Earth highlights the diversity of political responses to environmental issues by bringing together essential readings in environmental politics. These readings cover various definitions of environmental crisis, its causes and effects, and responses to it in institutions, politics, policies, organizing, and lifestyle. They are organized in a way that emphasizes the differences and links the various schools of thought on environmental affairs. The key debates cover:

- The nature of environmental problems: How real are ecological limits?
- Responses to environmental issues: Can expert administrators or liberal democrats respond effectively?
- Rent and economics: Is there a clash between economic and environmental values? Can we reconcile them?
- Techniques: What sorts of radical changes are advocated by deep ecologists, socialist ecologists, environmental justice activists and others?
- The state, and the environment: How can green critiques be put into political practice and democratic structures?

Offers a comprehensive introduction to environmental politics and will be a valuable text for students of environmental politics and policy, and anyone with an interest in environmental issues.

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Environmental problems arise in human dealings with ecological systems. Ecological systems are complex; so are human social systems. One should therefore expect environmental problems to be doubly complex. Complex problems demand the application of expertise, be it in ecology, engineering, economics, biochemistry, climatology, nuclear physics, epidemiology, or hydrology. The most established way to put expertise to use in the service of solving complex problems, concerning the environment no less than elsewhere, is to organize experts into administrative bureaucracies. Aside from specialists with the relevant substantive expertise, such bureaucracies contain experts in management, whose specialization is converting general statements of policy principle (in favour of, say, pollution reduction or wilderness preservation) into specific actions on the ground (say anti-pollution regulations). Along the way these managers will need to harness the appropriate substantive knowledge. Such an arrangement, according to the German sociologist Max Weber (writing in the early twentieth century), constitutes the pinnacle of rationality in collective human problem solving. Today's world is well-populated by Weberian bureaucracies. Until around 1970 these were few and small in the environmental area. But the wave of environmental concern that engulfed the developed world in the late 1960s soon produced a wide range of such bureaucracies: environmental protection agencies, ministries and departments of the environment, expert advisory commissions, and so forth. Indeed, the repertoire of institutional responses to environmental crisis in that era was remarkably similar in different countries. The character of those responses was essentially administrative, and their legacy remains.

Now, very few people actually claim to like bureaucracy, least of all the people who operate it. The fact that there is a lot of it about, notwithstanding this general dislike, is testimony perhaps to the truth of Weber's opinion concerning its problem-solving effectiveness. But what of the effectiveness of such administrative mechanisms in the environmental area? Can bureaucracies be made to operate in environmentally benign fashion? Our selections by Robert Bartlett and Kai Lee suggest that they can, though in quite different ways. Bartlett argues that the main function of one particular landmark piece of legislation—the United States National Environmental Policy Act of 1970—has been to insinuate environmental values into the entire range of agencies of the US federal government and their operations. In so doing, he believes that the Act has advanced the cause of ecological rationality in government, acting as a counterweight to more established economic and political rationality.

While Bartlett believes that environmental laws can change the way bureaucrats think, Lee's emphasis is more structural, entailing the redesign of bureaucracies themselves along ecological lines. To fit ecological specifications, administrative processes need to involve adaptive management, open to learning from both natural processes and political pressures from the people living in or concerned with an ecosystem. Lee's exemplary case of ecosystem management on a large scale is the Columbia River basin in the Northwest United States.
Torgerson is a more thoroughgoing critic of environmental administration, believing that administrative bureaucracies by their very nature cultivate a monolithic view of the world in which experts and administrators do not accept challenge, and are not open to learning. The administrative mind is not easily opened by environmental laws alone. Torgerson would consider that the kind of learning proposed by Lee requires radically participatory and democratic decision-making structures, rather than more enlightened administration.

Further Reading
To succeed, sustainable development must be both the product of political choice and the stimulus for institutional transformation. The recent surge of international support for phasing out chlorofluorocarbons and reducing greenhouse-gas emissions suggests that political momentum is building, even if not everywhere or uniformly. There is a lot of hard work beyond politics, however, because choices must be institutionalized if they are to endure; sustainable development will work only as a sustained policy.

How can sustainable development be woven into the institutional fabric? To the scant experience that bears on this question can be added the efforts in the Columbia River basin in the Pacific Northwest region of the United States, where an attempt to rebuild the salmon and steelhead trout runs of the Columbia is now under way.¹

Rising in the Canadian Rocky Mountains and flowing 1,200 miles through the Pacific Northwest, the Columbia is the fourth largest river in North America and drains an area that includes parts of seven US states and two Canadian provinces (see the map in Figure 8.1). The river’s average annual streamflow of 141 million acre-feet is more than 10 times that of the Colorado River.² The Columbia’s high flows and extensive drainage have made it ideal for colonization, first, by fish and wildlife,³ as the glaciers retreated at the end of the last ice age and, much later, by dam-building humans.

Not long ago, the Columbia River basin was a wilderness. Because it is a major spawning ground and nursery of Pacific salmon (Oncorhynchus spp.) and steelhead trout (Salmo gairdneri), the Columbia’s biological web reaches far into the North Pacific Ocean, where the fish mature for two to four years before returning to their native streams to reproduce. Before European settlement, this ecosystem supported a population of perhaps 50,000 American Indians,⁴ whose world centered on the yearly migrations that brought 10 to 16 million salmon and steelhead back to the river.⁵ Harvested by spear, net, and boat, these salmonids provided both food and trade goods for the people of the river basin.⁶ The Indian tribes lived in a long-term ecological equilibrium, which fluctuated between bad times and good but endured over many human generations. This original Columbia civilization lasted until about 1850.

Industrial Development

The second human civilization to invade the Columbia basin has turned the river into a power plant. The basin's 19 major dams, together with more than five dozen smaller hydro projects, constitute the world's largest hydroelectric power system. Today, dams on the Columbia River and its tributaries generate, on average, about 12,000 megawatts from falling water, which is more than enough power to run New York City.

Largely built by the US government at a time of low labor costs, the dams fostered the indus-
trialization of the Pacific Northwest with cheap electricity marketed by the Bonneville Power Administration, which is now part of the US Department of Energy.⁸ The river basin has also become a plantation of more than 3 million acres watered by some of the world’s largest irrigation works, including the Columbia Basin Project anchored at Grand Coulee, which is the largest dam in the United States.⁹ Industrial and agricultural development have built the population centers of the Northwest: Portland and the Willamette Valley of Oregon, Boise and Spokane in the upper watershed, as well as Seattle and the Puget Sound.

The Indians who lived in wilderness have given way to a population of 8 million,¹⁰ more than 100 times the aboriginal level. That increase in population, by two orders of magnitude, reflects a fundamental change in the relationships between people and the environment. The domesticated river provides power and irrigation while also eliminating its once legendary floods; serving as an inland waterway navigable by tug and barge for 500 miles from Astoria, Oregon, near the river’s mouth to Lewiston in central Idaho; affording world-class windsurfing in the Columbia Gorge; and, last but not least, supporting sport and commercial harvests of salmon, steelhead, and other fish and wildlife.

The industrial Columbia is a multiple-purpose marvel, a river, as the historian Donald Worster recently put it, that died and was reborn as money.¹¹ The governing principle behind the many functions of the river has been to maximize economic return. The river’s uses have been ranked accordingly: power first, then urban and industrial uses, agriculture, flood control, navigation, recreation, and, finally, fish and wildlife. The inferior position of fish and wildlife is evident in the decline of the annual fish runs from roughly 10 to 16 million in the pre-industrial era to 2.5 million by the late 1970s.¹²

As these numbers imply, however, the Columbia has not died entirely. Thus, there is hope that, just as the wilderness gave way to the power plant, so a new Columbia may arise, one whose watchword will be sustainable multiple use.

This is not only a hope. Since 1969, Indian tribes of the Columbia have reasserted their legal rights to harvest fish, under treaties concluded with the US government in the mid-nineteenth century. Today, $100 million is invested annually in fish and wildlife mitigation, and the river’s low-cost electricity is husbanded by innovative and successful efforts to conserve energy.¹³

"Between" Profit and Preservation

This new, perhaps sustainable Columbia is neither wilderness nor power plant but an ecosystem requiring active management. The wilderness the Indians knew is gone. Their world was an integral fabric whose natural time scale was the human generation. That cloth has been cut, and management by preservation, permitting nature to set the terms on which its constituent species will equilibrate, is no longer possible. Some have questioned whether management by preservation is possible today, even in unpeopled parks and biological preserves.¹⁴ Yet following the profit motive to its logical endpoint by increasing energy production as long as its revenues outbid the competing claims of irrigation and other uses is unacceptable. Any management system that optimizes only a single measure of worth is unworkable.

These points have been put negatively. There is a positive side as well: Sustainable
development of the Columbia River basin implies a culturally, economically, and ecologically viable relationship between people and the environment they inhabit.

To achieve sustainability, humans must somehow pick a path "between" preservation and profit maximization. "Between" is in quotation marks here to emphasize that preservation and profit maximization are not endpoints of some simple continuum, with sustainability an average or midpoint. Sustainability is a departure in a new direction—one likely to yield less than the maximum achievable short-term profit, but one that involves humans in the landscape more than is contemplated in the popular notion of pristine wilderness.¹⁵

Picking a path to sustainability is an unlikely job for a political process. Politicians often make decisions in response to perceived crises. When the crisis involves natural resources, the decisions are frequently neither biologically nor economically well informed. Instead, political choices are driven by symbols, whether they be charismatic vertebrates (e.g. marine mammals), waterways (e.g. the Grand Canyon), horror stories (e.g. Prince William Sound), or nightmares (e.g. Chernobyl).

More generally, politics cannot be regarded as an arena in which optimal choices are made. Instead, political decisions set institutional constraints that may either help or hinder the construction of a viable long-term regime. For example, in the statute that authorized the effort to rehabilitate the Columbia,¹⁶ one finds a typically mixed bag.¹⁷ The Northwest Power Act directs that the Columbia and its tributaries be treated "as a system."¹⁸ This language has become the linchpin for an ecosystem-wide planning perspective. However, the Act's language on water rights¹⁹ reaffirms an outmoded legal framework that inhibits the rescue of spawning grounds in headwater streams (some of the best places to rebuild self-sustaining fish populations) even as it fails to address the economic plight of the farmers and ranchers dependent on irrigation.²⁰

Indeed, what is likely to emerge from the political process is a mandate that may take a strong stance toward rehabilitation or sustainability but does not reflect a clear strategy for achieving that goal. The combination of noble ends and muddled means is characteristic of democratic governance, in which the political system seeks to accommodate an immiscible set of interests.²¹

The implementation of such mandates is also characteristic: Public organizations usually do not press their powers to the limits allowed by the political stance of their authorizing statutes. As the visible crisis ebbs, opposing forces come into play, some alleged "rule of reason" compromises the plain meaning of political mandates, and the flow toward sustainability peters out in the closed basin called "realism."²²

At its best, however, the political process can produce substantial improvement, and this fact should not be dismissed. Recently, consensus building among parties exhausted by long wrangling has produced noteworthy agreements in fisheries and forestry management in the Pacific Northwest.²³ When these policies fail, however, sniping continues as it has over toxic waste management throughout the United States.

Sustainable Management

In 1980, the US Congress, calling for the protection and enhancement of the fish and wildlife of the Columbia River basin, passed the Northwest Power Act to mitigate the effects of half a
century of hydroelectric power development.24 Taken at face value, the Act is a mandate for a sustainable balancing of the two uses of the river most directly at odds: electric power and anadromous (migratory) fish.25

The executor of the mandate is the Northwest Power Planning Council, an agency created by the Act for three purposes: to formulate a long-range power plan for the Pacific Northwest; to develop a program to rebuild the fish and wildlife populations of the Columbia, based upon suggestions from fish and wildlife agencies and Indian tribes in the basin; and to involve the public in decisions on energy and fish and wildlife.26 The powers of the council are unusual, if not unique, in US government. The council was formed by an interstate compact, consented to by Congress through the Act, among Idaho, Montana, Oregon, and Washington states. As a result, the gubernatorial appointees who compose the council hold a legal authority that can, in places, bind federal agencies—a rare constitutional power. The Act was stimulated primarily by the region's electric power crisis in the late 1970s, a time when controversy over the role of nuclear power in the region's electricity supply raised the provocative question of public involvement. The prominence during that period of Indian treaty fishing-rights litigation also prompted Congress to include stipulations for fish and wildlife. In response to these congressional concerns, the council adopted an ambitious fish and wildlife program in 198227 (subsequently amended in 1984 and 1987) calling for a broad spectrum of mitigating activities, including major changes in river operations28 to provide "equitable treatment" for fish.

Under the Northwest Power Act, implementation of the council's program is funded from the revenue that the Bonneville Power Administration gathers from its electric power ratepayers. The council has determined that losses of salmon and steelhead from hydropower development amount to between 5 and 11 million adult fish per year.29 The result is an effort to rehabilitate fish and wildlife on an economic scale unheard of in natural resource management.

Sustainable development of the Columbia River basin requires managing an ecosystem the size of France. If there is to be a sustainable Columbia, it will be a place governed by rules that approach the complexity of ecological interaction. It will be a place where human, economic objectives are deliberately balanced against natural boundaries and biological rhythms.

**Ongoing Work**

One might think that this is merely utopian, but the work already in progress is quite ambitious. For example, the harvest of Pacific salmon is now being regulated by the states and tribes of the Pacific Northwest and by the Canadian and US governments, both to conserve and rebuild fish stocks and to assure fair apportionment of the catch. The regulations, determined annually, implement the terms of a treaty between the United States and Canada signed in 1985,30 as well as the treaties governing relations between Indian tribes and the US government.31

Enhanced production of fish, by artificial means and by protection and improvement of natural spawning grounds, is under way and will be expanded significantly over the next decade. Several new hatcheries will be built in the basin to supplement the more than 100 existing artificial production facilities operated by state and federal governments with funding from federal appropriations and utilities. The existing hatcheries are mostly in the lower river, below the
traditional fishing grounds of the Columbia basin Indian tribes; the new facilities will be upstream. The present intention is to use the hatcheries to raise fish only until they can survive in the wild. Juveniles would then be released into streams where they will imprint the smell of their adopted waters at the time of migration. This way, the fish should return as adults to these streams, rather than to the hatchery, to reproduce. If enough adults do so, a natural spawning run will be re-established, independent of the hatchery.

Natural spawning habitat is being improved primarily by reopening fish passages that were blocked by earlier human usage. For example, in the Wenatchee River of eastern Washington, Dryden and Tumwater Falls Dams, originally built with inadequate fish ladders, have been greatly improved so that migrating adults can now reach the habitat that was once blocked by the dams.²³

Since adoption of the 1987 program, the council has also identified 40,000 stream miles of “protected areas” where small hydroelectric projects should not be built, to protect the ratepayers’ investment in fish and wildlife rehabilitation. The council advises the state and federal agencies responsible for hydropower licensing, particularly the US Federal Energy Regulatory Commission, which must, by statute, take the council’s program “into account at each relevant stage of the decisionmaking processes to the fullest extent practicable.”³³

The upstream and downstream migration of anadromous fish is now under close human supervision. In some years, more than 80 percent of migrants from the upper Snake and Columbia are individually marked before being transported in barges to the estuary. In an effort to protect the fish that are not transported, Congress has appropriated more than $30 million annually to install screens and carve bypass channels in dams to deflect young fish from power turbines. Most ambitious of all, perhaps, the river’s flow has been altered to benefit fish migration, at an annual cost of more than $40 million in lost power revenues. The key program, known as the water budget, ⁴ re kreates the spring snowmelt or freshet to flush migrating juveniles to the sea.

**Budgeting for Fish**

Oddly, it is easier to pay for sustainable management of the Columbia because of the failure of nuclear power in the Pacific Northwest. The wholesale cost of electric power soared more than 700 percent in the early 1980s,³⁶ largely to pay for nuclear power plants that were never completed. Thus, the revenue stream is much larger than anticipated, and the percentage needed to pay for fisheries has dwindled to near insignificance. The cost of the council’s fish and wildlife program alone is scheduled to consume about 1.5 percent of the Bonneville Power Administration’s annual budget of $2.7 billion for fiscal year 1990. The total costs for mitigating the effects of hydropower development on fish and wildlife will be somewhat higher because they include debt payments for fish ladders and other facilities engineered into the dams. However, the actual cash outlays are considerably less than the total cost because more than one-third of the economic cost comes from foregone revenues—lost because of changes in river operations that release water when it cannot earn its maximum return, such as during the spring freshet to flush juvenile fish downriver or when water is spilled to channel fish away from dam turbines.
Thus, the Northwest Power Planning Council can search for sustainability under conditions where budgetary limitations are only a secondary consideration. This condition is clearly unrepresentative of attempts to carry out sustainable development generally, so the case of the Columbia basin should be regarded only as a proof-of-principle—a demonstration that sustainability can be achieved (if it indeed is). Conversely, failure in the Pacific Northwest would raise questions about the feasibility of sustainable development anywhere.

The weak budget constraint is not an unmixed blessing, of course, because it encourages choosing expensive alternatives that secure agreement among parties at the table at a cost to ratepayers who may not be well represented. Such logrolling makes a program brittle and fragile, as the US experience with weapons procurement illustrates.

A related problem is the large number of hands on the steering wheel. The Columbia River Basin Fish and Wildlife Program is implemented or significantly influenced by 11 state and federal agencies, 13 Indian tribes, 8 utilities that operate major hydroelectric projects in the Columbia drainage, and numerous organized interests ranging from agricultural groups anxious to protect water rights to flyfishers impatient for the return of wild fish stocks. If the river is to revive in any sustainable sense, it will have to be managed with a stability, durability, and awareness of biology rare in human affairs.

Mindful of the complex institutional repercussions of the changes it was making, the council adopted the concept of adaptive management into its fish and wildlife program in 198446 and expanded the idea into a process called “system planning” in 1987.37 System planning is intended to institute an experimental approach to implementation in the early 1990s. In the meantime, remedial actions are under way and yielding information on what works and what does not before the full-blown adaptive plan is completed.

**Adaptive Management**

The Columbia River experience highlights two critical elements in the transition to sustainability: biological uncertainty and institutional complexity. In a field containing so many unknowns, learning from experience is the only practical approach. Without signposts, the path to a sustainable economy is easily lost. Consider some of the difficulties on the path to sustainability:38

- **Data are sparse.** It is difficult to observe the state of the ecological system and the human economy interacting with it. Measurements of the natural world, such as the size of migration populations, are inexact at best, and natural systems often yield only one data point per year (e.g. river flow).
- **Theory is limited.** Reliable observations are few, and theories of natural environments do not permit deductive logic to extrapolate very far from experience. Also, the perturbations caused by humans are frequently both large and unprecedented in natural history, so that it is unclear what theory is applicable.
- **Surprise becomes unexceptional.** With limited theory comes poor knowledge of the limitations of theory. Predictions are often wrong, expectations unfulfilled, and warnings hollow.

A general strategy has been devised to deal with natural resources under these conditions. The
Approach is called adaptive management, a term coined by C.S. Holling and his coworkers at the International Institute for Applied Systems Analysis in the late 1970s.\textsuperscript{39} Their work is built on a simple, elegant idea: If human understanding of nature is imperfect, then human interactions with nature should be experimental. That is, policies should be designed and implemented as experiments probing the behavior of the natural system. Experiments often surprise and scientists learn from surprises. So, if resource management is considered from the outset as an experiment, surprises are opportunities to learn rather than failures to predict. Adaptive management holds the hope that, by learning from experience, one can reach and maintain a managed equilibrium efficiently and with the resilience to persevere in the face of surprise.\textsuperscript{40}

Adaptive management originates in a comprehensive, ecosystem perspective, in which the interactions among the components of the natural environment are highly structured, and the behavior of the system as a whole is consequently rich in surprise.\textsuperscript{41} Proceeding from a base of careful observations, experimental interventions into this interacting system provide insights into its dynamic character—insights, like the longstanding belief that diversity reinforces stability, that are helpful, even when they are not universally valid, and useful, even when one cannot rely implicitly on their quantitative implications. The adaptive perspective begins from a scientific viewpoint, and its continuation into the realm of action is informed more by the observational interest of a naturalist or astronomer than by the manipulative tendency of the engineer or entrepreneur.

Adaptive management is ecologically rooted in two more specific ways. First, the adaptive perspective is linked to biological time scales, because effects of experimentation on a population often become visible only when measured over generations. For salmon this implies a time scale of five years or more—a long interval in a governmental world where senior policy officials serve terms shorter than the salmon lifespan. Secondly, the adaptive approach focuses on populations, not individuals. Failures are often fatal for individuals, but rarely for populations. There is, accordingly, a greater willingness to experiment when the unit of concern is the population.

Even if whole populations are being managed, however, the decisions are made by individuals. Put into governmental terms, a policymaker who regards each choice as an opportunity to succeed or fail may be reluctant to venture into the chancy—if realistic—terrain of adaptive management. Though the theory emphasizes the value of learning from failure, it requires individuals with a high tolerance for risk to carry it out. As in economics, where the theory emphasizes the benefits of competition, the risks facing individuals can be imposing.

Although virtually all policy designs take into account feedback from action,\textsuperscript{42} the idea of using a deliberately experimental design while paying attention to the choice of controls and the statistical power needed to test hypotheses is one rarely articulated and usually honored in the breach.\textsuperscript{43} It is for this reason that the explicit adoption of an adaptive policy in the Columbia River basin is noteworthy.

**Negotiating Consensus**

Adaptive management responds to biological uncertainty, but it is not clear how the adaptive approach can work in the presence of institutional complexity. That many interests have stakes
in the transition to sustainability is hardly surprising, but finding and maintaining a balance among disparate and often non-comparable considerations such as irrigation and tourism is evidently a political task, one that may not be consistent with the rational pursuit of knowledge through adaptive management.

Because control over large ecosystems is fragmented, the search for a sustainable economy requires extensive social interaction: sharing analytical information, such as simulation models and databases; identifying tradeoffs and coalitions for joint action; and learning from surprising outcomes. These interactions are ways to negotiate shared agendas that individual organizations cannot achieve by themselves.

The central role of negotiation emerges from the surprising blend of technocracy and consensus building that has gained visibility and favor among natural resource managers during the 1980s. In cases previously characterized by lengthy litigation and embittered conflict, informal negotiations have produced plans of action acceptable to traditional adversaries: tribes and state governments, environmentalists and developers, and resource managers and harvesters. Although wary of advocacy in the guise of science, the parties have found it possible to use technical analyses and have invented measures to assure the political and scientific credibility of analysts and their findings. The negotiated agreements have included joint oversight mechanisms because unforeseen circumstances are to be expected during implementation. As a social process, the negotiations have sought to achieve and maintain the measure of consensus needed for experiential learning to occur. Thus, consensus building creates the open political environment that is necessary for adaptive management.

Consensus building is central to sustainable development as well, because the natural systems being managed cross the spatial and functional boundaries of existing human institutions. Without this comprehensive perspective, the fragmentation of jurisdictions promotes abuse of the environment, because individual institutions seek to achieve purposes that often turn out to be incompatible with the sustainable use of the whole; this is the tragedy of the commons. Yet implementation of a management plan also requires a decentralized, fragmented perspective, because decisions are carried out by parties whose responsibilities are narrow compared to the breadth of the analytical tools used by planners.

The complexity of both human and natural systems is high enough to outstrip anyone’s ability to command from a central vantage. Building consensus by negotiation can link central perception to decentralized action. Consensus also may improve long-term plans to rehabilitate ecosystems.

Remedial actions require consensus when they encounter the problems of economic sustainability. Environmental damages from past actions are a sunk cost: The value of the resource has been taken by the exploiter and is no longer available to pay for remediation. The damaged ecosystem also contains hidden opportunities, since the ability of natural systems to recuperate is often uncertain. In that circumstance, strict cost-benefit estimates are likely to undervalue the worth of rehabilitating the ecosystem, especially if it is difficult or impossible to fund rehabilitation from the profits of exploitation. When these conditions occur, a negotiated consensus reflecting a mandate for rehabilitation is needed to justify expenditures. Moreover, past damages
may have altered the political environment by driving out a group of resource users (e.g. the Indians of the river basin). In such a case, rebuilding a sustainable suite of uses may require that points of view that were silenced by earlier misuse be actively sought out. Consensus building has been strategically important in the Columbia River basin, where a central agent finances decentralized actions, no one of which meets a narrow cost-benefit test even though their cumulative impact may be economically sound.

A consensus that fosters learning both facilitates and benefits from an open political setting. By lowering the barriers to participation and, in effect, organizing their own political environment, planners can negotiate and sustain a pluralistic, competitive political setting, in which disparate considerations can continue to be weighed as learning goes forward.

Planning and Politics

This consensus-building approach can be seen in the work of the Northwest Power Planning Council. Because important matters are at stake in development projects, a wide spectrum of interests usually is motivated to participate in the planning. Barriers to participation should be low at the outset and can be kept low by the planners. Established relationships are usually weak at the beginning of a development project, and, because there is often substantial uncertainty about how the links among different interests will be changed, it does not require much previous experience to become an effective player. Where external support is important to the implementation of the plan, however, planning must turn to the outside world.

Backed by a legal mandate to keep the public informed and involved, the council lowered barriers to participation and judged its success by its credibility with the public. The council’s first chairman, Dan Evans, a popular and well-known figure who had served three terms as governor of Washington State, led the way with an open political style. Evans made a special effort to approach the Indian tribes, whose legal battles on fishing rights began to be fought while he was governor. More generally, the council approached organizational and opinion leaders both inside and outside of government and consciously developed a constituency for implementation of its energy plan and fish and wildlife program. Support for the council has come almost entirely from organized groups because of the complexity of the council’s plans. Despite the wide popularity of efforts to protect and enhance the fish runs, the work of the council is not well known to the public at large. Instead, the council has cultivated a reputation for well-informed, even-handed judgment among organized interests.

The planning now underway illustrates the institutional style of gathering information from sources throughout the basin and subjecting data to public review as a prelude to a public process of priority setting for the 1990s. Building the institutional structure for sustainable development in the Columbia River basin has been based on several conditions:

- commitments in law, reinforced by political support, to preserve and enhance environmentally valued resources;
- explicit recognition of ecological, economic, and social uncertainties;
- a commitment to act on the basis of knowledge;
• adequate funding;
• an institutional process open to experiential learning; and
• a systems orientation.

The Columbia River basin program may be regarded as a proof-of-principle: Sustainable development on a large scale is possible to launch. Given the time necessary to achieve certifiable sustainability, that is as much good news as one can expect in the post-industrial world.

Three Caveats

The challenge of a sustainable Columbia River is no different from the challenge of sustainable development generally. Can humans endure on this planet? Nobody knows. It is clear that continuing the exponential increase in resource use of the past 150 years will have serious effects on the global climate. Stalling the rush toward the inhospitable greenhouse, however, raises the most profound questions of economic justice and strains the ability of the international system to maintain order. Thus, although humans must proceed adaptively in the search for sustainability, learning from experience may be neither sufficient nor feasible in the transition ahead. Three caveats are in order.

First, there is the problem of conceptual tractability. The natural systems to be managed sustainably are inherently complex, and their complexity exceeds both traditional human comprehension and the institutions that have managed portions of them in the past. In a related context, William Ascher and Garry D. Brewer recently argued that a sophisticated cost-benefit framework is politically vulnerable in proportion to its sophistication. Such vulnerability creates a barrier to sustainable development. The hurdle of complexity may prove to be a genetic defect in sustainability.

A second problem is the moral viability of sustainable development. Perhaps only rich, stable nations can afford sustainability and make the transition with some semblance of political consent. The concept of sustainability comes with no guarantee that it is attainable or that, if feasible by some quantitative measure, it will be politically and morally palatable.

Third, adaptive management emphasizes the interest of the population, not that of the individual. Belief systems that value individuals may find little comfort when learning comes at a high cost in suffering. The long delays inherent in many issues of global sustainability also limit the utility of adaptive methods, because the signals of success or failure come back too slowly to inform action. These are the same conditions that one encounters in social welfare policy: slow or incomprehensible feedback combined with urgent, undeniable individual needs. Thus far, social welfare programs have been more anodyne than cure.

The experience of the Columbia River basin points to two unorthodox paths for study and reflection. First, look to the industrial economies for examples of sustainability. Sustainable development may be like the demographic transition: Nations rich and stable enough to be able to experiment with different modes of living may discover the viable alternatives.

Second, the strategic importance of uncertainty in the path to sustainability must be considered. The adaptive approach offers a conceptually sound way to deal with uncertainties in the natural system and with the complexities of institutional structure. Thinking in terms of whole
systems while acting through many fragments ("Think globally, act locally") requires an explicit organizational and political strategy. Adaptive management is one such strategy.

Taking sustainability seriously is a question of governance. There are indeed promising leads, but time is short and resources are dwindling. Learning what does not work is a cost of finding ways that will. Minimizing that cost preserves humanity's already limited ability to pursue sustainability with justice and mercy.

Notes

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1. For other cases, see Walter V. C. Reid, James N. Barnes, and Brent Blackwelder, Bankrolling Successes (Washington, DC: Environmental Policy Institute, 1988); and Walter V. C. Reid, "Sustainable Development: Lessons from Success," Environment, May 1989, 6.


10. The population figure is that for the area served by the Bonneville Power Administration, the states of Idaho, Oregon, Washington, and Montana west of the continental divide.


13. The energy conservation programs assembled by the Northwest Power Planning Council and implemented by the utilities of the region are described in the council's regional energy plan, Northwest Conservation. For an interesting example, see Dulcy Mahar, "The County That Came in from the Cold," Northwest Energy News (newsletter of the Northwest Power Planning Council), June/July 1987, 26–9.


15. Compare with William Ascher and Garry D. Brewer, "Sustainable Development and
Natural Resource Forecasting," in Clark Binkley, G. D. Brewer, and V. Alaric Sample (eds), Redirecting the RPA, Bulletin 95 (New Haven: Yale School of Forestry and Environmental Studies, 1988), 216–29. Ascher and Brewer define sustainable development as "the pattern of resources exploitation that maintains the highest possible levels of net social welfare benefits into the future." The difference between this approach and the one taken here is more apparent than real, however, because the question of how to estimate "net social welfare benefits" opens up the issues of value and feasibility that are raised by putting the word "between" in quotation marks.


19. Ibid., Section 10(h).


21. For a helpful discussion of why contradictory interests come to be reflected in public policy, see John W. Kingdon, Agendas, Alternatives, and Public Policies (Boston: Little, Brown, 1984), chap. 4.


23. The emergence of joint management of salmon and steelhead harvest by Indian tribes and state agencies, after a prolonged legal struggle over the century-old treaties between the tribes and the US government, is described by Penny H. Harrison, "The Evolution of a New Comprehensive Plan for Managing Columbia River Anadromous Fish," Environmental Law, 16 (1986), 705–29. A similar accord on consensual management of timber harvest was concluded in the Timber/Fish/Wildlife agreement in 1987, covering forest management on nonfederal lands in Washington State. See Northwest Renewable Resources Center, Timber/Fish/Wildlife (tabloid) (Seattle: Summer 1987) and Cindy L. Halbert, Master's thesis (University of Washington Institute for Marine Studies, 1989).


31. Harrison, "Evolution of a New Plan."


34. Lawrence, "Water Budget."

35. Bonneville Power Administration, Programs in Perspective, newsletter, January 1988, 1 (figure 1).


45. Negotiated consensus may not be a necessary precondition for adaptive management. The simultaneous emergence of negotiated settlements to natural resource disputes and of adaptive management appears to be a historical accident, though it is clear that both draw upon ideas "in the air," including a bias for consensus as a management style and a commitment to use science in decisionmaking despite conflict.


50. Ascher and Brewer, "Sustainable Development."