Global Environmental Accords
Nazli Choucri, editor

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Global Accord
Environmental Challenges and International Responses

edited by
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Series Foreword

A new recognition of profound interconnections between social and natural systems is challenging conventional intellectual constructs as well as the policy predispositions informed by them. Our current intellectual challenge is to develop the analytical and theoretical underpinnings crucial to our understanding of the relationships between the two systems. Our policy challenge is to identify and implement effective decision-making approaches to managing the global environment.

The Series on Global Environmental Accords adopts an integrated perspective on national, international, cross-border, and cross-jurisdictional problems, priorities, and purposes. It examines the sources and consequences of social transactions as these relate to environmental conditions and concerns. Our goal is to make a contribution to both the intellectual and the policy endeavors.

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Global Accord: Imperatives for the Twenty-First Century

Nazli Choucri and Robert C. North

Drawing on the preceding chapters, this one provides a perspective on the global system and its components and presents a brief synthesis, which includes a broad integration of the concepts, illustrative data, and analyses put forward in the book as a whole. Additionally, a number of imperatives for research and policy making in the twenty-first century are derived from the earlier chapters.

Three contemporary challenges to humans were identified in Chapter 1. The first arises from close, intensely interactive, and increasingly powerful linkages between forces of the natural environment and human social activities, national characteristics, and international relations. Second is the human decision or behavior problem posed by concepts of—and approaches to—the global environment. This challenge derives from a recognition that the ecological balance of the globe is unintentionally affected by how individuals behave and how groups, institutions, and particular states manage their environments. And third is the institutional challenge pertaining to the identification of an appropriate framework for international cooperation at the global environmental level.

Responses to these challenges have been presented in four parts, which have focused on (1) theoretical and empirical dimensions of global environmental change; (2) the actors and processes involved; (3) evolving law, economics, and intertemporal issues; and (4) international systems and institutions. This chapter, the fifth part of the book, presents an integrated perspective and imperatives for the twenty-first century. The organizational plan for the book (table 1.1) summarized the diverse dimensions and perspectives addressed by the individual chapters. The

concerns expressed in this joint effort are of two types: First is the concern with global analysis, which is the subject of our inquiry, and second is the concern with the relevant perspectives or "worldview" implied, implicitly or explicitly, in each of the chapters. The individual chapters are not intended to fit into individual cells in this matrix. Rather, our purpose is to draw attention to the contending underlying intellectual orientations in matters of global environmental change, the policy concern shaped by these orientations, and the modes of institutional responses that emerge as a result.[1] To place the synthesis and conclusion of this volume in theoretical context, however, we will summarize some of the ways in which individuals (and local events), states, and international and global systems are dynamically interconnected.

Human and Physical Dimensions of the Global System

Because of their central relevance to human existence and survivability, population, technology, and resources—presented in chapters 1 and 3 as master variables—are discussed in other chapters as well. There are good reasons for this. The population variable, for example, represents more than mere numbers of people. Inherent in the concept of population are the phenomena of individual human thought, consciousness, imagination, beliefs, feelings, and creativity—to say nothing of needs, wants, demands, and overall (and ever-expanding) productive capabilities (knowledge and skills and technologies) and potentials for transforming energy and other resources into the remarkable accoutrements of modern civilization.

Without these many endowments, the social environment could not exist as distinguishable from (or threatening to) the natural environment. Neither human social systems nor the special environment(s) they create could have emerged without social technologies—the special knowledge and skills that appear to set anthropogenic organizations, activities, and ecological impacts apart from those of other species. In identifying such intricacies, it is not always clear to what extent our efforts are compromised and our conclusions clouded by the reality that we ourselves have emerged from—and are thus an element—of the natural system. Wherever the truth may lie, the fact remains that none of these phenomena,

nor other forms of life as we know them, could exist without the resource variable.

It is for all of these reasons that population, technology, and resources are referred to as master variables. They, in turn, are conditioned by uncounted numbers of intervening and dependent variables within the hologram—or the global system of reality—schematically represented by figure 1.6. In this connection, it is important to remind ourselves that, depending on specific functions and the perspective of the observer or analyst, the three master variables—like other variables—can be viewed (and analyzed) as intervening or dependent as well and independent only in the context of a system of complex interrelationships. If there is a case for decomposition, it can be made only for purposes of parsimony and only to integrate the constituent parts with a comprehensive whole. The systems at hand are inherently complex and intensely dynamic.

The Individual as the Source of Organization

Demands, decisions, and actions, strictly construed, originate with individuals in roles that are played out on a multiplicity of organizational levels (and social environments) from family, work team, or other small group to corporations, states, and the international and global systems. A large proportion of such activities are explained and generated by bargaining and leveraging of one kind or another among such individuals in the course of their dealings with each other.

As a reflection of the state, in turn, leadership—the individual leader or the president, prime minister, dictator, or other chief executive—can be envisaged as keeping watch over the country's internal and external environments from a swivel chair and pushing and pulling levers in efforts to achieve and, if possible, maintain something approaching an equilibrium between the two environments. In actuality, of course, a leader is not acting alone. Even a dictator or tyrant must bargain and leverage with his generals, ministers, advisers, enemies, and others; supporting (and unreliable, perhaps challenging) interest groups; and even the populace, of which he may be contemptuous.

Demands circulate throughout the system (unevenly)—as, in response, do energy, other resources, goods, services, benefits, and costs, which tend to cluster around concentrations of capability, influence, and power.

All of these phenomena contribute to the depletion and degradation of energy and other resources across wide landscapes, in a variety of forms and with many consequences. The production and distribution of resource uses and degradations tend to correspond to the generation and distributions of demand, capability, resources, goods, and services—and to concentrate around production and consumption centers. These are generic tendencies.

Worldwide the production, diffusion, and international distributions of resource depletions and degradations generally tend to correspond, in turn, to the distribution of demands, resources, goods, and overall consumption—together with a wide variety and range of depletions and degradations of energy and other resources extending worldwide. The generation of carbon dioxide (CO_2) and other greenhouse gas emissions by human actions is a disturbing manifestation of a broad and interconnected network of environmental uncertainties and potential dislocations.

The International System as a Distributive Mechanism

Interactions and competitiveness among states of disparate capabilities give rise to—and largely drive—the structure and characteristics of the international system, which is shaped and defined to a considerable extent by trade and investment, diplomacy (and international law), and strategic (military, naval, and air) activity—all of which exert powerful impacts on local, national, and global environments. Chapter 6 addresses trade and investment (focusing on multinational corporations), and diplomacy (and international law and regimes) bearing on environmental issues are discussed in chapters 12, 13, and 14. Since none of the chapters deals with international conflict, crises, or war, however, it should be noted in passing that war and preparations for war (including the establishment and maintenance of military, naval, and air bases) are notorious—and, with the development of chemical and nuclear weapons, potentially disastrous—agents of environmental depletion and degradation.

Although primarily driven by economic interests, trade, investment, and the activities of multinational corporations have distributive or disseminating effects that impinge upon local, national, international, and global systems in ways which—partly because of data deficiencies—

have not been adequately investigated. In fact, the rapid globalization of these functions—and the diffusion of structure and organization to perform these functions in the pursuit of desired goals—in recent decades has had the unintended consequences of distributing eminently useful products that are also agents of resource depletion and/or degradation—e.g., industrial chemicals (insecticides, herbicides, solvents, et al.); crude oil and petroleum products (including synthetics and plastics); automobiles, trucks, buses, and tractors); other whole technologies; and weapons of war (not always so unintentionally distributed)—throughout the world.

This is only one side of the story. Trade and investment being historically indispensable to development and social, economic, and political stability, these considerations call attention once again to the tension between growth and development and consequent policy dilemmas. An immediate concern deriving from uneven growth, development, and economic and financial distributions is the dichotomy between North and South, industrial and developing nations, which is explored in chapter 4 and referred to with some frequency in other chapters as well. In fact, as the authors of chapter 5 make clear from the start, the dichotomy concept has become increasingly inappropriate. In recent decades "the accelerating pace and increasing complexity of scientific advances and technological change" have made the process—and the dissemination—of technological and economic innovation "more rapid and systematic, but also more difficult and costly"—and possibly more uneven—for and among developing countries.

At the same time, poverty and population growth in developing countries are both causes and consequences of environmental degradation which, as indicated in chapter 3, tends to be aggravated by the higher levels and broader ranges of energy and other resources required by modern technologies. As if these problems were not sufficiently overburdening, several chapters refer to economic statistics revealing trends in living conditions that point to a widening economic polarization in the world and what Third World writers have referred to as environmental data "biased against developing countries" and a new "environmental colonialism" practiced by industrialized countries.

All of these phenomena occur within—and depend and draw upon—the planet and the natural system it supplies. This means that local,

national, and regional programs for environmental regulation and management cannot be fully and effectively operational without some measure of oversight at the global level. In fact, negotiations directed toward a Framework Convention on Climatic Change were already underway in the early 1990s—under the auspices of the Intergovernmental Negotiation Committee (INC) established by the UN General Assembly. And the United Nations Conference on Environment and Development (UNCED) included among its objectives the framing of an Earth Charter and Agenda 21 specifying global priorities for the twenty-first century (chapter 13). All of these factors point to the increasing recognition of local-global linkages and of the need to reach international agreement on environmental management.

Decisions, Outcomes, and Dynamic Feedback

In conventional theory, nation-states have been treated as unitary rational actors seeking to maintain conditions of stable equilibria. But in view of real-life uncertainties deriving from the uneven growth, development, bargaining, and leveraging and subjective decision making referred to above, we tend to discount unitary rational actor and stable equilibria assumptions. Our predisposition, rather, is to conceive of states (through their political systems and their leaders) as continually pursuing elusive equilibria or—at best—maintaining adaptive, continually changing and more or less self-adjusting, "dynamic" equilibria or by trial and error tending toward steady-state processes.

Chapter 2 raises issues similar to some of those identified in chapter 4: How many species can be extinguished before an ecosystem's resilience and adaptability are imperiled? How much diversity is required to sustain life? How, further, does the citizen environmentalist, the corporate executive, or, for that matter, the social scientist address such issues? The reality is that even the trained ecologist is seldom capable of providing certain answers to these crucial questions, particularly in specific circumstances. All too frequently, moreover, the questions are not forcefully addressed until an environmental crisis has occurred. Often, too, it is such a crisis itself that reveals the differences—the gaps, separations, and conflicts—between scientists and others having special knowledge, relevant competencies, and crucial responsibilities (decisionmakers, policy formulators, and bureaucratic managers, for example). How can

uncertainties in the "hard" sciences and the perceptions, affects, expectations, suspicions, animosities, and other subjectivities in the "softer" social sciences be dealt with?

Such dynamic feedback relationships, when positive, induce us to continue the behavior at issue or to modify or discontinue if it is negative. As human beings we are also capable, through "feedforward," of complex psychological processing and responding to images, ideas, questions, problems, or issues projected from the present into the future. It is such forms of feedforward that allow us to anticipate, plan for response, and devise the institutional mechanisms for reasonable action. These responses are serious challenges to conventional theory—in the social sciences more broadly defined and, more specifically, in the study of international relations.

Ecopolitics and Ecological Thinking

In reviewing the rise of global ecopolitics since the mid-nineteenth century, chapter 4 presents a main thesis to the effect that the rise of "a genuinely global politics of environmental issues" has been characterized by "a reciprocal, symbiotic, but still contradictory relationship" with a cluster of powerful and highly relevant interdisciplinary research paradigms and programs. An aspect of this relationship pertains to a certain divisiveness that results from the introduction of political issues into the more rigorous and coherent sciences of the natural environment. In line with Vernadsky's concept of "noosphere," this comprehension increasingly encompasses the interconnected but analytically distinguished part of the biosphere where humanity works for the sustainable development in balance with the biosphere as a whole. As Vernadsky saw it, "such an historical phenomenon should be examined as part of a terrestrial *geological* process, rather than merely as a *historical* process." The chapters in this volume are more restrained, but the overall thrust appears to be comparable.

The population, technology, and resource variables referred to in most of the chapters clearly indicate the tight interactions between human beings and the chemical, geological, biological, and other "natural" components of the global system. They also suggest how change and loose analogs of biological evolution reflect and help to explain anthro-

pogenic technological (mechanical, organizational, and institutional) development and consequent impacts on the natural environment. Relevant here are the unevennesses in growth and development processes within and between societies (and states). Central to modern development are the knowledge and skills derived from social learning in general. Also relevant to interconnections of social and natural systems are the distinct pathways of development that appear to be available to (and/or emergent from) countries of different population/technology/resource-availability profiles and grossly disparate capabilities (chapter 3).

Additionally, chapter 4 traces the "evolution of evolutionary thinking" in ways that expose something of a hiatus between the critical linkages inherent in global change (chapter 2) and in growth, development, and environmental change (chapter 3), on the one hand, and, on the other hand, the environmental policy instruments discussed in chapter 5. In this connection, chapter 4 also points to a tendency toward divisiveness that tends to emerge when environmental science confronts environmental politics and management. Both science and technology are double-edged in the sense that "along with the benefits they bestow," they also contribute to serious problems including unintended environmental impacts (chapter 7). Paradoxically, however, it is in science and "new" technology that options for reducing environmental damage are to be found.

Institutional Adaptation and Sociocultural Evolution

Directly relevant to policy formulation and policy response are the concepts and real-world manifestations of institutional development and adaptation or sociocultural evolution, which has been referred to above as an aspect of "the evolution of evolution" idea put forward in chapter 4. Whether derived from trial-and-error social learning, cultural tradition and moral imperative, or "backward indebtedness," intertemporal and intergenerational equity is likely to eventuate and survive as an operational principle only to the extent that it is institutionalized in conjunction with some operational sanctions. There may be an adjunct consideration, however. To the extent that each current generation (including our own as a baseline) can assess the "real" and preferred environmental utilities (developmental), equities (distributional), and their respective costs and benefits, the dynamic system-modeling techniques referred to above should provide us with the capability of monitoring, recording, projecting, and comparing utility and equity balances and trends from region to region and from generation to generation.

At this writing, the nations of the world are engaged "in a grand enterprise to build a regime that can safeguard the environment of the whole planet . . . an enterprise fraught with uncertainty, with possibly great and controversial costs, and with potentially divisive political implications" (chapter 13). The divisiveness is due as much to differences in levels of development and socioeconomic, demographic, and technological conditions and capabilities as it is to political and ideological preferences, national priorities, and perceptions of national profile. Fraught with uncertainty, this is an enterprise that "must proceed in timely fashion," however, because the climatic effects of human activities have now reached proportions that may be felt on a worldwide (as well as local) scale. Procedures along these lines should be eminently applicable to a time series study of the (admittedly challengable) profile and growth-development pathway data presented in chapter 3 and relevant to "steering functions," options, incentives, expectations, and other decision-making and management phenomena referred to throughout the entire volume.

Uncertainties and Unpredictabilities

All chapters refer directly or indirectly to uncertainties, unpredictabilities, disintegrative tendencies, and even a certain amount of "chaos" in natural and social environments and in their interactivities. Whether an observer or analyst looks into the past, considers the present, or projects into the future, uncertainties and unpredictabilities are certain to be encountered sooner or later. As in other spheres—research, planning, decision making and policy making—uncertainties and unpredictabilities need to be recognized and taken into account. Chapter 2 refers to a huge array of natural factors that appear to bear upon natural and social forces and thus to influence levels of global energy consumption—and possible levels of global pollution and warming over the next few decades. It goes without saying that these problems are further exacerbated by uncertainties and unpredictabilities in human decision making, policy formation, and program implementation. This problem is exacerbated by very real uncertainties pertaining to the natural environment that

remain to be resolved—predicting rates of greenhouse gas emissions and their implications for global warming, for example.

Numbers of other disturbing uncertainties and unpredictabilities are identified in the pages of this book (chapters 1, 2, 3, 4, 5, 6, 8, and 12, among others). As indicated in chapter 12, however, not all uncertainties are "bad." Chapter 2, for example, calls attention to the consideration that nonlinear, uncertain, and unpredictable interactivities often "push" unstable, even disintegrating, organizations or programs into new equilibria. Similarly a society, through its constituent organizations and institutions, may find ways of evading or reducing (if not resolving) difficult paradoxes or dilemmas resulting from a decision-making or policy-forming consensus catalyzed by pressures of uncertainty.

The three master variables raise important uncertainties of their own. This is especially true of the population variable, which includes the known impacts of the numbers of people, their levels of technology (and specific knowledge and skills), and their energy and other resource demands (and what they do with their resources when they obtain them). But also included are the consequences that are unforeseen and unintended—whether due to inadequate information, "irrationalities" of policy or decision, dilemmas of action, or limited scientific or technical (mechanical/engineering) knowledge of skills. Advanced levels of technology (scientific, mechanical, or organizational), in short, can expand human capabilities and widen their horizons of choice, but often the ascertainable problems also increase more or less commensurately (chapter 8). As suggested in chapter 5, the difficulties often emerge from differences in the scale, magnitude, and rates of change among the parts of the world system that different disciplines observe and seek to measure, but they may also result from specializations and fragmentations in the sciences themselves.

A related problem emerges from uncertainties with respect to the junctures in the processes of growth and development at which trend changes can be effected. Difficulties of this kind are exacerbated by the intense interactions, referred to above, that characterize relationships between natural and social (economic, political, strategic, and environmentally oriented) processes. Similar uncertainties emerge from uneven growth and development within and between states. Chapters 3 and 6 focus on some of these essentially structural dynamics (interactions and

distributions of populations, technologies, and resource accesses). This perspective should not be allowed to obscure or discount more proximate interventions in the immediate and critical domains of environmental decision making, policy formation, and regulation, but these will be discussed further along.

Intertemporal and Intergenerational Issues: Economics and Law

Some of the threats confronting us—notably possibilities of global warming—are not likely to "damage anyone now alive, nor more than trivially—even most of their direct descendants." No one now living, moreover, "stands to gain personally" by acting (or depriving him- or herself) now. This consideration raises serious questions about the willingness of current (or immediately succeeding) generations to work—or sacrifice—in order to protect the well-being of future generations whom they will never know and cannot even envisage. Yet if such threats persist unabated, more remote generations will be "progressively damaged," and the remoter they are, the greater the damage will be (chapter 9).

Utility versus Equity: Which Should Prevail?

In part, at least, the issue of respecting obligations of the living to the welfare of progeny several generations removed involves a choice between utility and equity (chapters 9 and 11). In pursuit of an international legal framework, chapter 10 presents the achievement and maintenance of the familiar concept of sustainable development resting on a "commitment to equity with future generations." The underlying intent is to constrain "a natural inclination to take advantage of our temporary control over the earth's resources" and use it for our own benefit—even at the expense of future generations. In pursuing any theory of intergenerational equity we must also guard our relationship to the natural system. Sustainability can be achieved and maintained only if we look at the earth and its resources as a trust that our ancestors have passed along for us to enjoy and pass along for the use of our descendants.

In order to define intergenerational equity it is useful to accept the human community as a partnership among all generations wherein each generation inherits the earth in at least as good condition as it had been

in for the previous generation and to have as good access to it. Such an approach has roots in the common and civil law traditions of the Judeo-Christian and Islamic traditions and also in African customary law and Asian cultures' nontheistic traditions. There should be no requirement for any generation to predict the basic or core values of future generations.

Finding conventional concepts of sustainable development unsatisfactory, chapter 9 approaches equity by a different route. From the perspective of utility, economists and other evaluators make the costs and benefits of events occurring at different times comparable by discounting them to a common discounted present value basis. The direct applicability of established procedures to matters pertaining to long-term environmental degradation remains subject to great controversy. In this connection, in the real world, given an absence of abatement, damages from climate change would be close to zero for fifty years or so, but would rise thereafter at an accelerating rate and become "very high toward 150 years and, presumably, much higher after that." On the other hand, the annual costs of an abatement program exceed annual benefits for about eighty years into the future, but thereafter (for future generations) benefits exceed costs. But under conventional discounting procedures, understandable concerns about early costs and distant future benefits would be suppressed.

At this point the concept of sustainable development becomes a debatable issue in chapter 9 on the grounds that it depends upon an essentially normative premise. The assumption is that each generation should make use of the environment and its resources only so far as to meet its needs "in ways and in degrees that leave the next generation with similar capacity to meet *its* needs and yet leave unimpaired the ability of still further generations to do likewise, and so on for the whole sequence of generations." Each generation, in short, should "live off income only and leave capital unimpaired."

In effect, this principle imposes on each generation the normative obligation to accept moral responsibility for the interests of future generations—an imperative that "cannot be enforced unless it is voluntarily agreed to by each generation as it assumes de facto control." Additionally, fulfillment of this responsibility raises accounting issues—e.g., if sustainability requires the maintenance of input stocks, how are they to be recognized and measured, and how is their depreciation with use to be calculated?

In order to circumvent these complications, chapter 11 introduces the concept of "backward indebtedness," which is founded on "the unquestioned debt that members of the present generation owe to the *past* at the moment of birth." Included in this legacy are the culture, institutions, knowledge and skills, and other forms of "capital" that have been accumulated and passed along by previous generations. How is this debt to be repaid? It cannot be repaid to the past, but only through support to future generations and a "giving back" to nature what "is taken from" nature by the generation. In what form(s) is the debt to be paid? Probably in terms of pollution abatement, protection of scarce and exhaustible resources in favor of resources that are renewable, and the development of more energy-efficient technologies for obtaining, processing, delivering, and using more energy-efficient resources—to name a few.

Asset Management for Sustainable Development

Every country is by definition endowed with a set of attributes and capabilities that together constitute its national assets. Every country controls its assets to one degree or another; however, the countries differ substantially in the type, content, concentration, and control over their national assets. These assets include human capital (population, educated individuals, management skills, etc.), natural resources (energy, agricultural land, raw materials, etc.), financial assets (in various forms), and a whole range of inputs into productive processes (technology broadly defined in its various dimensions and manifestations).

Some of these assets are within national boundaries; others are owned by the sovereign state but are physically located outside national boundaries; still others are owned by nationals of the state but located elsewhere. At issue are matters of ownership as well as those of legal jurisdiction. Every country is confronted with the policy problem of devising the "best" way possible of deploying its national assets in order to meet the needs of present as well as future generations. While the immediate concern for politicians and policymakers is always the present and the short run, none can ignore the longer run and the interests of future progeny.

Together the chapters in this volume point to the importance of envisioning a strategy of sustainable development as one that is tailored to the particular characteristics of each state but that also follows principles that might enhance propensities for sustainability. Once such a strategy is devised, in generic terms, the specifics for each country can be formulated and matters of implementation can be addressed. At this point our concern is with identifying the basic policy principles for enhancing sustainable development.

In the context of the profile concepts, it is clear that different groupings (I to VI) can be described differently with respect to their overall asset configurations (chapter 3). With growth and development, countries may alter the configurations of their national assets and may choose to deploy these differently as their profiles are affected by earlier decisions and developmental policies. An asset management perspective on development forces countries to consider the preservation as well as the expansion of their assets (Leonard 1988). Both preservation and expansion are essential requisites for sustainability. They may also serve as operational guides in the choice of policies. This means that in the choice of policy (in any sector or domain of activity), an important question to be considered is how it may affect preservation versus expansion of (which type of) national assets.

In an asset management perspective the basic priority is the *transformation* of assets from one form to another consistent with the characteristics of individual countries and with their goals and objectives. The content of the assets and the transformations that are required differ from profile to profile and, in the specifics, from country to country. In this connection, for example, for countries in profile group I (resources > population > technology), the general problem is to transform resources (such as oil in the ground) into physical capital (one application of technology) and expand the education base of the population (another application of technology) while at the same time raising the level of knowledge and skills of the population as a whole. By contrast, for countries of the group VI profile (technology > population > resources), the asset management problem involves the transformation of technology, knowledge, and skills into means of greater access to more energy-efficient technologies and resource use. Japan is the prototypical case in the sense that sustainable development will necessitate continued and expanded access to resources (from external sources) by expanded applications of technology and expansion of financial assets derived from investment and related activities.

In sum, every country, industrial as well as developing, is confronted with the need to devise an asset management strategy. Such a strategy would be designed to meet each country's own socioeconomic requirements in a distinctive way that is "customized" to its own conditions for the well-being of present as well as future generations. A good strategy for asset management is a central feature of capacity building. There is no universal prescription. There can be only general principles to guide the well-being of everyone in the international community.

The generic policy problem worldwide then becomes this: how to transform current conditions and the present configuration of national assets into a configuration that can enhance the prospects of survival and protect the interests of both present and future generations. An asset management approach to sustainable development also imposes a norm of equity across states in the international system (Choucri 1992). It frames sustainability in the same general terms for everyone in the sense that all countries, at all levels of development, need to find means of meeting the needs of present generations without undermining the interests of future generations—given the assets available to them, those located within their borders as well as those owned by them or their nationals but located outside national borders. Such challenges must be met on all levels of organization, from individuals, families, and local communities to states (and their major organizational components) and to the international and global systems. An asset management perspective includes the development of assets as well as their effective deployment.

International Law and Treaty Making

The three chapters in Part IV are concerned with the international system and the systems of its institutions—treaty making, international law, and the organization of function-specific international regimes—that most directly bear on issues of international and global environments. Pertinent to these functions are the analyses (quantitative and qualitative) in chapter 12 of international treaty making for environmental protection

and the responsiveness of international law "to this array of environmental challenges." Two contributions of chapter 12 are especially notable. First are the discussions on sovereignty, and second are the tables and the wide array of data on environmental realities they capture.

The formalized principle of national sovereignty dates back at least as far as the Treaty of Westphalia (1648), which is historically recognized as formalizing for the first time the concept of international system. Providing a basis for the legal concept of each state's autonomy over its domestic affairs, the concept of sovereignty also includes legal recognition of formal juridical control over a state's relations with other states and over other external affairs such as its authoritative participation (bargaining, leveraging, and coalition formation, for example) in joint decision making within the international system.

As indicated in chapter 12, many conventional Realist and neo-Realist scholars challenge the proposition that states can legally join in collective action for the resolution of environmental depletion or degradation falling beyond the limits of traditional national sovereignty. Other scholars consider this conventional view of sovereignty open to modification—an example of the kinds of adaptation and sociocultural evolution that modern environmental threats (and other contemporary and future exigencies) are likely to require as they become more international and global. In the meantime, the tension between national sovereignty and international interdependence becomes more pronounced as environmental alterations due to human action affect natural environments and their global implications. Not only is the "sovereign" state a reality of international life; it is an essential one: We do not know how to manage and regulate the activities of individuals in the absence of institutional requisites of "sovereign" states.

Chapter 12 traces—and seeks to explain—secular trends in international law and evaluates 132 multinational environmental treaties relevant to environmental issues. All such treaties deal with one of two categories of environmental problems—those pertaining to the protection of the oceans, the atmosphere, and other global "commons" outside national control, and those located or originating within some country's territorial control but exerting an impact elsewhere. All of these issues can be viewed as international in the sense that in effect they extend

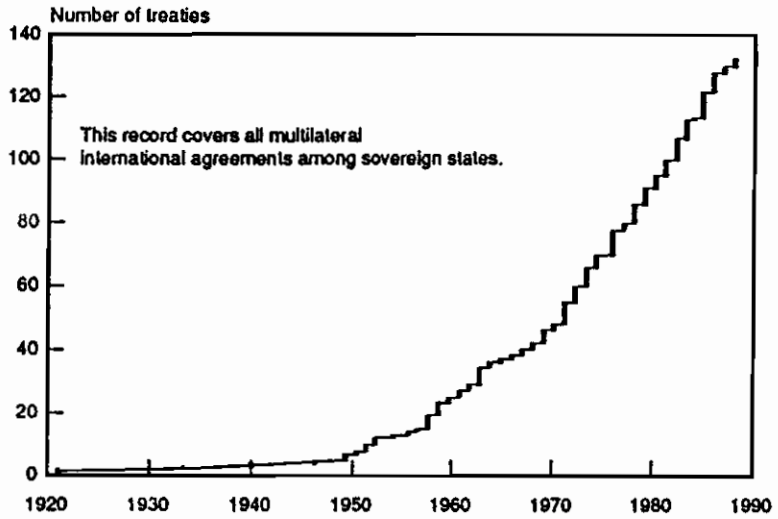

Figure 15.1
International environmental treaties, 1920–1990
Source: Based on compilations by Haas with Sundgren (Chapter 12) and derived from UNEP's International Registry of Environmental Treaties.

beyond national borders and impinge on one or more countries in the international system. To the extent that their impacts are worldwide (or threaten to become worldwide), they become global. In this sense, any country that produces carbon dioxide and other trace gases that rise into the atmosphere can be charged with exerting a global environmental impact.

The trend in international environmental treaty making analyzed in chapter 12 is represented here in figure 15.1. The most compelling factor is the similarity in patterns between legislative responses in the U.S. case (figure 6.2) and those at the international level. Devoid of the power of national law, international agreements nonetheless carry strong weight. Chapter 12 asserts that circumstances relate, in reality, to an array of incentives for cooperation and conflict that face the different parties. Data from the tables of chapter 12, combined with data from the tables of chapter 3, might open possibilities for further analysis and the development and testing of quantitative theories of cooperation in international environmental affairs.

Organization, Policy, and Uncertainty

As the chapters in this volume have shown, the dynamic interaction of social and political systems—shown in figure 1.6—provides a complex context and network of linkages for human dimensions. The point is this: A change at one junction disturbs the entire fabric of interaction, which defines the next (perceived as required) decision. While these are described sequentially for purposes of discussion, decisions and actions—of all kinds—are generally concurrent and simultaneous over and above the sequential (action-reaction) processes.

To the extent that paradoxes, policy dilemmas, and other uncertainties (natural or anthropogenic) impede efforts to regulate human activities contributing to environmental dislocations, chapters 13 and 14 urge organizational initiatives to enhance the transparency of national policies and thus begin the process of shaping effective policies to account for anthropogenic contributions to global warming (and other ecological threats). Such undertakings need to be initiated, in short, well before rates of deterioration and probable outcomes can be assessed at the levels of confidence that might be desired. From a global perspective, appropriate international regimes must be developed now in order to ensure that they are fully operational when they are needed.

Core functions should include the coordination and assessment of relevant science; the provision of an ongoing forum for negotiations; the systematic collection, review, and dissemination of data on emissions; and the review and assessment of national policies relevant to global warming. All four functions are complementary and interactively necessary for the proper function of each. In addition, all are sufficiently generic to work well with most of the different types of substantive climate regimes currently envisioned.

Chapter 15 represents the international community as "moving swiftly" to satisfy the need for the first two functions. In the atmospheric sciences, there is a long tradition of international cooperation in research. Much less progress has been made in the social sciences generally, and social science applications to problems of global warming and other atmospheric problems have barely begun. As indicated in chapter 1, the social sciences developed through a careful and consistent separation of

human concerns from natural (environmental) contexts. Then the various dimensions of human activities—social, political, economic, and strategic—were carefully separated from each other and scrutinized, and attendant "theories" of social action emerged. This strategy of fragmented knowledge building, so successful in the past, is no longer adequate, or even minimally effective, in addressing the challenges posed by anthropogenic sources of environmental alteration at all levels of analysis.

Increasingly this challenge of devising responsive strategies has assumed both international and interdisciplinary proportions. The preparatory process for UNCED-92 and the parallel international negotiation on the Framework Convention for Climatic Change were bold experiments for a new international and interdisciplinary duality for global policy. In the early 1990s, for example, the Intergovernmental Negotiating Committee (INC) on Climate Change was performing both forum and secretariat functions. Inasmuch as climate change involves a wide range of environmental and development-related issues, the preparatory processes for UNCED were also contributing to the international deliberations shaping a climate treaty (chapter 13). The secretariat for the Convention on Climate Change was expected then mandated to continue providing secretarial services after the conference had adjourned.

As the opening years of the twenty-first century approach, the need for integrated, fully functioning authoritative and legitimate regimes for managing the global environment becomes increasingly pressing. At the same time, however, the world's economic and political environments are characterized by rapid growth, development, unrest, and, in many places, violence—all deeply rooted in anthropocentric history.

Tumultuous Changes as Context for Policy

Dating from the explorations and colonization of the fifteenth and early sixteenth centuries, Spain, Portugal, England, France, the Netherlands, and other European nation-states rapidly transformed themselves into multinational empires. Thereafter, until World War I, these great overseas imperiums—together with surviving land empires (Chinese, Ottoman, Czarist Russian, and Austro-Hungarian) ruled the world. But the

early twentieth century became a historical turning point. In 1912 the Chinese Empire collapsed, and in 1917 the strain of Russian participation in the European conflict triggered the overthrow of the Czar and the establishment of the Soviet regime—in considerable part a reorganization of the empire under new management. By the war's end the Austro-Hungarian empire was dismembered, and the Ottoman Empire gave way to the Turkish Republic.

During the inter-war period the Fascist regime in Italy tried to establish a twentieth century successor to the ancient empire of Rome; the Nazis set out to resurrect and extend the German empire, and Japan expanded its imperial holdings into China and Southeast Asia. These triumphs were short-lived, however, and all three empires were extinguished by the Allied victories of 1945. Within the next few years, the overseas empires of Britain, France, the Netherlands, and other Western European nations were dissolved as their colonies were transformed into independent—for the most part developing—nations (India, Indonesia, Indochina, et al.). Most of Africa was "liberated," as were many island colonies of the Pacific. Many of the former colonies or other remnants of former empires—India, Sri Lanka, Turkey, Iran, Iraq, and numbers of African states—themselves encompass ambitious national ethnic or religious) minorities. Quebec challenges Canada. In northern Ireland the Irish Revolutionary Army opposes British rule with guerrilla tactics; Basque separatists mount a movement in Spain; the former Soviet Union is already dissolved; Yugoslavia has dismembered itself; and so it goes. Whatever its political and economic implications, such widespread fracturing vastly complicates the pursuit of global accord.

This is only one thrust of the times, however. Other seemingly countervailing thrusts point toward regionalization, as in Western Europe, and globalization—phenomena manifested in terms of technological diffusion (including accelerations in communication and transportation), economic interdependence, and strategic security (as evidenced by the "necessity" of keeping nuclear and other weapons of mass destruction under "responsible" control). Further thrusts toward twenty-first century globalization include the threat of ozone depletion, global warming, and a growing recognition that these and other environmental challenges, originating "locally," must be managed globally.

In Pursuit of Global Accord

The record of international environmental treaties presented in chapter 12 is summarized in figure 15.1. The trend speaks for itself. And in conjunction with the record of environmental legislation of the United States (table 6.4), we see evidence of the convergence of national and international responsiveness to environmental legislation.

What are the prospects for developing a global regime capable of regulating human activities that currently threaten to precipitate major changes in the earth's climate system? The current record of initiatives of this kind is somewhat ambiguous, but in recent years research in this direction has identified a number of key determinants of success or failure in this direction. The importance of establishing such a regime derives from the global aspects of the problem and also from the small but significant possibility that not preparing for climate change would have catastrophic consequences (chapter 13). At the core of the task are institutional bargaining, leveraging (positive and negative), and the payoff structures required for reaching agreements through appropriate regulating procedures (chapter 12) and shaping the bargaining process and evolving norms, including the conception of environmental sustainability and responsibilities to future generations (chapter 10).

Here a distinction needs to be drawn between bargaining approaches to conventional issues of competition and conflict resolution characterized by coalition forming and stabilizing for purposes of "winning" and institutional bargaining, which seeks to establish coalitions of the whole, or at least to develop a consensus involving as many of the countries as feasible. This distinction leads back to the Realist and neo-Realist issues of power and hegemonic stability referred to above. It also draws a sharp contrast between centralized conceptions of global order and consensual/participatory conceptions. Relevant, as indicated in chapter 12, are the considerations that hegemons do not always use their power in the interests of establishing institutional arrangements for "the whole" (or, all too often, for any interest other than their own); hegemons are not always successful in any case; and "regimes can and do form in situations where no dominant power is present."

On the positive side, and perhaps peculiarly relevant for regulating environmental problems, scholars have put forward concepts of insti-

tution nesting and networks of specialized international regimes as providing a more promising alternative to hegemonic discipline (see, for example, Koehane 1984, 78–84, 89–92). If there is a new institutional innovation at this point in time, it is the procedure leading to—and emerging from—UNCED-92, which we consider below. The "nesting"/"networking" is both vertical (within states) and horizontal (across regions and states) as well as governmental and nongovernmental in its institutional context.

But there are additional considerations that also appear to be highly relevant in view of the fact that one "superpower," the United States, is not only a "cautious" champion of environmental causes, but also a major perpetrator of resource depletion and degradation and another superpower, the former Soviet Union, as steward of its vast natural domain has been notably destructive. So far, at least, hegemonic leadership in the environmental domain has been minimal. In this connection, chapter 13 refers positively to the creation of a small number of bargaining entities providing a mechanism for articulating environmental issues at stake and ensuring that ecological threats are dealt with by reducing transaction costs and optimizing applications of the consensus rule in support of the basic needs of all interest groups. In line with these endorsements, there is the possibility of adaptive developments in the bargaining and leveraging function itself.

Central to the establishment of a regime for regulating human activities that threaten the environment (including major changes in the earth's climate system) are advanced processes of institutional bargaining (and adaptations of strategies for reciprocal interaction, such as GRIT and Axelrod's tit-for-tat strategies, for example). Historically, the record of such efforts has been mixed. Participants in institutional bargaining commonly assume the existence of a contract zone or range of feasible agreements that all would prefer over a no-agreement outcome. But reliable information regarding the contract zone and payoff patterns that are likely to emerge from specific institutional arrangements tends to be imperfect at best. In general, those bargaining and leveraging over terms of constitutional contracts at the international level rarely make sustained efforts to improve information about payoff structures before negotiations. The tendency, rather, is to proceed by identifying a small

number of key problems and refinement in the negotiating texts to encompass new areas of accord (chapters 12, 13, and 14).

Relevant here is the emphasis placed on the UNCED-92 process of capacity building in order to improve the understanding of local and global environmental problems and to enhance prospects for the identification of effective solutions. Overall, to the extent that capacity building is effective, then it may reduce discrepancy in the power and capability of actors engaged in institutional bargaining.

Emergent Paradigms and Methods of Inquiry

Conventionally, we think of growth, development, and contributory sources of energy or power as production forces, which they are, and decision making and management as option selecting and *steering* functions, which they are. If we use a boat, ship, or other vehicle as a metaphor, we perceive it as propelled by wind (on land by a draft animal) or by an encapsulated natural force such as heated (and expanding) steam, the internal combustion of a fossil fuel, and so on. Also, conventionally, such a vehicle is steered by a different source—a sailor manipulating a long oar from a vessel's stern or manning a tiller or steering wheel, or a driver guiding a draft animal or a motor vehicle.

Certainly societies are not only driven (propelled) by technological advancement and economic growth (production); they are also steered (developed in one "direction" or another, or inclined toward one course of action or another) by the uneven growth (absolute and/or relative to that of other countries) of its master (and other) variables. In different terminology, societies are steered by second differences (changes in the rates of change of their relevant variables). Such changes can be attributable to human decisions (conscious or not), to natural forces (weather, climate, erosion, earthquakes, volcanic eruptions, extinctions of species resulting wholly from natural forces, and so on), or to combinations of natural and anthropogenic phenomena. These considerations widen—and in some respects complicate—the implications of positive and negative feedbacks. And decision and action may influence both the extent and amplitude of feedback.

Recent studies in the physical and biological sciences—and increasingly in economics—have demonstrated the relevance of what have been referred to as nonlinear, disequilibrium dynamics in human (as well as

natural) systems characterized by stochastic fluctuations (Sterman 1989, 1–2) and trends toward "self-generating and self-sustaining chaotic oscillations" and unpredictability . . . By analogy, many social and economic systems may, like the weather, not be predictable in the future, even when the full dynamics of the system are known or when the system has no random processes in it (Anderson 1988, 3–4). Such fluctuations and oscillations can be attributed to both "intrinsic mechanisms and external shocks" (Chen 1988, 81).

System dynamics provides ways of linking "hard" uncertainties and "soft" uncertainties in ways that are at least relatively rigorous. It is almost self-evident, for example, that a "real" trend through "real" (elapsed) time can be compared with a "preferred" (subjective) trend and the differences measured. Similar, though admittedly "softer," is the feasibility of projecting an objective trend line (retrospectively established carbon dioxide production, for example) that can be compared with the projection of a preferred trend line and the differences measured (Sterman 1987, 190–209; Choucri 1981; Choucri and Bousfield 1978). However fraught by uncertainties, however, dynamic system approaches may yield more promising outcomes when applied to environmental threats.

Applied to energy markets (and hence to attendant effluence), both market instabilities and adjustments to "normal" conditions may be explained, and modelled, as a function of interactions in a dynamic system (Choucri, Heye, and Lynch 1990). Investments in exploration and development, due to expectations of demand behavior and price paths, influence actual output, hence supplies and thus price—and the resultant supply/demand relations affecting price expectations at the next iteration—and so on.

At issue for performance are decision, policy, and the specification of relations between the estimated parameters and the regimes of behavior—e.g., are the estimated decision rules of the managers "inherently stable, or do they produce limit cycles, period multiples, or chaos?" Variously defined, chaos refers broadly to "complicated, aperiodic, nonlinear dynamic systems . . . sometimes stable, sometimes unstable . . . often creative . . . erratic . . . first high, then low . . . never settling down to a steady state . . . never exactly repeating" (Gleick 1988: 42–43).

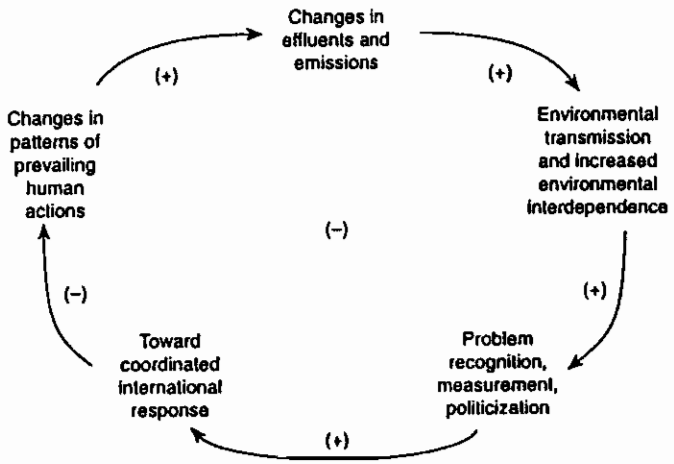

Figure 15.2
Dynamics of Human Action, Environmental Effluences, and Global Accord

In what ways, if any, can this dynamic perspective and attendant system dynamic methodology be useful for framing and analyzing decisions in the context of environmental research and understanding?

Certainly the issues are complex. In this volume we posited a set of dynamic interactions connecting human actions and environmental consequences. Figure 15.2 provides a simplified view of these interactions. The negative sign in the center represents prospects of corrective processes: *if* environmental problems were assessed, and *if* there were appropriate and coordinated international responses, *then* we could expect changes in prevailing patterns of human action and hence alterations (i.e., reductions) in effluence, emission, and pollutants.

The next major challenge for science and for policy is to specify, delineate, and further examine the dynamic processes embedded (and simplified) in figure 15.2. That is most surely an important task for the international community post-Rio.

But there is foundation work that also needs to be done. High on the list (in addition to the need for more and better data) is the development and analysis of time series data along the lines suggested by the national profiles and groupings selectively represented in chapter 3 (for only one year—1986). The object here is to establish to the extent feasible a

substructure of levels, rates of change, and second differences over the last four decades. In time series, such country profiles and groups provide a context for "retrospective forecasting" (forecasting over known data) wherein projections from early years can be compared with "real-world" outcomes. (Choucri 1978, 11–15; North 1978, 270–77). It is within such a context and from such an in-depth data base that forecasting into the "real" future can best be undertaken.

Equally fundamental (but not unconnected with the time series data) are the networks of anthropogenic effects that threaten the quality of life in many parts of the globe—water qualities and availabilities, the disappearance of ancient forests, the paving over of agricultural lands, the miles of traffic gridlocks, blankets of urban (and increasingly rural) smog, growing monuments of garbage and trash, and the continuing production of nuclear waste, to mention a few.

The first imperative for the twenty-first century is to recognize the dynamic, multiplicative, transformative, and potentially divisive and constrictive linkages between individuals and their needs, demands, knowledge, and skills, on the one hand, and the implications of their aggregates on the other. More specifically, what we need to get at are the varying ratios of individual needs, demands, and consumption to individual capacities to produce and the multiplicative consequences when these individuals and their demands and productive activities are aggregated. The problems leading into this imperative are elusive. Applied economics and political economy conventionally treat the individual as a source of labor and a potential consumer and taxpayer. The temptation, therefore, when individuals are aggregated, is to conclude that the larger a population is, the more productive (and cheaper) the labor force will be, the stronger the market, and the more extensive the taxable base. These easy assumptions are threatened, if not dispelled, however, (a) when unevennesses among population growth, technological development, and resource availabilities are made explicit; (b) when unevennesses in distributions of knowledge, skills, and capabilities are taken into account; and (c) when the impacts on resources and the other environmental impacts of population growth combined with technological advancement are factored into the calculations.

Issue (a) has already been addressed, and many of the implications of (b)—gross discrepancies in wages and other forms of income, for example—are well known. To the extent that the twenty-first century is characterized by robotics and related applications of automation, however, three possibilities may be exacerbated: Demands for energy and other (possibly rare) resources required for particular operations may increase rapidly; the only workers employable in large numbers may be highly educated specialists; and growing sectors of the populace may become unproductive (the "underclass," drug entrepreneurs, and other contemporary phenomena may be early manifestations) and dependent on unprecedented distributional mechanisms. Issue (c) brings us back to the development-sustainability paradox.

The second imperative, then, is to explore the relationship between the multiplicative potentials of demands and productive potentials, on the one hand, and resource availabilities and costs (depletions or degradations) that are partly additive and partly multiplicative, on the other hand—through time. In order to understand and assess "objective" and changing relationships between processes of growth and development (stability, prosperity, and jobs) and environmental sustainability, both horns of the seeming dilemma need to be clearly and rigorously framed and analyzed through time within the same conceptual, theoretical, and empirical framework. Until this imperative is met and rigorous research is undertaken, rebuttals to the presentation of choices of jobs versus wilderness and owls versus humans are not likely to maintain credibility through the ups and downs of future economic and political cycles. Related, therefore, is the search for ways of integrating and assessing environmental costs and benefits within acceptable accounting procedures.

The third imperative is to formalize evolving international norms for effective responses to environmental challenges. The global norms endemic to the chapters of this volume—legitimacy, equity, volition, and universality (as defined later)—are guides shaping both objectives and the direction of international negotiations for global environmental management. A fourth imperative is to transform what is learned into local, national, international, and global policies, procedures, and actions. This translation problem must be met head on, as authorized by the United Nations General Assembly in 1989. The UNCED and INC preparation processes that have led to the Rio Conference of 1992 were strong efforts in that direction. Nascent efforts to bring representatives of the social

and natural sciences into mutual dialogue for improved understanding of interactions among social and natural environments are essential to this process.

Although these general imperatives are for the long run, their pursuit and implementation should not be delayed. At the same time a number of specific imperatives for the management of growth and development—in local, national, international, and global contexts—need to be articulated and implemented. Defining profiles of states, chapter 3 focused on interactions among the master variables—population, resources, and technology. A number of specific policy priorities for each of the six profile groups were identified and predicated within an interactive international system and a global environment; however, many, if not most, of the policy imperatives framed at the state level in chapter 3 are also global issues.

The proposition that populations should be allowed to grow only as technology and resource availabilities proceed in advance of the numbers of people and are sufficient to support increasing such numbers is clearly globally (as well as locally) relevant. As long as technologies and/or resource availabilities in developing countries are severely constrained, populations in developing countries may be expected to attempt emigration to industrialized nations, which may have to confront the risk of becoming less and less capable of absorbing them. Also globally applicable is the proposal that knowledge, skills, and materials pertaining to the management of population concerns should pass freely from industrial to developing societies. In other words, this is an arena in which "protection" or commercial considerations should not necessarily dominate international deliberations toward global accord.

Universally applicable is the clear imperative for the development of technologies, energies, and other resources that are optimally efficient and environmentally "clean." Priorities for the industrialized nations include such developments not only for their own use, but also for use in developing countries. Obversely, of course, industrialized countries need to refrain from exporting to developing countries technologies, resources, and products that are environmentally threatening (and even outlawed for sale and use in the country of origin). And concurrently, connected R & D strategies should be devised to help frame and pursue

developmental paths that avoid reproducing environmental degradations of known historical patterns. The balancing of an increasingly scarce (and costly) resource (and/or technology) against another scarce resource (and/or technology) that is slightly less scarce (and costly)—the substitution of nuclear technology and energy for oil technology and energy *prior to the development of an effective solution to the nuclear waste problem*, for example—requires careful analysis and comparisons of environmental costs and benefits.

Some of the most critical imperatives pertain to monitoring environmentally focused and economically and politically relevant time series indicators and performing sustained research including the modeling of alternate futures, that is, making future projections from past trends; generating alternate futures derived experimentally on an "if this, then probably that" basis; and experimentally introducing various different policies (differing rates of change for different indicators) as early steps in the pursuit of optimal balances between economic development and environmental sustainability. In this connection, relevant economic, political, and environmental investigation needs to be integrated to the extent feasible and pursued hand in hand with the other. Interdisciplinarity is often more of a cliche than a reality; but the problems addressed in this volume simply cannot be examined effectively—or solutions rendered—in the absence of insights and exchanges across the diverse disciplines of the social and natural sciences.

Imperatives pertinent to the shaping of legal and institutional dimension of environmental management—issues and actions—include paying close attention on all levels (from the locality to state, international, and global systems) to the development-sustainability paradox. In the meantime, people in all countries and all walks of life need to learn—and contribute to—a body of rule-of-thumb guidelines that could save us from possible delay and immobilization resulting from uncertainties. First of these is to recognize forthwith that the generation of carbon dioxide and other greenhouse gases originates locally and has effects that are local as well as those that are global. Again, an insightful, if homespun, approach to the question is "think globally, act locally." However simple these precepts might seem, the imperatives for their implementation pose daunting challenges.

Toward Global Norms

Meeting crucial challenges and imperatives for the twenty-first century requires framing global norms—those principles essential to guide strategies for environmental viability. All the chapters in this volume, together, point to five strategic norms. These norms are strategic in the sense that they constitute core values that need to be pursued if global accord on environmental management is to be effective.

First is *legitimacy:* Basic responses must be viewed by all actors—governmental and nongovernmental—as legitimate in both content and processes. Since different states of different levels of development generate different types and forms of effluents and emissions and influence natural environments in different ways, the principle of legitimacy is dictated by the ubiquity of both the cause and the consequence of environmental degradation (chapter 3). To the extent that the scale and scope of physical impacts of humans on their natural environments are extensive (chapter 2), then the emerging trend toward global ecopolitics places environmental matters at the core of strategic concerns (chapter 4) and shapes an increasingly salient trend toward internalizing environmental treaty-making (chapters 12, 13, and 14).

Second is *equity:* Policy responses must be viewed as fair and appropriate among countries and across generations (chapters 9, 10, 11). The element of fairness is especially important as developing countries have argued, and will continue to argue, that the "problem" was created in the industrial states and that they should assume the responsibility for "solving" it. Eco-development has as a basic precept framing the policy concerns for the priorities of developing countries (chapter 5). Third is *efficacy:* Approaches and instruments for global environmental management should be effective and pragmatic (chapter 14) rather than strictly "efficient" in narrow economic terms (chapter 9). More important, the efficacy norm would recognize the multidimensional nature of rationality—over and above the technical definition of the term in economic theory, which, by itself, impedes prospects for global accord. Fourth is *volition:* Responses must be voluntary, predicated on a shared recognition of environmental problems based on shared interpretations of scientific evidence and strategies for solution (chapters 7 and 13) rather than on geopolitics or considerations of power and domination.

Fifth is *universality:* Global accord must involve the participation of all actors—governmental and nongovernmental—in that (as with the norm of legitimacy) it is the ubiquity of human action that generates environmental degradation and, therefore, imposes a logic of universality, despite differentials in the scale and scope of degradation at any one point in time. The compelling dynamics of growth and expansion—population growth, technological change, and resource uses—all but guarantee that the developing countries—thus governments, peoples, and nongovernmental organizations—will be the major players in the global environment of the twenty-first century.

These principles constitute crucial norms for the pursuit of global accord in the international community. Together they lead to a critical policy precept: the maintenance of adjustable target priorities in the pursuit of ever more energy-efficient technologies and resources.

Note

1. We leave it to the reader to review each chapter in the context of table 1.1. For the contributors to this volume, the organizational device of that matrix forces us, in this joint venture, to pay explicit attention to the dimensions of interest and perspectives adopted. By way of illustrating the usefulness of this organizational plan for the contributions to this book as we proceeded to frame the intellectual basis for this project, we highlight some examples. The table is to be "read" in terms of any two (or more) combinations of "entries" by dimension and perspective. For example, chapter 1 adopts a society-nature interaction, drawing attention to policy concerns revolving around managing growth processes, and implies both institutional bargaining and novel equity calculations (across nations and across generations). By contrast chapter 7, on science and technology, implies a gradualist intellectual orientation, viewing technology options as a key policy concern and (in conjunction with chapter 14) pragmatic moves as the basic institutional responses.