

is, we will attempt to clarify and alleviate some of the problems in environmental policy. The discussion will be based on the belief that an understanding of environmental policy should include not only policy as it is, but more important, policy as it ought to be.

Wells (2000)



Chapter 2

Institutions, Strategies, and Actors

The Context within Which Environmental Policy Occurs

A policy, once it is soundly based theoretically and has clearly defined objectives, requires the additional elements of institutional structures, policy strategies, and policy actors. These three elements constitute the context within which environmental policy is developed and implemented. They profoundly affect environmental policy outcomes.

Policy scientists have been deeply divided over what roles institutions play in the policy system. In the view of some, institutions mean very little. Most students of public administration are familiar with the couplet from Alexander Pope to the effect that "For forms of government let fools contest; whatever is best administered is best." In this view, institutions are almost neutral conduits within which the critical actions of individuals and groups take place. A second and more recent view is referred to as the "new institutionalism" (March and Olsen 1984:738). In this view, institutions play a semi-autonomous role in the policy system as political actors in their own right, and so the achievement of policy objectives depends in part on the design of these institutions. This view seems especially important for environmental policy.

Also important in the policy process are policy strategies, or the means by which policy objectives are accomplished. Policy strategies are among the most political of all aspects of the policy process. Certainly, they are subject to much debate, a process that leads to a great deal of change in strategies.

Identifying and tracking the importance of the actors in environmental policy is not the simple task that it might appear to be. We have already seen that institutions are semi-autonomous actors. Beyond that, the influential actors in the policy process often are not visible but play their trade "behind closed doors," as power structure studies have consistently found. Given these problems, it is important to know the major actors at both the international and national level.

INSTITUTIONS IN ENVIRONMENTAL POLICY

Institutions function in several ways as semi-autonomous actors in the environmental policy arena. One way is in the distribution of resources. Some of these resources are tangible, such as money and human resources. Some are intangible, the most important of these being information. Institutions convey access to information to some and deny it to others. Information is power; denying access to information is a means of keeping an individual powerless.

A second way institutions function semi-autonomously is by determining or modifying individual preferences through control of an extraordinarily wide range of symbols, myths, and rituals. Some of them are true, some false, and some partly both. The important point is not whether they are true or false but whether they are believed. Some of society's most important symbols are numbers (Stone 1988: 129). Issues become policy problems in part because we count or measure them and determine that there is a "problem" of sufficient importance to justify a policy response. Since numbers imply the direction action should take, some level of measurement becomes the standard for a "solution." Institutions by and large control the numbers.

Third, institutions define the rules of the game. They form the action channels within which policy takes place (Allison 1971). The action channels preselect the major players, determine the player's point of entrance into the policy process, distribute advantages and disadvantages for each game, and determine who "gets a piece of the action." Anyone who has dealt with a regulatory agency in any country can testify to the efficiency of institutions in establishing and maintaining these action channels.

Fourth, institutions function semi-autonomously by imposing order on a policy area. In environmental policy, it is hard to avoid the conclusion that policies are designed to ensure that events and behaviors take place in regular and prescribed ways. That orderly process is often equated with protecting the environment when in fact it may have little to do with policy outcomes. All of these functions make institutions critical elements in environmental policy.

International Institutions

International organizations have become increasingly important actors in the environmental policy area. There are a large number of these organizations with a wide variety of objectives. Since it is impractical to examine all international agencies that affect environmental policy, we will identify only the most active of them. Of the multiple-purpose international agencies, the United Nations Environment Programme, the World Bank, the International Monetary Fund, and the United Nations Educational, Scientific, and Cultural Organization are the most important to environmental policy.

The primary purpose of the United Nations Environment Programme (UNEP) is to facilitate international cooperation on all matters relative to the environment. Policies of the UNEP are determined by a Governing Body made up of 58 members allocated among nations on a regional basis. Its Secretariat is located in Nairobi, Kenya, and has a budget of just under \$40 million annually. The organization of the Secretariat reflects the three main objectives of UNEP. First, the environmental assessment section consists of the Global Environment Monitoring System, the International Referral System for Sources of Environmental Information, and the International Register of Potentially Toxic Chemicals. This section has produced some of the most valuable data on the condition of the global environment. Second, the environmental management section addresses such concerns as terrestrial ecosystems, technology and the environment, industry and the environment, oceans, coastal areas, and desertification control. Finally, the support section consists of such programs as environmental education, public information, developmental planning, and environmental law.

Pursuing its mission of facilitating international cooperation, UNEP has served as an important catalyst in several international agreements. Conventions that have been sponsored by UNEP include the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on the Conservation of Migratory Species of Wild Animals, the Convention for the Protection of the Ozone Layer, the Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal, the Convention on Regional Seas program, and the Montreal Protocol on Substances that Deplete the Ozone Layer. Pursuing its monitoring and assessment objectives, UNEP has established Earthwatch, an early warning system designed to inform governments on events that pose serious environmental risks. Pursuing its environmental management and support objectives, UNEP has sponsored or conducted more than 1,000 projects addressing a wide range of environmental concerns. As a result of all these activities, UNEP has established a reputation as a responsible and effective international institution for accomplishing environmental objectives.

are significant for the environment, among them a reduction in infant mortality rates, universal access to safe drinking water, sanitary means of excreta disposal, and an improvement in literacy rates. UNICEF assists governments in developing countries with projects designed to accomplish these objectives.

Several specialized agencies conduct programs in the area of agriculture and food. The Food and Agricultural Organization is committed to freedom from hunger for all humanity. Within this broad objective, it assists in projects to improve the production and distribution of food. Additionally, it advises governments on a wide range of environmental protection activities, including soil degradation, water resource management, pest management, and fertilizers. The World Food Programme (WFP) is specifically charged with assisting the most vulnerable peoples. As a result, it often provides essential emergency relief. Since many of the world's most vulnerable people live on marginal lands and fragile environments, WFP has been a major provider of grants for reforestation, soil conservation, and sustainable agriculture. This money is contributed by governments and intergovernmental bodies at biennial pledging conferences.

The mission of the World Health Organization (WHO) is to promote human health by providing a wide range of support to participating nations for development of programs to control environmental health hazards. Historically, the most important of these have been water supplies and sanitation facilities. Recently, WHO has placed increasing emphasis on air quality, radiation exposure, and environmental epidemiology. The general objectives of WHO are stated in the document, "Global Strategy for Health for All by the Year 2000."

Along with the agencies whose primary concern is service to people, a second type of specialized agency functions in relation to a particular sector of the environment. The most important of these are the World Meteorological Organization, the International Maritime Organization, and the International Atomic Energy Agency.

The World Meteorological Organization (WMO) is one of the world's most active organizations in the assessment of the state of the global atmosphere. WMO has established the Global Climate Observing System, whose objective is to monitor world climate and detect climate change. Substantial data are derived from a network of climate stations cooperating with WMO. In addition to research activities, WMO works through its members to reduce pollution of the atmosphere.

A similar agency with activities targeted to the ocean is the International Maritime Organization (IMO). The IMO's overall objectives have focused on international cooperation in technical matters relative to shipping and to maritime safety. However, it has been very active in environmental policy and reflects a strong commitment to the prevention of pollution to the ocean. The IMO has sponsored negotiations that led to sev-

The World Bank and the International Monetary Fund are important in the environmental area because of their funding activities. The primary purpose of the World Bank is to provide capital for projects that help raise the standard of living in developing countries. Environmental considerations are a part of the decision-making process, especially when the projects have to do with energy, industry, infrastructure, or agriculture. In fact, the Bank has an Environment Department and four Regional Environment Divisions. It also maintains a close working relationship with the United Nations Environment Programme. For example, the Bank often functions as the implementation agency for providing low-interest loans and grants to developing countries for various environmental projects. The primary purpose of the International Monetary Fund (IMF) is the promotion of international monetary cooperation and stability among monetary systems of the world. One IMF activity that affects the environment is the making of loans to developing countries for projects that contribute to sustainable development. IMF staff members work with other institutions in identifying the interplay between economic development and environmental responsibility.

The United Nations Educational, Scientific, and Cultural Organization (UNESCO), as its name implies, seeks to promote cooperation among nations in education, science, and culture. Many of its activities are designed to promote human rights, a commitment to justice, and respect for the rule of law. However, within these broad activities, UNESCO engages in several important environmental functions. These include providing information and expertise to projects seeking to improve environmental quality, conducting programs to increase member states' capacity to deal with environmental problems, and conducting educational and public awareness programs on the environment. Nearly all of UNESCO's environmental activities are linked to the goal of sustainable development.

There are also a number of specialized agencies whose activities are important for environmental policy. They may be categorized as agencies that work primarily with people and those whose work is directed toward some sector of the environment, such as the ocean.

The specialized agencies that work directly with people concern themselves with population, children, agriculture, food, and health. The United Nations Population Fund promotes research on population and family planning and assists developing nations in projects designed to relieve population problems. It has developed a set of guidelines, "Population and Environment," for ensuring the integration of environmental objectives with population activities. The primary objective of the United Nations Children's Fund (UNICEF) is to promote the survival and development of children. The Declaration and Plan of Action adopted by the UNICEF World Summit for Children included a number of goals that

eral important international agreements on ocean pollution: the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (The London Dumping Convention of 1972), the International Convention for the Prevention of Pollution from Ships (MARPOL, 1973), the International Convention on Civil Liability for Oil Pollution Damage (1969), the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution (1971), and the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969). In addition, the IMO provides information, codes of practice, and recommendations to member nations in order to prevent conflicting standards as nations might proceed unilaterally to develop regulations.

The International Atomic Energy Agency (IAEA) is an independent organization within the United Nations system. One of its more important objectives is supporting research on the peaceful uses of atomic energy. For example, the Agency sponsored a joint program with the Food and Agriculture Organization to develop nuclear applications in agriculture in order to reduce the use of fertilizers and pesticides. The Agency has also been very active in the development of standards relative to all aspects of fissionable materials. One of its earliest efforts in this regard was the development of acceptable regulations on the pollution of the ocean by radioactive materials. Like the WMO, the IAEA has sponsored negotiations that led to significant international agreements. These include the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water (1963), the Treaty on the Non-Proliferation of Nuclear Weapons (1968), the Convention on Civil Liability for Nuclear Damage (1963), the Convention on Early Notification of a Nuclear Accident (1986), and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986). A significant part of the Agency's work has been to provide services to member nations in the safe operation of nuclear power plants and nuclear facilities. The Agency's Radioactive Waste Management Advisory Programme provides technical assistance to member nations for establishing radioactive waste management programs.

Regional Institutions: A Supranational Institution and Regional IGOs

In addition to the intergovernmental organizations affiliated with the United Nations, there is one supranational institution and several regional intergovernmental organizations that play important roles in environmental policy. The supranational institution is the European Community.

The European Community is in many ways a unique political institution. It is not a nation since the twelve member nations retain sovereignty

even in the pursuit of foreign relations. At the same time it can enter into agreements with other nations, one of the primary characteristics of a sovereign nation. The EC is rightly referred to as a "community," without the full attributes of a nation, yet policy that it adopts can have the same force as national legislation. The EC has used that influence to profoundly affect the environmental policies of Europe (Haigh 1992). An understanding of EC environmental policy is essential for an understanding of the environmental policy of member states.

EC legislation can take several forms. A Regulation is legislation that is enforced directly by national courts. The Directive, on the other hand, is legislation that sets broad objectives but leaves to each nation the determination of how to achieve those objectives. For example, a Regulation sets percentage reductions in the quantity of ozone-depleting substances that are emitted; a Directive limits emissions of sulphur dioxides and nitrogen oxides from power plants but leaves to individual nations the means for accomplishing those limits.

The relationship between the EC and its member nations is more complex with regard to international conventions. The EC can enter into international agreements in those areas where it "has competence." Member nations also have competence to enter into international agreements and are at times signatories to the same agreements to which the EC is a party. A treaty to which both the EC and some or all member nations are parties is called a *mixed agreement*. The general rule is that member nations cannot act independently on matters on which the EC has exclusive competence, even when the EC Council cannot reach agreement on policy. When the EC does not have exclusive competence, the member nations may act independently if they choose to do so.

The most active of the regional intergovernmental organizations is the Organization of African Unity. The OAU sponsored the negotiations that led to the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement of Hazardous Waste within Africa. This convention branded the transportation into and the disposal of hazardous waste within Africa as "a crime." It has been the instrument on which many African nations have acted to end the irresponsible dumping of hazardous wastes. In addition to the formal convention, the OAU has sponsored a number of forums for the discussion of environmental rules, regulations, and standards most relevant for African nations. It has provided substantial technical assistance to member nations with regard to many of the complex environmental issues. The OAU has cooperated extensively with the United Nations Environment Programme in carrying out a number of projects on the African continent. Certainly other regional intergovernmental organizations, such as the Arab League and the Organization of American States, have been much less active in accomplishing environmental objectives.

National-Level Institutions

When the focus shifts to the national level, the variations in practice are so numerous it is difficult to establish meaningful categories that will encompass all national practices. At the most general level, three patterns of national institutions are found. The first is a centralized agency with general jurisdiction for environmental policy. This pattern is most often found in countries with unitary systems of government. The second pattern is one of decentralization, with policy prerogatives vested in provincial or regional governments. This pattern most frequently occurs in countries whose central governments tend to be weak and the provincial governments relatively strong. The third pattern is the one associated with federal systems. Here jurisdiction over policy is dispersed between the central and state governments. Usually there is an agency with responsibility for environmental policy at both levels. In the United States, for example, there is a national Environmental Protection Agency and also an environmental protection agency within each state. The relationship between the two levels is complex and it varies, as does the relation between environmental policy subfields.

In evaluations of national-level institutions, most comparisons have been made between central institutions and decentralized or federal institutions. Lennart Lundqvist did a perceptive study of environmental policy outcomes in the Swedish centralized system and the American decentralized system. He found advantages in both approaches. The advantages of the centralized approach were summarized as consistency, efficiency, expertise, continuity, and a different character to the issues. In the decentralized pattern he found legitimacy, democracy, local experience, continuity, and a different character to the issues (Lundqvist 1974:63). Issues in the centralized systems tend to have a national character while issues in decentralized systems tend to have a local character. Weighing the relative merits of a centralized versus a decentralized system is a difficult task.

Lundqvist is understandably cautious in his assessment. The general conclusion is that both countries "have experienced some success in fighting air pollution" (Lundqvist 1974:196). He adds that the importance of differences in the two systems "lies in the fact that they provide different political contexts of choice. They provide different sets of political incentives and different sets of political constraints. In short, they provide for different types of clean air politics, different styles of clean air policy choice and change" (Lundqvist 1974:182). The truth of this point will be clear when we examine specific environmental policy areas.

BASIC STRATEGIES IN ENVIRONMENTAL POLICY

A policy that is soundly based theoretically and that occurs within clearly identifiable institutional structures requires the additional element of

strategies or policy instruments. In environmental policy, policy instruments are strategies adopted by the international community or by nations to achieve the objective of preserving the ecological basis of life. These instruments vary substantially, particularly the international versus the national instruments.

Multinational Strategies

Most of the instruments of transnational cooperation are utilized to accomplish cooperation in the environment. The most basic instrument of international cooperation is the treaty. Unfortunately, the word *treaty* has been applied to all forms of international cooperation except executive agreements. In this context, *treaties* will be understood in the narrower sense as agreements between two or more nations that have the binding force of international law. In fact, treaties are a major source of international law. Additionally, treaties are a part of the supreme law of the land in the United States and take precedence over state constitutions and laws. An *executive agreement* is an agreement between the heads of states of the nations that are party to it. Executive agreements are not legally binding, as are treaties, but are seen as agreements between the executive authorities of the signatory nations. *Conventions* have the same character as treaties but usually deal with more specific and technical subjects; therefore, they are important policy instruments in the environmental area. A *protocol* is the official record of a diplomatic conference that shows the agreements arrived at by the participants. Protocols are normally signed by the participants and are often preludes to conventions. *Declarations* are either statements setting forth the agreements reached on certain principles of international law or statements of policy on the part of particular governments. Finally, *nonbinding agreements* are agreements between nations that do not have the force of law.

A complex array of factors are involved in the choice of one or the other of these instruments of multinational environmental policy. Probably the most important factor is the determination of what kind of agreement can be reached with regard to the issue. Consider the use of chlorofluorocarbons (CFCs) as propellants in aerosol cans. What type of agreement is feasible and can be negotiated? A convention would be the most binding, carrying as it does the force of international law. On the other hand, some nations may not want to be bound formally to a certain course of action. Furthermore, in most countries the process of negotiation and ratification of treaties is more complex and fraught with more "veto points" than other forms of international agreement. An example is the requirement for consent by the U.S. Senate, often the occasion for extensive supportive and obstructionist interest-group activity. The protocol and executive agreement have the advantage of involving executive action without the more

formal process of a treaty. The executive in most countries can act unilaterally. If secrecy is desired, the protocol and executive agreement processes can be conducted in greater secrecy than the treaty and convention processes. The declaration offers the advantage of clarifying a nation's understanding of the specific meaning of an agreement. A nonbinding agreement is often possible when no other form of agreement is, and so it is a fall-back possibility when all else has failed.

One of the major problems with all forms of international agreement is the problem of enforcement. Any agreement without an enforcement mechanism is subject to being ignored. There are various sanctions that can be utilized to give multinational agreements some effect, such as a boycott or economic embargo. However, such sanctions are seldom applied, particularly in the environmental policy area, and when they are, their effectiveness depends a great deal on the particular circumstances. Accomplishing environmental objectives, then, depends primarily on mutual cooperation between the parties to an agreement. Such cooperation is not easily obtainable, because of the many social, economic, and cultural differences among nations. Among the most important and clearly visible set of difficulties is that between the economically advanced nations and the economically developing world—often referred to in international relations literature as the North/South conflict. No area of conflict is more important for global environmental policy than the one between the North and the South.

Several features of the North/South conflict are particularly intractable. First, the North is the major source of environmental degradation. It has approximately 16 percent of the world's population and emits 48 percent of the greenhouse gases. The 230 million people in the United States are responsible for the same level of greenhouse gases as the 4 billion people who live in the South (Lunde 1990:9). Second, the North uses a disproportionate amount of the world's resources. Leaders in the South are understandably concerned with this imbalance and insist that global environmental policy must accommodate the future economic development of the South. The failure to develop such a policy will mean that the South could become a major contributor to global environmental degradation.

The most far-reaching proposal to enforce global environmental policies is for a world legislative body with the power to impose such policy on nations. This idea was the basis for substantial discussion at the Hague in 1989. New Zealand suggested that the body be called the Environmental Protection Council and be established as a unit of the United Nations. The Hague meeting resulted in the adoption of a declaration calling for the creation of such an institution and empowering it to supersede national authority on matters of environmental policy. Since no such institution exists at the present time, national-level environmental strategies take on added importance.

National-Level Strategies

There are three categories of strategies generally employed by nations in implementing environmental policy. The most extensively used of the three are command-and-control strategies, which use the coercive power of law and regulation. A second type, market-driven strategies, utilize economic inducements, either positive or negative, to achieve environmental objectives. Finally, technology-forcing strategies are based on the assumption of an ever-improving technology; potential polluters find it in their best interest to utilize the improved technology and thereby reduce their pollution. These policy strategies have been vigorously debated in nearly all nations that have an active environmental policy.

Command-and-Control Strategies Command-and-control strategies consist of traditional environmental regulations. In most nations, such regulations are formulated through a four-stage process. The first stage is the establishment of the policy goal. This is normally done through an act of the nation's legislative body. The goals may be quite specific, such as setting target dates for lowering automobile emission standards, or the goal may be quite vague, such as the U.S. Clean Air Act goal of protecting the public health and safety.

The second stage is the establishment of policy criteria. Criteria are indicators used to determine when to regulate a particular substance. Three categories of criteria are found in national practices. *No-risk* criteria require that substances be controlled to the point where they pose no risk to human health or safety. The problem is that it is virtually impossible to determine when this criterion is reached, because of scientific uncertainty (Lowrance 1976:83). *Margin-of-safety* criteria require that substances be controlled within a reasonable margin of safety. In many instances, what is reasonable is determined by what is practicable. Thus the utilization of "best available control technology," or BACT, functions as the real criterion of reasonableness. Finally, there are *cost-based* criteria. When these criteria are in effect, regulators are required to take costs into account when setting standards.

The third stage in developing regulations is the establishment of standards, that is, the maximum levels of pollutants that will be allowed in the air, water, soil, or workplace. *Personal exposure* standards specify the levels of pollutants to which humans can be exposed. Radiation exposure standards are important examples of such standards. *Ambient composition* standards prescribe the levels of pollutants that are allowed in a specified "encompassing environment." Air quality standards are examples. *Product composition standards* control the makeup of certain products. Food additives is a good example of something controlled by product composition standards. *Product performance* standards require certain performance levels

of various products in emitting pollutants. Automobile emission standards were among the first such standards to be developed. Finally, *packaging* standards regulate the composition of various packaging products. The utilization of styrofoam in food packages is an example of this standard. While there are other standards in use among the policy systems of the world, these are the most frequently imposed and the most important ones for their environmental outcomes.

The fourth stage in command-and-control strategies is enforcement. In some nations, enforcement strategies are very rigid and leave the administrator with little flexibility. In other nations, the administrator is given discretion to bargain with the polluter to achieve maximum reduction in emissions. More important, levels of enforcement vary substantially from nation to nation. Some nations vigorously enforce regulations while others are very lax in enforcement.

The issue of level of enforcement is especially important where there are federal systems. The problem is well illustrated by the experience of the United States, which has both a central Environmental Protection Agency and decentralized state-level environmental protection agencies. U.S. command-and-control strategies are frequently carried out through an instrument known as *partial preemption*. This is the policy instrument employed in the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (chemical residuals). The doctrine of *preemption* relates to those policy areas in which both the national government and the states can act. In *Gibbons v. Ogden* the Supreme Court ruled that a valid exercise of national power emptied that policy area from state action. This doctrine of preemption is the basis for the policy instrument of partial preemption. The "partial" component opens the way for state action. The initial step is for the national government to take action, such as through the passage of the Clean Air Act, which authorizes the national government to accomplish national objectives in the area of clean air. But this legislation also provides for state action which can supplant national action. In essence, the legislation provides that if the states act, then the national government will not, but if the states do not act, then the national government will. Since the states have a strong interest in the policy area, it is almost certain that the states will act. As a result of partial preemption, separate state programs in the United States accomplish the objectives of clean air, clean water, and the control of toxic chemical wastes.

Utilization of the partial preemption strategy raises the question of the extent of state discretion. Are states simply convenient administrative agencies of national policy or do they have significant discretion in establishing standards and determining enforcement levels? In this question, there is a clear example of the importance of how an individual looks at a situation. Looked at from the "top down," that is from the perspective of national legislation and administrative action, there is the definite appear-

ance of substantial national determination of policy. Clearly, the intent of the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA) is that the responsible official in each policy area is the Administrator of the national Environmental Protection Agency.

When examined from the "bottom up," that is from the perspective of state implementation, a very different conclusion is reached. A bottom-up view suggests wide state discretion that results in substantial policy variation among the states. Five characteristics enhance this state discretion. First, states have adopted standards different from those prescribed as "baseline" standards by the EPA (National Conference of State Legislatures 1982). Second, political, economic, and social factors combine within states to produce varying state levels of enforcement and program activity (Lester, Franke, Bowman, and Kramer 1983). Third, there are no clear and consistent performance audit trails in the environmental policy area. In part, this lack is due to cutbacks in EPA funding, inadequate national office staff, and weak national commitment to enforcement in the 1980s. Fourth, the quality of information provided by states varies widely. The environmental data base in some states is impressive, in others it is minimal. Finally, the EPA is in somewhat of a dependency relationship with the counterpart state agency. In essence, if the RCRA, the Clean Air Act, and the Clean Water Act are to be implemented, the EPA must have the cooperation and support of the responsible state agency. These factors combine to suggest wide discretion for states in environmental policy areas utilizing the partial preemption strategy.

Market-Driven Strategies Market-driven strategies utilize economic factors such as inducements or penalties to accomplish environmental objectives. The most commonly used market-based strategies are marketable emission credits, full costing mechanisms, and either negative or positive incentives. It is important to emphasize that these strategies have not had wide application as yet. Their advocates, however, propose them as alternatives to the dominant command-and-control strategies.

The most significant application of the marketable emission credits strategy in the United States involved the 1990 Clean Air Act Amendments designed to reduce the level of sulfur dioxide emissions. Under the terms of the Act, implementation begins with the identification of a definable air shed. Policy makers then draw an imaginary "bubble" over that region (Tietenburg 1985:8). The total level of sulfur dioxide emissions that are considered to be within acceptable risk in that air shed is calculated. Each producer of sulfur dioxides is then allocated a certain level of emission, usually through formulas based on the firm's percentage of total production in the area and negotiation with the EPA. If a firm generates less sulfur dioxide than it is allocated, the firm may sell that surplus to another firm. Conversely, a firm may generate more sulfur dioxide than it is allo-

cated if it is able to purchase emission credits from another firm. In any case, the total volume of sulfur dioxide emissions remains at the level established. The assumption is that this strategy will provide incentives for all firms to reduce sulfur dioxide emissions.

Evaluation of marketable emission credits is difficult, given the limited experience with their use. First of all, there are almost no data on the use of such strategies. Perhaps more important, application of this strategy has actually involved a mixture of the incentive and command-and-control strategies—the issuance of the permit is a command-and-control strategy, while the ability to market unused portions is an economic incentive—and separating the impact of one strategy from that of the other is a nearly impossible task (Bower, Barre, Kuhner, and Russell 1981:3). Additionally, persons living in the vicinity of the high emission firm do not breathe the air of the general “air shed,” but only the air with high concentrations of pollutants purchased under this policy. So the question is what is being traded—people’s health or pollution rights?

Full costing mechanisms charge the full cost of a service under the assumption that such action will reduce pollution. Seattle’s solid waste plan is a good example. Rather than a flat fee for garbage collection regardless of the volume, Seattle charges by the can. The objective is to encourage individuals and firms to reduce their garbage levels through such tactics as recycling. Results of the plan have been impressive.

The third market-based strategy involves the provision of either negative or positive incentives. When negative incentives are employed, the system is most commonly referred to as an *effluent charge system*. When positive incentives are employed, reference is generally to *tax incentives*. There are at least four variations of the effluent charge system (Bower, Ehler, and Kneese 1977). A charge can be placed on the units of residual discharges. For example, a five cent charge per kilogram of sulphur dioxide could be imposed. Second, a charge can be placed on the unit of related input. For example, the European Community has proposed a \$5 per barrel tax on oil, coal, and other carbon fuels as a means of combating global warming. Also, the charge could be on the basis of units of output. An example would be a charge per unit of horsepower on automobiles. Finally, the charge can be placed on some related activity. An example of this would be a surcharge on downtown parking fees to encourage the use of mass transit.

A similar variety exists with regard to tax incentives. A tax subsidy can be placed on each unit of discharge reduction. For example, there might be a five cent tax subsidy for each kilogram of reduction in sulfur dioxide emission. Second, the subsidy could be placed on unit reduction in input use. Here the tax subsidy could be given for each kilogram reduction in pesticide use. Third, the subsidy may be placed on unit reduction of related output. In this instance, the tax subsidy could be placed on the kilo-

gram reduction in package weight. Finally, the tax subsidy could be targeted to a related activity. An example would be a tax reduction for farmers who engage in soil enrichment activities as a means of reducing fertilizer applications. Negative and positive incentives are often used in combination.

As with marketable credits, evaluation of incentives is very difficult. The most ambitious attempt was a study of the French national system for water quality management and of the German system for management of the river basins of Nordrhein-Westfalen (Bower, Barre, Kuhner, and Russell 1981). These two programs were chosen because they are often cited as examples of the effluent charge system. In their findings, the authors argue first that the term “effluent charge system” is something of a misnomer and understates the richness and complexity of the French and German approaches. The strategy, they argue, is not really an effluent charge strategy, but rather represents complex mixed systems with elements of both the command-and-control and the market-driven strategies. Therefore the two systems were found to have little in common with incentive schemes proposed in the United States. Finally and perhaps most important, the authors found that the setting of effluent charges is an extraordinarily difficult task because of the difficulty in identifying the damages resulting from pollution of any kind, although there has been significant effort to “price” the damages resulting from air pollution (Smith 1976). Thus the authors concluded that industries in these studies were moved to act because of regulations and available subsidies, not because of the effluent charges.

Technology-Forcing Strategies The final strategy for accomplishing environmental quality objectives is the technology-forcing strategy. This strategy is based on the assumption of an improving technology that is in the discharger’s interest to utilize. The interest served can range from greater efficiency in the production process to enhanced capacity to comply with command-and-control regulations.

Obviously, a distinction has to be made between improvement in technology that results from forces within the economic system and improvement in technology that results from deliberate policy choice to change technology. Those nations that have adopted a technology-forcing strategy have relied primarily on research grants to develop new technology followed by demonstration projects to inform potential users of the technology’s advantages. The most serious application of these strategies is found in Europe and particularly within European chemical waste policy. These applications will be examined in the chapter on chemical waste.

Ironically, the North has a distinct opportunity to utilize a variation on technology-forcing strategies to encourage environmentally responsible economic development in the South. For example, India and China have

resisted until recently the ban on the use of chlorofluorocarbons. In essence, the two countries forced a technology sharing agreement with the North as a condition of accepting the Montreal Protocol. But the reverse is possible. The North can and should share technology with the South as a means of encouraging environmental responsibility in economic development. Appropriate means of technology sharing, then, would become an essential ingredient in a policy of sustainable development.

ENVIRONMENTAL POLICY ACTORS

In many ways, the dynamics that fuel environmental policy are the various actors in the policy process. Along with the institutions discussed earlier, important actors in the policy process are nongovernmental organizations (NGOs), interest groups, grass roots organizations, and scientists.

Nongovernmental Organizations (NGOs)

Nongovernmental organizations are of much the same character as love—it is difficult to define precisely but known by nearly everyone who experiences it. The Green Globe Yearbook provides the best definition of NGOs: organizations that "are multinational and have a substantial part of their activities within both environment and development... [and are] reasonably independent of governments" (Bergesen, Norderhaug, and Parmann 1992:14). The wide variety of these groups makes it difficult to identify the most important of them for global environmental policy. Recognizing that any grouping of NGOs is arbitrary, it is useful to think of NGOs in three general categories: those that are basically alliances of other groups, those that engage in direct action, and those whose primary activities are educational and informational in nature.

Of the NGOs that are alliances, some are alliances of environmental groups while others are alliances of groups that have a different primary purpose but a strong environmental emphasis. The most important alliances of environmental groups are the African NGOs Environment Network, the Alliance of Northern People for Environment and Development, the Asia-Pacific People's Environment Network, and the European Environmental Bureau. The African NGOs Environment Network consists of over 530 member NGOs in 45 African countries. Its primary purpose is to facilitate communication and cooperation between its member NGOs. It also provides advice, information, and training in the areas of its primary policy interests—water management, renewable energy, deforestation, sustainable agriculture, and wildlife resources. A similar alliance for North America and Europe is the Alliance of Northern People for Environment and Development. It seeks to provide communica-

tion links and facilitate cooperation among NGOs in its primary areas of interest—a holistic approach to environment and development, human rights, social and ecological justice, democracy, and peace. The Asia-Pacific People's Environment Network provides informational and communication services to its member NGOs in 18 Asian countries. Its policy emphases are development and the environment, climate change, the marine environment, and protection of rain forests. The European Environmental Bureau consists of 126 NGOs in 12 European Community countries. This organization puts emphasis on conservation, land use planning, transportation, energy, and agriculture. Like the other alliances of NGOs, it seeks to accomplish its objectives through education, communication, and the provision of advice and information.

Other NGOs are alliances of groups whose primary objectives are not the environment but who have a strong environmental orientation. The most important of these are the International Council of Voluntary Agencies, the International Confederation of Free Trade Unions, and the International Organization of Consumer Unions. The International Council of Voluntary Agencies promotes the development, growth, and improvement of voluntary agencies. Its membership consists of 86 organizations in 34 countries. To accomplish its objectives, it primarily provides information, advice, and assistance to interested parties. The International Confederation of Free Trade Unions has member unions in 108 countries and a total membership of over 100 million individuals. While its primary purpose is to promote the union movement, it is also interested in sustainable development and has made environmental issues important parts of various conferences that it has sponsored. The International Organization of Consumer Unions is a confederation of 175 organizations in 68 countries. Its primary purpose is to promote consumer rights, and it includes among these rights the right to a safe and healthy environment. It has also emphasized the consumer's responsibility to be sensitive to the effect of consumption patterns on the environment and thus has become a major proponent of ecological awareness.

A second major grouping of NGOs engages in direct action. These organizations sponsor projects, engage in direct environmental activities, or mobilize individuals to engage in such activities. For illustrative purposes, Earthwatch, Friends of the Earth International, Greenpeace, the Green Belt Movement, the Sierra Club International, and the World Wide Fund for Nature represent this group of NGOs well.

Earthwatch is both a research and direct action organization. Its Center of Field Research receives donations from foundations, corporations, and individuals to fund significant research projects on environmental problems. In regard to direct action, Earthwatch has a unique program of volunteers who carry out over 140 projects in more than 50 countries. The volunteers pay a share of the costs of their accommodations and food.

Friends of the Earth International in many ways resembles the alliances discussed earlier. It has been instrumental in creating alliances of environmental, consumer, and human rights organizations. However, it also attempts to coordinate the direct action of member groups in lobbying for environmental objectives relative to climate change, rain forests, ozone depletion, and marine conservation. It maintains observer and consultative status in a number of international organizations. Greenpeace International, which has over 4.5 million individual members in 143 countries, has been an active lobbyist for various environmental objectives. The major emphases of Greenpeace are stopping whaling and preventing toxic and nuclear waste dumping and river and sea pollution. The focal point of The Green Belt Movement is the tree. This organization stresses such environmental problems as desertification, the fuel wood and food crises, overpopulation, and the general mismanagement of resources. The Green Belt Movement has established over 1000 tree nurseries and conducted projects in which over 7 million trees were planted. Its membership consists of 1.5 million individuals in 13 African nations. The Sierra Club International engages in extensive lobbying for environmental legislation, primarily in the areas of clean air and water, control of toxic chemicals, and the designation of wilderness areas. It is the international arm of the Sierra Club, an important interest group in the United States. Presently, it has over 500,000 members in 27 countries. One of the most active sponsors of environmental projects is the World Wide Fund for Nature. Since its founding in 1961, it has spent over \$300 million on more than 10,000 projects in over 130 countries. The Fund supports a wide range of projects, from the banning of trade in ivory to a reduction in greenhouse gases.

The final group of NGOs consists of organizations whose purposes are primarily educational and informational. They sponsor conferences, publish materials, establish communication networks, and encourage educational activities for young people. Examples of this group include the European Youth Forest Action, the International Solar Energy Society, and the Society for International Development. The primary purpose of the European Youth Forest Action is to teach young people about environmental problems. It sponsors an extremely effective summer camp called "Ecotopia," at which young people are saturated with information on environmental problems. All of the organization's educational programs are designed to teach young people how to act against polluters and how to work for better governmental environmental policies. The International Solar Energy Society promotes education on all aspects of solar energy. Among the more important of its activities is a biennial International Congress on Solar Energy to provide a meeting ground for those interested in the development and utilization of solar energy. The Society for International Development uses a similar strategy, a triennial World

Conference, on sustainable development. In addition to its educational activities, the Society supports research and publication on sustainable development and alternative development strategies.

NGOs accomplish important functions in the global environmental policy process. In a very perceptive case study of NGOs and marine policy, Stairs and Taylor found that NGOs contribute to the international policymaking process in four ways (Stairs and Taylor 1992:134). First, they enhance the legitimacy of the decision-making process. In essence, NGOs provide the mechanism through which people affected by a pending decision can present their views. Second, NGOs improve the quality of decisions. They are the source of facts and perspectives that would not be available otherwise. Third, they help balance access to decision makers. Decision making is often an insider's game with some interests better represented than others. NGOs help balance that representation. Fourth, NGO participation helps foster public education. Since they are involved in many decision situations, NGOs are able to report to their members information that would not be reported in the press. They serve as "watchdogs" for national delegates. In these ways, NGOs have emerged as major actors in the environmental policy process.

Environmental Interest Groups

Environmental interest groups are similar to NGOs and, in fact, are often treated in the literature as NGOs. Interest groups are national-level organizations with the most significant part of their activity within the environment. In most respects, then, the primary difference between an NGO and an interest group is that the former is multinational and the latter is national in scope of operations.

On a global basis, the variety of environmental interest groups is almost staggering. Unfortunately, no comprehensive analysis has been done on these groups from a global perspective. Considerable analysis has been done, however, on environmental interest groups in the United States. Given the richness of the data on U.S. environmental groups, it is useful to use the American experience as a prototype of what can occur within these organizations.

Environmental organizations in the United States, a diverse group representing a broad spectrum of styles and ideologies, have become important forces in the policy system. Much of their influence can be traced to a spurt in growth which they enjoyed in the 1980s. Most of that growth was a result of growing public commitment to environmental objectives, the anti-environmental stance of some Reagan administration officials that provoked "crisis" type confrontations, and the utilization of modern technologies for recruiting members (Dunlap and Mertig 1992). While membership in environmental organizations overlap, the number of Americans

who belong to these organizations probably exceeds 7 million. This membership is scattered among many groups, but seven large organizations have the preponderance of memberships and financial resources. Table 2.1 presents the 1990 membership and annual budget of these seven organizations. In total, the Big Seven have 6,663,000 members and over \$416 million dollars annual budget.

Environmental organizations in the United States have used three basic strategies in pursuing their objectives: education, direct action, and policy reform (Dunlap and Mertig 1992:19). All of the Big Seven and most other groups engage in educational activities of some kind. Many publish regular magazines, such as the highly regarded *National Wildlife* magazine published by the National Wildlife Federation. The Federation also publishes a Big Backyard series for small children and a Ranger Rick series for older children. Education efforts often have a specific policy interest. An example of this type of campaign is the Natural Resources Defense Council's efforts against the use of Alar on apples. Many organizations go beyond sharing information and are actively engaged in research on a variety of environmental questions.

Table 2.1 The Seven Largest Environmental Organizations in the United States

Name	1990 Members	1990 Budget (millions of \$)
Greenpeace U.S.A.	2,300,000	50.2
National Wildlife Federation	975,000	87.2
World Wildlife Fund	940,000	35.5
National Audubon Society	600,000	35.0
Nature Conservancy	600,000	156.1
Sierra Club	560,000	35.2
The Wilderness Society	370,000	17.3
Total	6,663,000	416.5

Source: Data in Dunlap and Mertig 1992: pp. 13, 18.

Second, a wide range of direct action strategies are available to environmental organizations. The most formidable in terms of money is the land purchase program of the Nature Conservancy. The Conservancy purchases and then manages land it considers important for ecological reasons. Since 1953 the Conservancy has acquired over 5.5 million acres of land. Various market-based strategies have been used by other organizations, including boycotts of the products of firms that are deemed to be irresponsible toward the environment and shareholder actions to effectuate a change in corporate policy. Greenpeace U.S.A. is probably the most active direct action organization. Its nonviolent strategies include plugging pipes

that carry toxic industrial emissions and placing inflatable boats between whaling ships and whales. Litigation is an increasingly important strategy. The Sierra Club Legal Defense Fund has as its primary purpose litigation against polluters. Finally, some environmental organizations advocate "ecotage" or the damaging of property to accomplish environmental objectives. Among these are Earth First! with 200,000 members and the Sea Shepherd Society with nearly a half million members. Ecotage tactics include such actions as sabotaging bulldozers to protect wilderness and sinking whaling ships to protect marine mammals.

Policy reform, the third strategy, is an attempt to get policy adopted or to strengthen existing policy. In this regard, environmental organizations have utilized many of the traditional strategies of interest groups generally. In the past, contributing money to political candidates was disdained by most environmental groups—only the League of Conservation Voters used the technique. Today, most of the Big Seven provide significant financial support for environmentally sensitive candidates. In many ways, the preferred tactic of environmental groups is lobbying Congress and administrative agencies such as the EPA, but it is important to note that this represents a significant shift in the strategy of environmental groups. Before Earth Day, only two lobbyists were retained by environmental organizations. In 1975 twelve organizations employed 40 lobbyists. By 1985 the number of registered lobbyists for environmental organizations had increased to 88 (Mitchell 1989). Lobbying has become such an important emphasis of some organizations that some analysts divide environmental interest groups into two categories, lobbying and nonlobbying.

Measuring the effectiveness of environmental groups in the United States or any other country is a difficult task. However, it is clear that they perform important functions in regard to policy. In the first place, they perform what political scientists call *interest definition*. For most people environmental degradation is essentially invisible. Interest groups help give visibility to environmental problems. This function leads to the charge that such groups "create the issue." In a sense, that charge is correct. Interest groups do assist in developing consciousness about a problem. Once consciousness is developed, interest groups help translate the sense of being affected by a problem into a proactive stance. However, in the sense that the charge "creating an issue" implies the manufacture of an artificial concern the accusation is essentially groundless. Second, interest groups help mobilize individuals and resources toward solving a problem. This function is usually referred to as *interest-group mobilization*. While a lone individual may certainly affect public policy, the policy process in most nations is primarily a group process. Interest groups mobilize like-minded individuals in pursuit of their common goals. In this respect, environmental interests are particularly affected by the "free rider problem," that is, the benefits from any given public policy will accrue to a much wider range of

individuals than those who have worked to bring about the policy. If clean air is provided for one individual in a community it is provided for all, regardless of how few individuals worked to accomplish clean air. Since environmental organizations cannot, and indeed would not, limit the benefits of a clean environment to those who worked to accomplish that objective, such organizations are particularly vulnerable to the free rider problem. As a result, most national-level organizations seek to offer selective benefits to its participants, such as magazines, field trips, periodic policy updates, and various logo type paraphernalia.

Third, environmental interest groups provide *interest articulation*. That is, they present the position of the membership to government decision agencies. Most groups have expanded their efforts to include appearances before the legislatures and the courts in addition to the traditional effort to influence administrative and regulatory bodies. Through interest articulation, environmental interest groups provide representation beyond what would be accomplished through the formal system.

Grass Roots Organizations

Grass roots organizations are nongovernmental organizations that work at the community level. They are an extremely diverse group. Some are large organizations, most are small and lack significant resources. Some have rather broad objectives, most are single-issue organizations. Some have very high success rates while for others the hope of success is quite low. Some develop sophisticated organizational structures, such as the Pesticide Action Network of over 300 grass roots organizations. Most are loosely organized and very participatory in nature. The concern that triggers the formation of a grass roots organization may vary substantially between and within nations. What links the groups is a common concern for the environment. The perspective of most groups is reflected in the motto, "Think globally, act locally."

One of the strongest motivations for the formation of a grass roots organization is the NIMBY syndrome. NIMBY is an acronym for "Not In My Back Yard," reflecting the intense negative reaction to an attempt to locate any undesirable facility in a community. The reaction can occur with regard to any locally unwanted land use (referred to by the delightful acronym LULU). Thus the proposal to build a prison in a community can provoke the NIMBY reaction. The reaction occurs also when environmental facilities are LULUs. A chemical hazardous waste facility would most certainly provoke the NIMBY reaction. Ironically, the NIMBY reaction can be provoked by proposals for facilities with which people almost unanimously agree. For example, Americans are strongly in agreement with recycling, but the proposal to establish a recycling center to serve the entire city may provoke a NIMBY reaction in the affected neighborhood.

The NIMBY phenomenon illuminates a critical problem with regard to environmental facility siting. All environmental facilities concentrate the risks and disperse the benefits. The easiest way to understand this problem is to consider the example of a hazardous chemical waste facility. Clearly there are benefits from such a facility. As we shall see in a later chapter, the United States faces a serious problem in the inadequacy of facilities for the environmentally benign disposal of chemical waste. Consequently, the benefits accruing to the siting of waste facilities are dispersed to the nation as a whole. Additionally, producers of chemical wastes must have some place to dispose of their residuals. Again, however, these benefits are dispersed among the producers in the so-called "dump zone," while the risks are concentrated in the local area of the site. Locals therefore become obstructionists, often very effective ones, in the siting process. The NIMBY phenomenon is a powerful motivation for the creation of grass roots organizations in the developed countries.

A number of organizations come into being for reasons other than the NIMBY phenomenon. Grass roots organizations sometimes form out of a mutual concern for policy reform. Most often those common concerns are about threats to human health derived from environmental problems. The common concern might also be for racial justice or for respect of cultural heritage. The motivations behind formation of grass roots organizations are as diverse as the organizations themselves.

In the United States there have been attempts to provide some coordination and support for these organizations. The Institute for Conservation Leadership provides training for the leaders of grass roots organizations. Additionally, regional and national environmental interest groups provide support and coordination. The Environmental Support Center helps grass roots organizations obtain pro bono legal advice, raise funds, and obtain scientific information. Often national environmental interest groups, or their state affiliate, will join the grass roots organization in the effort to accomplish objectives.

In economically developing nations, grass roots organizations most commonly form out of a concern for sustainable development. Within this broad concern, local groups tend to emphasize a local problem or attempt to meet a local need. They provide credit or link the individual to credit agencies, engage in production support services to farmers and local entrepreneurs, conduct educational and informational projects, and deliver health services to local residents (Bratton 1989:570-571). Grass roots organizations often provide an extremely important stimulus for locals to participate in projects. In this regard, they are especially important as agencies for mobilizing community support. In some cases they are the most important channel of communication with the poor in a community. Since their contacts with locals are much closer than those of international agencies, grass roots organizations often bring a different perspective to problems. They

understand local mores and customs and incorporate them into development plans. As a result, they sometimes offer alternative development plans that are more effective than those of international agencies. In all these respects, grassroots organizations in economically developing countries make significant contributions to both sustainable development and environmental policy.

Scientists

Scientists present special problems in the environmental policy process simply because their perspectives are not as neutral or their findings as exact as is popularly believed.

Affecting their neutrality is the reality that scientists are products of their environment and are influenced by it. They have opinions that affect their judgments on issues. For example, most scientists have at least some vague notion as to how government should function in the economy; support or opposition to a proposed regulation may be the result of this preexisting opinion. Scientists are influenced by social and economic forces. One of these forces, institutional affiliation, has been subject to considerable analysis in the United States and has been found to be an important determinant of the scientist's position. Scientists employed in industry are more politically and socially conservative than those who work in universities, government, or environmental interest groups. For example, a study of 136 scientists relative to risk assessments for carcinogens found that industry scientists favored premises and judgments in the research process that made regulation of a substance less likely (Lynn 1986). Even more to the point, another study found that when scientists became involved in policy issues, say as advisors to government agencies or in testifying before Congress, there was a noticeable weakening of their scientific perspective and a strengthening of ideologically based perspectives (Dietz and Rycroft 1987:17). This means simply that scientists stopped acting like scientists and began acting more like politicians or political activists. Scientific neutrality is often one of the first casualties in policy debates.

Scientific findings also are not as exact as is popularly believed. The major reasons are found in the inherent complexity of most environmental problems and the reluctance of funding institutions to support state-of-the-art advances in environmental research. Environmental problems are so complex that scientists are divided over the most fundamental questions relative to the approach and methods to be used in studying phenomena. And once basic methodological decisions are made, there are many points within the methodology where differences over approach can develop. For example, there are over 50 points in a routine risk assessment where choices have to be made, involving both technical and value issues. It is not

easy to get any two individuals to agree on all choices. Thus the "findings" of any two individuals doing the same risk assessment and making slightly different choices will vary.

What are the results of these characteristics of scientists as policy actors? One result is that environmental "facts" and "solutions" are subject to infinite deniability. Sometimes this deniability is cloaked in grandiose polemics. Consider this denial of the problem of carbon dioxide buildup in the atmosphere

...the rising CO₂ content of the earth's atmosphere is not the grave threat to humanity it is typically made out to be. Quite the opposite, it is one of the better things that could happen to our planet. For CO₂ is, literally, the elixir of life, providing the primary molecular link between the atmosphere and the food chain of the entire biosphere. In its absence, life as we know it would be impossible. In abundance, it can lift the biological activity of the planet to heights never before dreamed possible. (Idso 1992:10)

The author refers to scientific experimentation with carbon dioxide augmentation in greenhouse production of plants as his evidence.

A second result of the limited neutrality and the inexactitude of science is difficulty in establishing standards. There is a great range of scientific questions involved in setting standards for any given environmental regulation. Policy makers generally are not scientists. Faced with a wide range of scientific issues, they look to scientists for guidance. But scientists may disagree or supplant their scientific judgment with ideological perspectives. Warren G. Harding is reputed to have evaluated his problem as president as follows: "I listen to one side and they seem right, and then I talk to the other side, and they seem just as right, and there I am where I started.... God, what a job." Any official working in the environmental policy system could echo the same frustration. If the experts cannot agree, how are policy makers to arrive at decisions?

A third result is "advocacy science," the practice of using science in an attempt to influence the provisions of a particular policy. It is used by industry groups opposing various environmental regulations. For example, the tobacco industry fields substantial scientific information and respected scientists in its efforts to dispute the dangers of passive cigarette smoking. Environmental organizations have discovered advocacy science in recent years, and have developed a "counterscience" capability. That is, they use their own scientific capabilities to evaluate the basis of environmental policies and refute the scientific claims of opposing groups (Mitchell, Mertig, and Dunlap 1992:22). Scientists affiliated with environmental organizations frequently hold significantly different positions than their counterparts in industry and the two groups are often adversaries in the policy process.

The general result of all these factors is that science has limited capabilities in the environmental policy process. This is not to denigrate the role

of science. Scientists are important actors. But it should be emphasized that in any public policy system, information is never complete. It is "interpretive, incomplete, and strategically withheld" (Stone 1988:21). It is therefore important to understand that much of the efforts of actors in the environmental policy process, including the activity of scientists, is directed toward affecting what information is used and how people in the process interpret that information. This means that information is deliberately kept secret at times—what Stone calls "strategically withholding" information. And it certainly means that policy makers, like all decision makers, must content themselves with making the most informed decision possible in a context of uncertainty.



Chapter 3

Air Quality

It's More Than What We Breathe

Air pollution is the release of waste into the air at a faster rate than the air can clean itself. The carrying capacity of the air—that is, the amount of pollutants that it can cleanse through natural processes—varies according to the type of pollutant. For example, the amount of natural CO₂ released into the air is about 700 billion tons a year. In fact, so much carbon dioxide is released through natural processes that CO₂ is not usually classified as a pollutant. However, carbon dioxide is an unavoidable by-product of the burning of carbon fuels. Thus human activities release 24 billion tons each year, and only about half of this is being cleansed. Joined with other gases in the air, carbon dioxide becomes an important polluter.

As the experience with carbon dioxide suggests, there are both natural-based and human-based sources of air pollution. The list of natural-based sources is long. Anyone who has sneezed in the spring because of pollen in the air has experienced one. There are many other airborne viruses, bacteria, and spores that occur naturally and can be regarded as pollutants. Some naturally based pollutants are sources of great beauty. The haze over the Blue Ridge Mountains is the result of plant decay. Depending on one's esthetic taste, others are not so pretty, including volcanic dust and ash, meteoric dust, particulate matter from burning forests, and salt spray from the ocean. Many of these natural pollutants are recycled into useful material, as is carbon dioxide in the photosynthesis processes of plants. Others are simply returned to earth. Volcanic ash, for