institutions at different levels impacting each other negatively, not intentionally (at least in this case not to begin with) but because of widely differing norms, values, objectives and (on the part of CITES) decision-making mechanisms that failed to recognize local circumstances.

In her opening address, entitled “Common Property Regimes: Moving from inside to outside” to a recent Common Property workshop, Margaret McKean noted the accomplishments of researchers who have focused on the “internal arrangement” on mechanisms governing the use of common property resources, such as rules for use, techniques of cooperation, and enforcement of harvest controls. (1997) She commented that what will be required is the creation of common property regimes that don't now exist and that we therefore need to know more about the evolution of common property regimes and how to design and create them. Another area on the “outside” of common property systems that has been neglected by the field, she described as the “relationships between

successful systems and their surroundings” such as relationships with government (for example, co-management, legalization of common property rights, and government recognition and acknowledgment of common property rights), relationships between common property regimes and commerce, and finally, the “relationship with the ecological setting”. She thus makes the link between institutional arrangements and their fit with the ecological system with which the institution interacts as well as interplay among or between institutions. At the same workshop, Peter Taylor identified “the deep boundary” between what goes on inside (commons regimes) and influences from the outside, and pointed out the “the processes of change span spatial and temporal scales” in “intersecting processes”. Taylor suggests that the idea of an external-internal divide, even in the form of inquiring into how different institutions were undermined by “external forces” (such as CAMPFIRE institutions undermined by CITES) “discounts the way unequal “internal” agents mobilize and are mobilized by “external forces in the rough and tumble of scale spanning, intersecting processes”. Taylor’s question for future research is: “What can agents do in a world of intersecting processes and ubiquitous embeddedness?”(McKay and Jones, 1997)

To some extent, it could be argued that co-management regimes evolved in response to the need for institutional linkage in arenas of institutional conflict, particularly conflicting tenure regimes involving common property arrangements of traditional societies and institutions for public lands management. This could be interpreted as institutional design specifically focused on the need for linkage, in this instance, vertical linkage between national level institutions and local institutions. (Berkes et al, 1989, Osherenko, 1988)

Again, there are a variety of approaches to common property issues and to the analysis of common pool resource regimes as is illustrated by the contrasting perspectives of the - institutional approach embodied in the work of Ostrum and her colleagues and the human ecology perspective of Pinkerton. (Pinkerton) Both of these perspectives can add to our understanding of these regimes and the study of local common property regimes and their interaction with other institutions at different societal levels holds a great deal of promise especially since it allows researchers to build upon a substantial body of empirical field research.

Regime Analysis

The third area or body of current research that has relevance and potential for the study of institutional interplay is the growing body of work on international environmental regimes. “Regimes are social institutions composed of agreed-upon principles, norms, rules and decision-making procedures that govern the interactions of actors in specific issue areas. They are the rules of the game that determine the character of recognized social practices.”(Young, 1989) (Osherenko and Young, 1993) (Krasner, 1983) (Rittberger, 1995) Keohane (1993) suggests that the most widely used definition of international regimes is “implicit or explicit principles, norms, rules, and decisionmaking procedures around which actors’ expectations converge in a given area of international relations”. This definition is clarified with respect to actors as “a form of institutionalized international collaboration distinct from governments, treaties or international organizations” (Faupel, 1984, Rittberger 1995) and in terms of linkage, as “a way to understand international cooperation, defined as coordinated mutual adjustment of states’ policies yielding benefits to participants” (Keohane, 1995) These definitions all incorporate the concept of interplay into the structure, function and purposes of regimes.

Regime analysis uses the institutional perspective on natural resources (as opposed to the microeconomic and ecological perspectives) to differentiate regimes from the broader domain of human behavior and empirically identify regimes through analysis of social conventions. (Young, 1982) Krasner (1983) identifies three different approaches to or views of regime analysis. the approach of Young and others who see “regimes as a pervasive characteristic of the international system” the rejection of this concept as a denial of “basic economic and power relationships” by Strange in a structural critique, and a third position, labeled “modified structural” or “structural realist” which recognizes the existence and influence of international regimes under certain circumstances. Within 10 years of this analysis many of the perspectives contained within these views have merged and Rittberger stresses the dimension of “institutionalized cooperation” in his reformulation of the definition of regime: “the institutionalized cooperation of states for managing conflicts and interdependence problems.” (Rittberger, 1993. 9)

Young's concept of “governance without government” further elucidates the nature of international environmental regimes.

“At the most general level, governance involves the establishment and operation of social institutions. . .capable of resolving conflicts, facilitating cooperation, or, more generally, alleviating collective action problems in a world of interdependent actors” (Young, 1994,15)

Keohane and Ostrum (1995) bring together their observations and analysis of international resource regimes and local common property regimes to investigate issues of heterogeneity and cooperation in regimes at different levels. They conclude that this work “demonstrates the value of comparing collective-action problems at vastly different scales” and that comparisons across scales can be illuminating”. (22-23) I suggest that this comparison across scales, particularly the impacts of one level on another, (vertical linkage) as well as the tendency to build and operate regimes at different levels with no recognition of the *existence* of related regimes, (let alone potential negative impacts), at other levels are not just illuminating, but are critical to our understanding of institutions and institutional impacts on biophysical systems.

Concepts from this literature that may prove useful in generating hypotheses about institutional interplay are identification of the features of regimes, in general, and of particular regimes, classifications of regimes according to structure and performance, dynamics of regimes - *e.g.* life-cycles, and finally evaluation of regime performance and outcomes.

Describing the essential feature of all social institutions, including resource regimes, as the conjunction of convergent expectations and patterns of behavior or practice, Young goes on to identify the major elements or “substantive core” of regimes rights, for example property rights, rules, such as liability rules, and procedures for compliance, dispute resolution, and decision-making among others. (Young, 1982, Sufficient numbers of regimes have now been identified and analyzed to enable researchers to classify different types of regimes and functions (*e.g.* regulatory, procedural, programmatic, generative) in different settings and scales. (Young, 1997)

Regimes develop or evolve over time. They are formed, grow, change and, occasionally, die. Is there an identifiable life cycle of regimes? Young (19~2) discusses processes of regime formation and transformation. Identifying those dynamics and stages of development appears to be a critical variable for understanding global and local institutions and their role in environmental change. We can also inquire about how

institutional life cycles or different stages in the development of an institution affect its interaction with other institutions.

Regime analysis has proved to be extremely productive in theory building, integration of a variety of approaches and settings, data collection and archiving. The study of resource regimes appears to have great potential for generating hypotheses and for providing data on which to build a research program related to institutional interplay in the context of global environmental change.

Institutional Interplay

In all three areas of literature discussed above, the nature of institutions and in particular, environmental institutions or regimes as well as common property regimes almost inevitably leads to the consideration of institutional interplay.

“..All institutions are social artifacts created by human beings—consciously or unconsciously- to cope with problems of coordination and cooperation that arise as a result of interdependencies among the activities of distinct individuals or social groups.” (Young, 1994) Social institutions..constitute a response to coordination problems..” (Young, 1983)

This implies that the business of institutions is interplay or linkage. For all the centrality of interplay concerns in the definitions, classifications, and descriptions of regime structure and dynamics, however, surprisingly little (at least recognizing and explicitly focusing on interplay) is found in the current social science literature about institutional interplay. In the literature that exists there appears to be confusion about or a muddying the distinction between institutions interacting with one another (*e.g.* trade and environment regimes) with impacts on actors and institutions, setting up procedures for the interaction of their members or actors (*e.g.* national financial agencies and government resource agencies) or different states, governments interacting, cooperating, competing). One may be able to distinguish three levels of interplay—institution to institution (or interaction/linkage among many institutions), institution to actors, *i.e.* institution/organization linkage, and finally, actor/actor interaction, which, at the institutional level means institutional mechanisms for ensuring, promoting, interaction among actors, or issue linkage (a question of institutional design).

McKean writes about common property regimes as solutions to problems of scale and linkage, but she is writing mainly about the last level - linkage among users of a single resource, or shared management of a large ecosystem. In her Japanese example, courts at higher levels were used to mediate conflicts and often served to reinforce the local regime but she does not comment upon this as an example of institutional interplay.

Lisa Martin examines issues of linkage, also in the context of common property regimes but primarily with a focus on the impacts of numbers of, and variability among actors. She sees issue linkage mainly as a form of “horse-trading” to achieve institutional goals. She compares the cooperation of states around global commons issues with the cooperation of individual resource users in common property regimes. (Keohane and Ostrum suggest that in both of these setting, there may be no recourse to higher level authoritative hierarchies.) (Keohane and Ostrum, 1995,1) Martin examines the role “issue linkage” plays under conditions of heterogeneity (as opposed to the “identical interests and capabilities” often assumed by theorists). (Martin, 1994, 473) Due to the problem of conflicting interest, numbers and heterogeneity of actors are assumed to “impede cooperation”. Martin hypothesizes that “heterogeneity of capabilities and of preference intensities may themselves lead to cooperative solutions, often through the mechanisms of issue linkage”. (Martin, 1994,490) She concludes that “linkage and international

institutions are not alternatives to one another. States wishing to influence one another's behavior do not have to choose between relying on issue linkage and on rule-structured interaction. Instead, institutions often incorporate, facilitate, and demand issue linkage. For example “unanimity rules create demands for linkage”.

Oye (1992) suggests a typology of issue linkage—extortion, exchange, and explanation and Young identifies embedded, nested, clustered, and overlapping institutions (discussed in Section 4 below). We have already discussed horizontal and vertical linkage. Even this may not be a simple distinction. Some observers believe that most institutional cooperation appears to be organized horizontally rather than vertically (with few rules hierarchically enforced) through the practice of reciprocity but Young and others point to 'specific agreements .. embedded in a multi-layered system in which agreements are “nested” within a more comprehensive set of agreed-upon rules.’’

Are there other kinds of linkage? One potential area for research based on this literature is the definition, identification, mapping and evaluation of different types of institutional linkage and their outcomes or consequences, at various scales and settings and in different types of regimes.

Another area with potential for research is the role of interplay in institutional learning. “All international institutions, because they are under human control, are capable of becoming more effective over time as a result of learning. Yet we lack a rigorous understanding of how they do so, of what strategies of learning work better than others, and of what conditions are most conducive to learning.” (Levy, Keohane, and Haas, 1993. 422-423)

“States may modify policies in a discrete area of activity, or they may come to link two areas of activity which had previously been managed independently. Because environmental issues interact with so many other international issues and regimes, investigating the linkage element is important for understanding the conditions under which more holistic and comprehensive environmental and other international policy choices are reached. (Haas, 1993, 175, in Rittberger)

Haas suggests that “linkages between issues may be forged on the basis of tactical, fragmented or substantive connections. Tactical and fragmented linkages are likely to persist so long as they serve the short-term political needs of the coalition for whom the linkages are useful. Substantive linkages, on the other hand, will probably persist until the scientific basis for the connection is rejected.” (Haas, 1993, 176)

Another area raised in the literature is the connection or linkage among nongovernmental organizations and regimes. Global environmental politics provides many examples of the relationship between PVO's and regimes. (Haufler, 1993, 107)

“we need to explore further the degree to which NGO's organize their activities and cooperate with one another, and the impact of the “increased incidence of transnational and transregional coalitions and alliances of NGO's on global issues” Krasner, 1993, 106, Porter and Brown 1991,56)

Haas (1989, 1992) explores the role of “epistemic communities”-- scientists and scientific organizations, in developing a Mediterranean pollution control regime. An epistemic community came into being across PVO and State lines, sharing common perceptions and understanding of the problem and possible solutions. This generative function gave rise to common understandings that played a role in regime formation. Another example is the way in which The Nature Conservancy - “forged a crucial link

between the international financial system and the environmental movement by developing the idea and practice of debt for nature swaps” (Williams, 1992) In both, States which had an interest in developing an inter-state regime, appropriated the principles and norms of private sector organizations.

The literature in all of these areas contains many implications and questions concerning design principles and whether or not institutions can be designed to avoid the negative consequence of interplay and enhance or reinforce the positive, reinforcing, synergistic consequences of interplay and whether or not institutions can be designed specifically for purposes of linkage.

Design Implications

It is clear that although not a great deal of work has yet been done in the social science community on issues of interplay, there are many ideas and concepts in the literature pointing to emerging research directions in a number of fields. The practical application of these concepts is the potential for identifying design principles for institutional design incorporating interplay and institutional linkage. The recent cooperation among researchers in common property and international regimes has already yielded some interesting results. (Ostrum, Keohane and Ostrum, 1995)

Can principles derived about the successful operation of existing common property and other regimes, be translated into design principles, for different levels and scales of institutions and can they incorporate the issues of intersecting processes and interplay, both vertical and horizontal? Can we also incorporate lessons about not-so-successful interplay, reasons for negative interplay, obstacles to positive interplay and instances of the failure of interplay into design principles or into adaptive management? As Keohane asks: “can states construct institutions to help themselves cooperate more reliably? (Keohane 1984) Can we enhance institutional learning through the explicit design of linkage mechanisms or as Levy, Keohane and Haas ask: how can institutions promote more innovation? Does institutional linkage play a role in innovation and learning?

Martin addresses the issue of institutional design “given a demand for issue linkage” both linkage among the institutions themselves, and linkage among actors complying with different regimes.

“Concentrated patterns of power facilitate the solution of public-goods problems. If power is not sufficiently concentrated, state may have to create functional differentiation through institutional design.” Martin, 1994, 490)

Haas concludes from his analysis of common property design principles: “Not surprisingly, many of the 'design principles' underlying successful self-organized solutions to CPR problems appear relevant to the design of institutions to resolve problems of international cooperation as well as those at a strictly local level.” Examples are effective monitoring arrangements, and attention to transaction costs. Other observers emphasize in both common property regimes and international regimes the underprovision of effective arrangements to enable participants to cooperate.

All of these findings have implications for institutional design and I return to a discussion of design principles in Section 5 below.

3. Characteristics of Institutions

In attempting to characterize institutions, it is sometimes difficult to draw boundaries around one institution without including the overlap with other institutions. Thus, we not only need to be able to characterize institutions but also to characterize the interactions of those institutions.

What characteristics of institutions determine or affect the ways in which they interact with other institutions, for example, highly centralized versus more diffuse decentralized regimes? How do asymmetrical interactions work out, for example highly centralized institution interacting with decentralized institution, powerful institutions with weaker institutions? What institutional characteristics provide barriers or obstacles to interaction, linkage? How do institutional dynamics affect interplay and the consequences of interplay?

As discussed above, institutions can be characterized along a number of dimensions, formal/informal, number of actors, membership, heterogeneity of interests and actors, leadership, incentive structures, societal level, centralized, decentralized, and by institutional dynamics, purposes, functions, and outcomes as well as the way in which they were formed (whether through evolution over time or through deliberate design) and so on. Characteristics of institutional environments can also be characterized with reference, for example to regime density, domain complexity etc. Institutions can be embedded or nested within, or clustered with other institutions or overlap with them. (Young, 1996) Institutions may also be characterized by their major purposes or functions. Young (1997) identifies four types of institutional purpose or function-regulatory, procedural, programmatic or generative. While all of these functions may exist simultaneously in a single institution, institutions may emphasize one function over others or different functions at different stages in their life cycles.

Do these characteristics inhibit or promote linkage? In what ways? Duncan Snidal asks. for example: "Do large numbers of heterogeneous actors [within institutions] inhibit cooperation?" (Snidal 1994) And Lisa Martin poses a similar question of heterogeneity of interest. (Martin, 1994) (See above)

Life Cycles of Institutions

Another way of characterizing institutions is to identify stages in institutional life cycles and to identify at which particular stage the focal institution may be. This may enable us to predict performance outcomes of that institution. We may then ask: does the stage of an institution's life affect the type and quality of interactions with other institutions? Young identifies stages in the life of regimes, or developmental sequences. including different types of regime formation and transformation. *Self-generating* or *spontaneous* regimes "do not involve conscious coordination among participants, do not require explicit consent on the part of subjects or prospective subjects and are highly resistant to efforts at social engineering. A very different development sequence can be initiated through *negotiated* institutional arrangements, regimes characterized by conscious efforts to agree on their major provisions, explicit consent on the part of individual participants, and formal expression of the results. Another category Young describes as *imposed* arrangements, "those fostered deliberately by dominant powers or consortia of dominant powers". (Young, 1982, 1989) What are the impacts of regime formation on institutional interplay? It may be simplistic to hypothesize that negotiated regimes would have more positive interplay outcomes and that imposed regimes may well have negative consequences for other institutional arrangements, but these are the kinds of questions we can pose given these characterizations of regime formation.

Young identifies other dynamics of regime operation through time, which he refers to as regime transformation. Institutional change and transformation may occur in response to internal contradictions or crises or external change such as power shifts in international society or technological change.

“While institutional arrangements are difficult to alter in a planned or guided fashion, they change continuously in response to both their own inner dynamics and a variety of political, economic and social factors.” (Young, 1989)

Based on these observations, Young poses two questions: How and why do regimes arise from the interaction of individual actors over time? How and why do regimes change once they become fully established? To these questions, I would add: What is the role of interplay in institutional transformation? Does interplay, for example, contribute to institutional learning and innovation? And on the other hand to what extent do the nature of institutional formation and change determine the type, degree and consequences of institutional interplay? Added to the need to study institutional dynamics, is the growing need to analyze one particular type of institutional dynamics, the dynamics of linkage.

4. Dynamics of Institutional Interplay

Institutional interplay is defined as interactions occurring between or among distinct institutions operating at the same level (horizontal interplay) or at different level (vertical interplay). As discussed above, institutional analysts increasingly recognize interplay as a critical variable in regime operation and effectiveness. Young asks, however: “how can we move beyond this simple acknowledgment to being to make progress toward understanding the nature and consequences of institutional linkage at the international level? (Young, 1996,1)

One can distinguish among a variety of types of linkage, including, as already identified above, vertical and horizontal, functional and political. Many institutions, almost by definition, are part of larger, more broadly based institutions. This is a form of structural linkage. Young describes four types or characterizations of institutions based on this kind of relationship. (These four types of institutions, embedded, nested, clustered and overlapping are described below.) Thus we can describe different structural, functional linkages as well as issue linkage discussed above in which different issues are linked as a means of negotiating among institutions. We can also speak about domain linkage in which institutions are linked through a common interest in a particular problem domain, ecosystem, or natural system, although those interests may be quite different. (For instance, institutions with an interest in marine contaminants as opposed to seabed mining or conservation of marine species.) We can also classify or characterize institutional interplay by its goals and by outcomes or consequences, as well as by different power relationships. It may be possible to construct a continuum of increasing linkage potency or power, ranging from information exchange or communication to collaboration or even merger. One can also characterize interplay by its negative or positive valence, for example by whether the linkage is coercive or cooperative. One could classify a number of proposed design mechanisms for interplay along these continua.

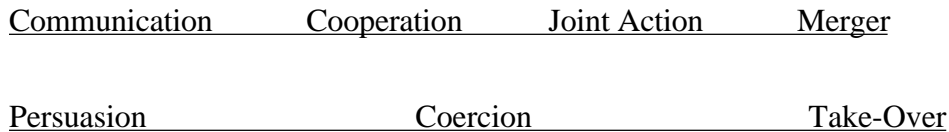


Figure 1 Continua of Interaction

Some institutions are explicitly designed to enhance linkage: “states may choose to construct institutions to help themselves cooperate more reliably” Keohane, 1984

If we accept the notion that one critical variable or dynamic of institutions is interplay or linkage with other institutions, then we need to investigate the degree, type, and effects of linkage among institutions. How does interplay affect institutions and how does it impact on environmental systems? Lack of linkage or coordination has often played havoc in the national and international level. Also, as documented in particular by common property researchers, national and international institutions often operate at cross-purposes or in ignorance of local regimes, sometimes with negative or even disastrous consequences for local resource regimes and the resource base on which they are dependent.

Researchers studying institutions in the field are among the first to recognize the importance and implications of interplay and the degree to which theoretically separate (and academically classified) institutions are inexorably linked in practice.

In field settings, public and private institutions frequently are intermeshed and depend on one another rather than existing in isolated worlds. (Ostrum, 1990, 15)

Institutions also link through and with and impact biophysical systems. Biophysical systems, themselves nested ecosystems, often provide the link among institutions. Shared or overlapping problems, issues, domains, impacted areas, systems, also provide linkages across institutions and at the same time, provide a rationale for, a demand for, linkage.

Types of Linkage

Any research program focused on institutional interplay must first clarify the nature, range of types and quality of linkage among institutions as well as the way those linkages may vary with differences in institutional characteristics and dynamics. Institutional interplay includes the interaction of institutions horizontally and vertically and the influence that interaction has on human behavior, and also the way in which institutions interact with other social drivers to influence human behavior and to determine the impact of humans on natural systems and as the means of alleviating or responding to the problems caused by those impacts. While researchers have recognized the existence of horizontal and vertical linkage, it will be instructive to get beyond these categorizations to document in practice the range of different linkages and their effects in each of these modes of interplay. This will allow linkage mapping and the tracing of interplay outcomes.

As discussed above, Young and Underdal identify and distinguish between functional and political linkage.

“Functional linkages typically reflect (inter) dependence relationships existing in the biophysical contexts or social settings... Politically constructed

linkages exist whenever actors decide to consider two or more institutions as part of a larger complex or package.” (34)

Institutions can respond to institutional interplay or overlap through “unilateral” adjustments or adaptation of one institution to another, or “mutual” adjustment in which two or more institutions are designed to work together in order to optimize *joint* effectiveness. must political support, or achieve some other purpose that neither can accomplish on its own.” (Young and Underdal, 1997,36) Since mutual adjustment requires the existence of a decision-making arena that can deal with both (all) institutions involved”, Young and Underdal suggest that this kind of mutual adjustment occurs more often horizontally than vertically, and it seems apparent that many local resource regimes are forced to adjust to national or international regimes that do not recognize their existence.

Structural Linkage

Structural linkages are the positional relationships among and between institutions. Young distinguishes four types of linkage “that give rise to...*embedded* institutions, *nested* institutions, *clustered* institutions and *overlapping* institutions”. (Young, 1996,2) He defines ***embedded institutions*** as those, like most issue-specific regimes in international society, that are “deeply embedded in overarching institutional arrangements in the sense that they assume. . .the operation of a whole suite of broader principles and practices that constitute the deep structure of international society as a whole”. (2-3) Young provides examples such as the 1973 Agreement on the conservation of Polar Bears, components of the Antarctic Treaty System, and the emerging environmental protection regime for the Arctic, all regimes which are embedded in, and based on an understanding of international society and its rules of state sovereignty. They are also nested in a slightly more focused but still overarching emerging global environmental regime which plays by the rules of that international society and adds rules and norms of its own such as the need to preserve species and biodiversity, to avoid irreversible impacts, and increasingly, promotes a goal of sustainability. In Young's terms, this would be “institutional **nesting**, which he describes as “linkages in which specific arrangements restricted in terms of functional scope, geographic domain, or some other relevant criterion are folded into broader institutional frameworks that deal with the same general issue area but that are less detailed in terms of their application to specific problems. Young gives as examples the various “framework” conventions such as Long-range Transboundary Air Pollution (LRTAP) which incorporates specific protocols dealing with SO₂ NO_x, and VOC's. The Law of the Seas (UNCLOS) is another example of a broad convention that incorporates a number of nested regimes that are more specifically focused on a particular issue or problem. Such nesting also allows for flexibility and adaptability in the face of rapidly changing environments since nesting can occur at any time after the original, broadly based regime comes into force and advantage can be taken of broad provisions to design and institute new regimes that complement. promote more specific and more effective remedies, or even correct deficiencies in the 'parent’ regime. McKean suggest that such nesting will be increasingly important in future for large scale ecosystems: “ common property regimes for very large ecological systems can be nested so that small collectivities manage subsections of the resource but federations of these collectivities can be called into action if externalities among subsections arise. We might call this resource 'federalism,' an arrangement in which small units operate independently as long as they don't affect each other, but the units amalgamate into larger wholes to cope with problems that are physically larger than any single unit can handle.” (McKean, 1996, 230)

The third type, *institutional clustering*, “occurs when those engaged in the formation or operation of differentiable governance systems find it attractive to combine several of these arrangements into institutional packages, even when there is no compelling functional need to nest the individual components into a common and more generic framework. Again the Law of the Seas, the new initiatives related to an Arctic council, and the oft suggested Law of the Atmosphere are examples of focal institutions around which can be clustered any number of regimes dealing with, respectively, marine, arctic, or air issues. Such clustering would reflect the complexity, interconnectedness, and interdependencies inherent in the large scale ecosystems which characterize global environmental change and could therefore enhance the “fit” of institutions to their environmental domains. *Overlapping* regimes, perhaps the most common, are those in which “individual regimes that were formed for different purposes and largely without reference to one another intersect on a de facto basis, producing substantial impacts on each other in the process”. (6) Trade and environment regimes are among the most commonly recognized overlapping regimes, possibly due to the perception of negative impact on environment of free trade policies. Another example of overlap at different levels, (i.e. vertical interplay), is the conflict between the emerging sustainable use of common pool resource regimes at the local level in Southern Africa (such as Zimbabwe’s CAMPFIRE (Communal Areas Management Program for Indigenous Resources) with CITES (Convention on the International Trade in Endangered Species of Wild Fauna and Flora). This conflict came to a head in the controversy over CITES’ move to place the African Elephant on Appendix I of the convention therefore effectively destroying the financial basis for the Southern African programs designed to act as incentives for sustainable use of wildlife and other resources. This is an interesting example of two different sets of norms and rules acting on different levels, at cross purposes, with purportedly the same overall goals of environmental protection.

Overlap, however, can have positive as well as negative consequences for institutions, reinforcing or acting synergistically, as well as having differential impacts on the overlapping institutions, depending in large part on the power, strength, and level of the institutions. Young suggests that overlap will continue to gain significance for international governance: “...institutional overlaps will become progressively more important as determinants of the effectiveness of functionally restricted regimes as the density of human activities extending beyond the jurisdictional reach of individual states continues to grow during the foreseeable future”. (6) Young sees this kind of overlap as providing a significant incentive to design clustered regimes to avoid the unanticipated negative consequences of regimes operating without consideration of the operation of other regimes. Where there is functional overlap, Young observes that “again and again, those pursuing goals in one or another of these functional areas are finding it difficult to achieve success without taking into account the development of rules relating to one or more of the other functional areas”.

Consequences of Interplay

One of the major questions concerning the consequences of institutional interplay concerns the effects of interplay on institutional effectiveness and robustness. To answer that question will require analysis of the impacts of different forms of linkage. (See the discussion of characteristics of interplay, above.) These forms of linkage are designed to address or are responses to perceived problems of interplay. What are those problems? They are usually manifested by conflicts among different institutional arrangements. These conflicts can be inadvertent and can go unnoticed for periods of time. Participants can adjust or be forced into non-compliance with one or another sets of rules or aspects of the arrangements. Sooner or later the negative consequences of such conflicts will become obvious and very often those consequences are to be felt in the degradation of biophysical

systems. This establishes institutional interplay as a causal factor, along with institutions more generally, in environmental degradation. We hypothesize that institutions can also be factors in the solution of such environmental problems and the amelioration of their impacts. The difference lies in sorting out the consequences of institutions, and for the purpose of this discussion, of institutional interplay.

If we can answer the question of what is institutional effectiveness for any given institution, then we may be able to identify ways in which that effectiveness is compromised by the operation of other institutions. If institutional effectiveness is compromised to too great a degree or if its core functions or purposes are negated, eventually that interplay may lead to the demise or dissolution of the institution. Of course the weaker institution will usually perish. (Therefore the impacts on effectiveness and robustness may, in some instances, be parts of the same continuum.) As researchers have observed in some of the local, small scale common pool resource regimes, (Ostrum, Keohane and Ostrum, Berkes et al., Bromley) the strong/weak dimension of power often plays out in vertical interplay between a strong institution at the national or global level (e.g. financial or trade institutions, the global economy) and a weaker local regime but sometimes local regimes, operating in some isolation, prove to be tenacious and withstand the onslaught of powerful conflicting regimes far removed from their operation. What factors make the difference in these outcomes? Relative power, isolation, degree of conflict, involvement of “core” values or purposes, duration of operation, membership, leadership, societal level, and many other factor can be hypothesized to exert a greater or lesser effect on the outcomes or consequences of interplay. The presence or absence of mechanisms for promoting interaction or for alleviating the negative consequences of interaction can also be presumed to be factors and may indeed be decisive factors in determining outcomes.

We might have strong international regimes conflicting with weaker local regimes (e.g. CAMPFIRE/CITES); we might have weak international regimes conflicting with strong local regimes (anti-whaling, whaling) or we might have strong local regimes confronting other strong local regimes or strong/weak, strong/strong, or weak/weak horizontally or vertically at any societal level.

We need also to investigate the relationship of interplay to other anthropogenic drivers of environmental change, with which institutions may interact in different ways, either reinforcing or conflicting. We should also identify the distributional impacts of interplay which may be different both within and between institutions. To what extent does interplay determine who gets what?

Although the outcomes and consequences of institutional interactions and interplay may be positive, negative, or neutral it may be hypothesized that interplay promotes institutional flexibility, learning, and effectiveness and robustness. If interplay is a learning mechanism, how can we evaluate whether learning is contributing to institutional effectiveness and robustness and what other impacts does that learning have? What is the effect on institutions with primarily a generative function? It could be hypothesized that institutional learning is particularly significant for such generative functions and that therefore mechanisms such as interplay should be designed into institutional structure and functioning.

Figure 2 provides some examples of the range of possible positive and negative outcomes of institutional interplay, from simple awareness of the interaction of conflicting or reinforcing institutional arrangements to merger or dissolution.

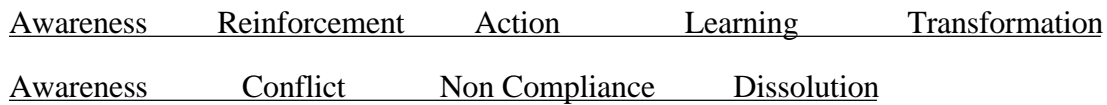


Figure 2 Examples of Continua of Institutional Interplay Outcomes

We have seen that linkage between and among institutions takes different forms -for example, as discussed above, “functional linkages” and “political linkages”. We could also speak about membership linkage. Different institutions share actors, problem domains, target ecosystems, and social units. These constituent, shared entities (at same or different scales) provide links among institutions. Such inter-dependencies, perceived similarities or conflicting interests provide links among institutions and produce consequences for institutions and for the biophysical systems they are designed to manage. If the behavior of actors is influenced by two sets of rules and norms which conflict with one another then actors will be unable to fulfill or comply with both so that even a good faith actor cannot comply with one set or subset of institutional prescriptions. What are the advantages of studying linkages, interplay, clusters, and networks of institutions? What can this approach yield? One hope for such a research program is that it can yield understandings on which we can base design principles to assist us to create Institutions that better reflect the realities of the increasingly dense regime environment and the inter-dependencies, complexities and vulnerability of the natural systems to which they relate and on which we all depend.

5. Design Principles

One of the practical outcomes of a research program that focuses on the questions of interplay raised above, is the potential for deriving institutional design principles. Design questions that might be asked include the following:

1. Can we reduce negative impact of conflicting interaction and reinforce positive interaction among institutions?
2. How can we improve institutional effectiveness, performance through use of linkage?
3. How can we design institutions to improve linkage as a means to improved effectiveness and learning?
4. Can we design institutions explicitly as linkage institutions? (as a way of recognizing and building on interdependencies)

Many environmental regimes increasingly specify relationships among actor member such as those between landlocked and sea accessible states in the Law of the Seas (UNCLOS) and between nations with technological resources and those without in climate change agreements and in the proposals for Joint Implementation strategies for climate change initiatives. Guidance is needed about the best designs for mechanisms for such interaction. In order to enhance linkage and reinforce positive linkage, while avoiding the hazards and inefficiencies of negative interactions and overlaps, we need information about successful mechanisms and processes. This will be a complex undertaking.

“..I argue that 'getting the institutions right' is a difficult, time-consuming, conflict-invoking process. It is a process that requires reliable information about time and place variables as well as a broad repertoire of culturally acceptable rules. New institutional arrangements do not work in the field as they do in abstract models unless the models are well specified and empirically valid and the participants in the field setting understand how to make the new rules work.”
(Ostrum. 1990,14)

To respond to the design challenge, we shall need to identify and investigate instances of states choosing ' to construct institutions to help themselves cooperate more reliably” (Keohane. 1984) Is it possible to design institutions that focus on interplay as one of their main goals? If so, what characteristics would such institutions incorporate? Can we get guidance from studying institutions that are “successful” at positive interplay, regardless of whether that is their major goal?

Other questions include: How critical is institutional interplay, linkage, and interaction to institutional effectiveness and robustness? What role does degree and nature of interplay have in institutional effectiveness and robustness? Could we hypothesize that resilience and adaptability increase as linkages/interplay increase? How can we design...”processes of mutual reinforcement among linked arrangements”? (IHDP Scoping Report,29) Although interactions and interplay may be positive, negative, or neutral it may be hypothesized that interplay promotes institutional flexibility, learning, and effectiveness and robustness and this is one of the most significant outcomes, consequences of interplay.

The key to institutional effectiveness may be identifying, understanding, and targeting those effects, making them more effective where needed (positive) and ameliorating their effects where negative. Linkages and interplay are not “good” in themselves. They can be both positive and negative (or neutral) as well as differential in their impacts. How can we use design to reinforce and promote effective, positive linkages and ameliorate, reduce, negative interactions? When designing new institutions, how can we design linkage into institutional formation and development? How can we identify areas of potential interplay so as to address that linkage in the design of new institutions and structures? How can we ensure that interplay operates to advantage, and design procedures to manage, ameliorate. negative linkage/interplay?

To address these questions, we shall have to define institutional effectiveness, identify the role of interplay in effectiveness, and assess the degree. nature. and quality of interplay. It may be possible to map linkage, and to assess its impacts. One could also construct a continuum of varying degrees of interplay ranging from simple one-way communication, to info/resource exchange, coordination, cooperation, collaboration, joint action (as the potential positive range with conflict, coercion, take-over and merger as potential negative range). Another potential continuum is the kind of mechanism designed for cooperation ranging from mechanisms for linkage, to incentives, to compliance sanctions.

Designing the right mechanisms for linkage is related to designing the right incentive structures: “ If the economist's typical policy advice is to get the prices right, ours is to get the institutional incentives right. Government policies that have ignored the local knowledge of participants or underestimated their ability to solve collective action problems have done great damage. (Keohane and Ostrum, 1995, 21)

In addressing the issue of design of interplay mechanisms, Young asks: ' Assuming that we can develop the knowledge base needed to understand institutional intersections, how can we design regimes to cope them?' (Young, 1996, 19) In response. he suggests some design solutions to negative overlap, including side agreements, mergers and procedural devices (1996,19) *Side agreements* involve “efforts on the part of those concerned with a specific regime to add provisions designed to mitigate its unintended-ordinarily negative-impacts on other institutional arrangements”. The best known example we have is the environmental side agreement of NAFTA (The North American Free Trade Agreement). There is a great deal of controversy about this side agreement and while it is too soon to judge its effectiveness, it is significant because it is an instance of the recognition of the negative impact of one very powerful institution (international trade) on another (environment) growing in international power. Young's assessment of such side agreements is: “When overlap starts to affect core interests..it seems unlikely that the negotiation of side agreements will be sufficient to solve the resultant problems. In such cases, it may be necessary to *merge* the regimes in question, creating a single more comprehensive regime covering two or more intersecting issue areas.” This points to another design option or mechanism which is to refigure current institutional arrangements, creating new clusters, merging institutions, phasing out institutions and designing new institutions. Young warns that if the merger option is exercised “..integrated regimes covering numerous issue areas can become so complex that it is difficult to reach agreement on their terms, much less to administer or operate them successfully once established.” The third approach is “the establishment of *procedural arrangements* designed to resolve conflicts arising from institutional overlaps”. (19) The design of such instruments is just one of the design challenges posed by the implications of institutional interplay.

6. Global Change: implications for biophysical systems

All of these questions can be appropriately pursued in the context of geographical and substantive settings relevant to global environmental change. This could include key substantive areas of environmental change such as oceans, atmosphere, terrestrial, energy, waste, and biodiversity as well as critical geographic areas such as the Arctic and Antarctica.

Global change cuts across, and is impacted by, many existing institutions (and the interaction of those institutions) both as causal factors and as responders to change. Global environmental change also indicates the need for new institutions - to shape human responses to global change. Issues of global change, the global environment, and the emerging institutions developing around them are highly complex, interdependent and dense. Institutions related to global environmental change will therefore need to be highly linked to each other, and to other existing institutions at all levels. In this environment, institutional interplay can be seen as significant factors shaping human activities that cause, respond to and reduce global change.

How specifically does institutional interplay impact global change? How does institutional interplay impact human responses to global change? How does/can institutional interplay ameliorate/reduce the impacts of global change? We have indicated above some of the factors, mechanisms and characteristics of institutions and the dynamics of institutional interplay that might affect or mediate that impact. The key research questions identified below could provide the basis for a social science research program that would contribute substantially to answering those broader questions.

7. Summary: Key Research Questions

This section summarizes potential research questions derived from the discussion above and relates them to the draft proposed research foci developed by the science steering committee of the IDGC program. These potential research questions should be assessed and prioritized using criteria such as, *inter alia*, relevance to the goals of the program, relevance to the social science community, maturity, inherent intellectual interest, potential productivity, and ability to build on prior research findings. These questions are at the intersection of many fields and so in themselves are indicators of the problems of linkage and demand interdisciplinary team approaches.

The goals of the IDGC program as articulated in the IHDP Scoping Report are:

1. To separate out institutional forces from other social drivers in order to pinpoint the proportion of the variance in human actions relating to global change that can be shown to flow from the operation of institutions and
2. To explore how institutions interact with other social drivers to produce anthropogenic impacts on global environmental systems and to determine human responses to environmental change.

The proposed research foci being developed by the Scientific Planning Committee to promote work that will fulfill those goals are summarized in the following two areas of inquiry within which research questions are formulated

1. The formation and evolution of institutions governing human interactions with large biophysical systems.
2. The operation and consequences of institutions affecting human/environment interactions.

Investigations of institutional interplay can contribute to those goals and research foci by addressing a range of research questions and activities --descriptive to predictive. For example, we can describe and map linkages, predict ways in which different kinds of linkages at different levels affect effectiveness, robustness of different types of institutions and assess the consequences and impact of those variations in institutional interplay on biophysical systems. We can analyze the ways in which institutions form, develop, operate, change, decline, and die and the implications of those dynamics and life cycle stages for institutional interplay as a key variable in determining the effectiveness and robustness of institutions. We can examine the mechanisms through which institutions influence actors and other institutions. We can identify the degree and type and effects of linkage among institutions and the ways in which that interplay affects institutions and impacts on environmental systems. We have noted above that lack of linkage or coordination has often played havoc in the national and international level. We can build on these findings to improve institutional design to incorporate mechanisms for interplay that reduce the negative consequences of interplay and enhance positive, reinforcing consequences. Therefore one potentially productive area of focus is interplay as a determinant of institutional effectiveness. A related question is whether or not linkage promotes social learning and therefore adaptability, resilience and robustness.

As indicated above, the first stage in such a program could be to identify types of linkage between and among institutions, including:

- a) substantive/functional linkage/(inter)dependency (Young and Underdal, 1997, 34) or institutional linkage based on biophysical interdependencies, and impacts, through “interactions among polluting substances” or “through the generation of consequences for human welfare and well being by one sphere of social activity upon another (e.g. by industrial activity upon recreation).” (35) and
- b) politically structured linkages: “Political linkages exist whenever actors decide to consider two or more institutions as parts of a larger complex or package,” (35)(e.g. state sovereignty plus an issue specific regime).

Institutions can respond to institutional interplay or overlap through “unilateral” adjustments or adaptation of one institution to another, or “mutual” adjustment in which two or more institutions are designed to work together in order to optimize *joint* effectiveness, muster political support, or achieve some other purpose that neither can accomplish on its own.” (Young and Underdal, 1997,36) Since mutual adjustment “requires the existence of a decision-making arena that can deal with both (all) institutions involved”, Young and Underdal suggest that this kind of mutual adjustment occurs more often horizontally than vertically. It may be that adjustment vertically takes on more coercive qualities.

Vertical links or linkage across levels of social organization (micro, meso, macro) often appear to take the form (sometimes inadvertently) of coercive or at least dependent relationships. They often appear as well to have negative consequences for social groups as well as for biophysical systems. They often act as constraints upon local solutions to environmental problems, such as the impact of globalization on local economies and life style solutions to environmental problems at the local level. This type of top down, systemic forcing also acts as obstacles to local accountability and learning. Often institutional capacity at lower levels needs to be created or enhanced to resist such institutional conflict. On the other hand, local level actors can sometimes use macro-level institutions as leverage for institutional change at meso or micro levels or domestic interests can use international regimes for leverage. (For example? indigenous peoples using international human rights law to press for changes at home.) (Cortell and Davis, 1996)

Horizontal links, “between institutions operating at the same level of social organization” conflicts and overlap can also have consequences for institutional effectiveness and natural systems. All of these types of linkage suggest that it is not just institutions but also institutional interplay that has negative consequences for natural system and plays a role in causing environmental damage. That dynamic needs to be documented if we are to understand the role of institutions in environmental change. It is just as likely that institutional overlap can promote environmental protection and the restoration of degraded systems. Co-management regimes have been designed to accomplish that goal.

Improving our understanding of the ways in which institutions interact, the effectiveness and consequences of that interaction should contribute substantially to improving our understanding of how macro-, meso-, and micro-level, institutions interact to shape human behavior and the outcomes of social processes” (38)

If we can identify and recognize interactions, linkages, overlaps and impacts of institutions on one another and on individuals actors. their perceptions and actions; if we can classify and assess all of the different ways in which institutions interact---horizontal/vertical, conflict/synergy, coercive/cooperative, resource consumptive/allocative,

formal/informal, unilateral/mutual, one-way/two-way communication mechanisms, tightly structured/loosely structured, as well as scale, scope, number and heterogeneity of actors etc., we can go a long way toward evaluating the differential impacts of that interaction on natural systems. Can we then use our understanding of those effects to create design principles for institutional development and global environmental management? All of these investigations will have implications for institutional design and development. We should be able to formulate institutional evaluation and design criteria as well as particular and general design principles that enhance linkage and that relieve negative impacts on vertical interactions, conflicts. We can also identify barriers (as well as enabling factors) to institutional interplay and the consequences of failures in institutional interplay.

Institutional resilience and adaptability may be a function of linkage, interplay. Does linkage promote social learning at all levels? Does vertical linkage permit institutions at one level to take advantage of controls/advantages operating at a different level but absent in that level (e.g. courts, social stigma)? Can we identify design principles related to interplay? The more mechanisms for overt interplay, or the more mechanisms for identifying and reinforcing interactions and linkages with other institutions, we can incorporate into institutional design, the more effective, robust, and better able to influence behavior and events will those institutions be.

Relationship of interplay and scale

How does scale affect interplay? Can we generalize up and down about interplay? Can we apply findings about horizontal interplay to vertical interplay? Much of the work that has been done in interplay has been about an organization linking to other organizations in its problem domain or field. Can we generalize from organizational actors to institutions?

Relationship of interplay and fit

The relationship between interplay and fit is primarily a design concern. We can hypothesize that designing mechanisms for interplay could help to improve the fit between institutions and their complex, interactive social and biophysical problem domains. It is clear that the problems of global environmental change require new kinds of institutions - institutions that are flexible, and capable of learning in conditions of complexity and uncertainty. The ability to link with other institutions may be crucial to designing institutions that fit with large scale, complex, interdependent problems in turbulent environments. One hypothesis is that interplay enhances fit and can make institutions more responsive to, consistent with, their domains.

8. Research Plan for IHDP in Institutional Interplay

It is clear that a number of research questions can be drawn from the preceding discussion. Can investigation of the range, scope and consequences of institutional interplay be integrated into a coherent research plan? The goal of such a research plan might be to understand the role of institutional interplay in the ways in which institutions determine anthropogenic drivers and human responses to global environmental change.

It might include such activities as:

1. Determining the scope and strength of links (inadvertent as well as designed) among specific institutions and mapping functional links across substantive domains

2. Identifying the factors that determine the type and consequences of linkages among specific institutions.
3. Determining the consequences of these links for the effectiveness and robustness of the institutions concerned.
4. Distinguishing links that are positive (synergistic) from those that are neutral or negative.
5. Identifying policy implications and deriving evaluation and design criteria and principles for the design of new and the adaptation of existing institutions.

“Whatever the attractions of examining individual regimes as self-contained entities, there can be no doubt that the subject of institutional linkages in the sense of connections among differentiable social practices is destined to loom larger and larger in our thinking about governance in international society during the foreseeable future.” (Young, 1996, 20)

It is clear that linkages, interconnections and interdependencies in natural systems should be reflected and effectively incorporated into human institutions designed to protect, restore, and manage those biophysical systems at different levels of social organization. As researchers, we need to ask how that is being done now and how it could be done better.

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