ENVIRONMENT INDUSTRY STUDY REPORT 1996

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In harmony with the Tao,
the sky is clear and spacious,
the earth is solid and full,
all creatures flourish together,
content with the way they are,
endlessly repeating themselves,
endlessly renewed.

When man interferes with the Tao,
the sky becomes filthy,
the earth becomes depleted,
the equilibrium crumbles,
creatures become extinct.

Lao-tzu, 500 BC

ABSTRACT

This report discusses the basis of environmental concern in the United States, explores the role of the government in dealing with environmental issues as they relate to industry, reviews the role of industry in relation to the environment, analyzes the impact of environmental issues on industry, and makes recommendations based on conclusions drawn from our study.

INTRODUCTION

Lao-tzu, the Chinese sage quoted above, wrote his words of wisdom in the *Tao Te Ching* about 2,500 years ago, but the words have come to resonate more intensely since his thoughts were first recorded. In the process of conquering the planet, humans have lost their sense of a proper balance with nature and now find themselves on the horns of a dilemma: How can they meet the needs of the present generation without compromising the opportunities of future generations? The answer is the concept of sustainable development.

Over the past 25 years people have begun to realize the consequences of their neglect and abuse of the earth and have acted to reverse the trends that eventually could irreversibly alter life on earth as people have come to know it. The basis of all concern for the environment is the quality of the land, air, and water and the availability of the natural resources needed for reasonable economic progress.

Just how serious is the environmental problem? Some say that the effort to bring about necessary changes has gone too far and that those changes will be detrimental to economic health. Others say that the effort to

reverse a pattern of development that will prove to be cataclysmic for all species, including the human species, has not gone far enough. Beyond the basic issues of ground, air, and water pollution, which are the principal focus of industry's concern about the environment, lie a host of related issues that require a response. Among these are global climate change resulting from the accumulation of greenhouse gases and depletion of the ozone layer, deforestation, desertification, depletion of resources, the availability of potable water, and the extinction of plant and animal species. Taken collectively, these issues are evidence of a noticeable pattern of neglect and abuse with potential long-term ramifications.

The environmental problem is real and is inexorably linked to economic development. Indeed no intelligent, fair, and acceptable approach to dealing with this problem can fail to consider the interdependencies among environmental problems and the issues associated with sustainable development for all nations. In the final analysis, sustainable development must serve as the basis for all sound environmental practices. An effective response must be a joint effort by the government and industry, both nationally and internationally.

THE ENVIRONMENTAL INDUSTRY DEFINED

Environmental considerations are integral to everything that all other industrial segments do in the course of their business. Part of the nation's industrial sector is specifically focused on environmental concerns, but environmental issues affect industry as a whole. Based on our research, site visits, and discussions with leaders from government and industry, we have formulated the following definition of the environmental industry.

The environmental industry is a multifaceted base of manufacturing and services that involves two segments of industry. The first consists of the purely environmental companies, which seek to ameliorate the effects of past abuses and develop new products and processes that are consistent with environmental concerns. These firms include those that develop and market environmental technologies to resolve process deficiencies and handle waste and support remediation functions for other industries. The other segment includes industries in general that have applied environmental technology to ensure their continued economic viability.

We had the opportunity to see both aspects of the industry; however, our primary focus was on industry in general as affected by environmental issues and government regulations.

Although environmental issues and their impact on industry are international concerns, our principal focus was the United States. Our international studies and visits served primarily as a basis for comparison and a source of new ideas. In this report we address international issues only from the perspectives that environmental problems do not recognize political boundaries and that industry is increasingly global, which requires approaches broader than those mandated by individual nations.

CURRENT CONDITIONS

Until the late 1960s, industry seemed to be unconcerned with the environment. Natural resources seemed to be inexhaustible, and waste, an accepted by-product of production processes, was washed away, carried off by the wind, or buried where it did not come into visible contact with communities. In the late 1960s, however, Americans became aware of the results of this waste ethic. They recognized not only that resources were finite but that their use sometimes had adverse effects. Public outcry drove the government to enact legislation and promulgate policies aimed at rectifying these problems. Industry responded to the threat of punitive action and has taken steps to address environmental issues. Most corporate leaders concede that the government's approach was warranted and that industry had abused its privilege but maintain that industry has since corrected its behavior and that the government should change its approach. The industrial sector today contends that environmental values have become an essential dimension of responsible personal and corporate behavior and that external pressure to change is no longer necessary. Although industry exists to make a profit, it recognizes that the profit motive must be accompanied by responsible approach to the environment.

Every industry we visited during the course of our study has taken steps to address environmental concerns, although the motives vary widely. We have characterized the environmental aspect of industry as being international in scope, driven by government regulation, diverse in environmental protective practices, dictated by economics, and focused on

technology for solutions. It is in this framework that we look at specific examples of the impact of environmental issues on industry.

International Scope

The international aspects of environmental issues with respect to industry are twofold: the environmental impacts of industrial processes transcend national boundaries, and corporations are increasingly global and must comply with multiple environmental regulatory systems.

The global economy is alive and growing, and the progress of humanity is increasingly discussed in the context of the global village, but collective responsibility for the earth's environment has not yet struck a resonant chord. Most environmental initiatives appear to have a national focus dictated by the application of government regulations, the immediate effects on the local populace, the economic health of the enterprise, and the cost and technical viability of alternative approaches.

Shared water and air resources can make environmental issues matters of national security, which became most obvious when the Chernobyl nuclear reactor spread radioactive contamination across Europe westward from Russia to Sweden. While this incident forced the world to recognize environmental interdependence, nations still choose to overlook pollution issues in the interest of addressing more basic priorities. This problem is more pronounced in nations that are trying to develop market economies. In Poland, for example, the primary energy source for generating electricity is brown coal, a significant producer of harmful emissions. While there is concerted action to reduce the impact on the local environment, concern over the overall atmospheric degradation is mitigated by the economic benefit and the fact that 70 percent of the hazardous emissions leave Poland. Even nations with developed economies can have a somewhat myopic view of their global obligations. An industry spokesman in France indicated that it would be perceived as an inappropriate intrusion into internal affairs for other countries to raise objections about industrial practices in France. The United States, in spite of significant resources and environmental enlightenment, still uses coal-fired power plants that emit large amounts of greenhouse gases that are tied to global warming.

The second aspect of international environmental issues is that transnational corporations are responsible for complying with multiple sets of national environmental regulations. Industrial giants like General Motors, Grace-Davison Chemical, Dupont, Wacker-Chemie, Siemens, and ELF Aquitaine produce and market their products worldwide, and to be successful they must comply with environmental standards wherever they do business. This is accomplished through different levels of clean-up, pollution control, and environmentally oriented manufacturing processes in each location, depending on the local requirements. Such an approach often reflects a compliance orientation limited to the specific area of operation rather than a true environmental ethic based on the knowledge that the industrial process has a global environmental effect.

Government Regulation

We have determined that industry as a whole has been spurred to act on environmental issues by government legislation and regulation. Examples of neglect and inaction were widespread in the United States throughout the 1970s and continue to exist in eastern Europe today. Where environmental regulation has been passed and enforced, cleanup is occurring and practices improving. Over the last 30 years the United States has made , significant progress, and environmentally responsible practices are now the norm. This is true in western Europe as well, but eastern Europe is only beginning to make meaningful progress.

In developed market economies, industry as a whole is complaining of overregulation, heavy economic burdens that are not justified by limited benefits, and government supervision made unnecessary by industry's acceptance of environmental responsibility. These are legitimate concerns, but the fact remains that the environmental decline of the past would not have been reversed without government intercession and control.

The developing economies of eastern Europe face significant challenges. Newly emerging and struggling governments are burdened with a legacy of pollution and contamination at a time when budgets will not support more than basic services. These same governments are reluctant to make decisions that might jeopardize jobs and income by restraining or

penalizing industries that are, or will be, polluting. Not only do old ways of operating resist change, but the politics of balancing priorities means that environmental issues will lag economics, which will have top priority in eastern Europe for many years. Although market acceptability in the European Union may dictate "environmental correctness," substantial acceptance of and action on environmental issues will be lacking for some time to come.

Diverse Environmental Protective Practices

Industry's efforts to protect the environment, regardless of whether they are stimulated by compliance with government regulations, by the quest for higher profit margins or by environmental altruism, can be divided into three categories: remediation, end-of-pipe pollution control, and process improvement.

Remediation. In remediation, industry attempts to clean up environmental pollution that has already taken place. The primary example is cleaning contaminated soil, usually of petroleum, chemical, heavy metal, or radioactive waste. Remediation is most frequently seen in areas where past practices resulted in contamination of the soil and groundwater; however, spills today can result in emergency remediation requirements.

The U.S. Department of Energy Hanford Operations Office is perhaps the mother of all remediation efforts. In 46 years of processing nuclear materials for the nation from 1943 through 1989, the 560-square-mile Hanford site generated about 350 million liters of high-level radioactive waste, and radioactive materials and hazardous chemicals contaminated 64 million cubic meters of soil and 2.7 billion cubic meters of groundwater (about 200 square miles). This facility is the largest single contaminated area in the United States. Today, the mission of the site is environmental clean-up and storage of contaminated waste. The remediation effort, which is projected to take 30 more years and cost approximately $40 billion, involves two major contractors in everything from removing, treating, and disposing of contaminated liquids, to performing vitrification of contaminated soil, to demolishing and storing radioactive facilities.

For example, Simpson Tacoma Kraft remediated 17 acres of intertidal harbor in Puget Sound by scaling and covering years of bottom contamination with soil materials that have fostered a resurgence of the marine ecology. Grace-Davison Chemical's remediation of 49 sites, at a total cost of $216 million, includes such actions as recontouring and capping hazardous waste piles, removing contaminated soil, closing underground storage vessels, and reclaiming sites.

Pollution control. End-of-pipe pollution control involves capturing hazardous by-products that are inherent in a production process before they can be released into the environment. Scrubbers, bag-houses, and wastewater treatment plants are examples of this type of protection. This approach still produces hazardous waste, but it is controlled and disposed of in less harmful ways. Innovative companies may even recycle the waste back into the production process or into another product line. The efficiencies inherent in recycling the waste may offset some of the cost of the pollution prevention or even generate additional profit.

Standard end-of-pipe mechanisms were in existence in every industry we visited, from scrubbers at the Belchatow Power Plant, to bag-houses at Eastalco, to wastewater treatment plants at General Motors, Skoda Plzen, and Grace-Davison. End-of-pipe pollution control is not unusual, and in fact its absence would be the exception. What is unusual is the innovative uses for captured by-products that were formerly waste materials but have become raw materials. We saw examples of this at the Belchatow Power Plant (gypsum resulting from the combination of sulfur and lime in scrubbers providing raw materials for wallboard and concrete), Grace-Davison (recycling of plastic waste into new products, silica waste into sodium silicate [a raw material] and ammonium nitrate back into the chemical production process), Dupont (chemical and plastic waste into new products), and the Texaco Anacortes Refinery (sulfur waste sold as raw material for fertilizer).

Process improvement. The third industry approach to environmental protection is modification of the production process to reduce or eliminate pollution and waste. The possibilities are endless; examples include substituting materials, changing the physical manufacturing process, upgrading equipment, and changing packaging materials. For example,

Grace-Davison burns plastic waste to generate steam for its manufacturing process, and General Motors substituted a nonsolvent based adhesive for one that was causing the release of 300 tons of hazardous emissions a year.

Economics

Industry pursues those practices that will increase profits and avoids those that reduce profits. In the past, efforts to protect the environment were to be avoided because they would have resulted in additional expense. Beginning with the passage of environmental legislation in the 1970s, industry's objective became to avoid environmental damage because it resulted in punitive fines and directed clean-up--both of which would have a negative impact on the bottom line. Industry has begun to find that it can actually increase profits in the process of pollution prevention. In end-of-pipe pollution control, profit can result from recycling hazardous materials back into the production process or by using waste as raw materials in new product lines, in both cases reducing raw material costs and avoiding disposal costs. When industry modifies production processes in order to prevent pollution, process improvements that prevent pollution frequently result in greater efficiency in production as well. Therefore, while industry may have initially viewed environmental protection as a cost avoidance measure, it is now increasingly viewing pollution avoidance as an income generator.

Technological Solutions

When faced with the requirement to meet environmental regulations, industry has looked for technological solutions rather than scrapping processes entirely. This approach has been largely successful but uneven across industry as a whole. In the chemical industry, for example, technology has provided solutions in the manufacturing process, the handling and transport of materials, the processing of waste, the use of waste materials as raw materials for new products, and the substitution of materials. The petroleum refining and mining industries, on the other hand, has limited its use of technology largely to containment of pollution.

CHALLENGES

In general, much of industry does not argue about the virtues of environmental protection. However, a challenge for industry is to deal with the way the government requires it to protect the environment and the degree to which government requires it to do so.

In an era of rapid change, when industry must be particularly agile in order to remain competitive, bureaucratically cumbersome and prescriptive regulations can be a fatal handicap. For example, the EPA intends to require potential sources of major pollution to apply for a new operating permit for each facility every time it modifies a manufacturing process. For a computer chip manufacturer, like Intel, that means 30-60 new permits per factory each year. Each new permit requires several hundred pages of data specifying the operations and the amounts of actual and potential emissions. The permit action requires 30 days for public comment, 45 days for EPA to object, 90 days for revisions to be considered, and 60 days for citizen petition. In the information technology business, delays of this length would be devastating. Without modification of the requirements, Intel could choose to relocate to a less regulated country.

A further criticism by industry is its perception that regulations work against the environmental outcomes they were designed to accomplish. By dictating specific technologies for pollution prevention, the government has regulated against the development of new products and processes and established the status quo as the only acceptable standard.

Other industries believe that correctly focused regulation may actually stimulate innovation and competition, particularly among the most technologically dynamic firms. If regulations require achievements that can only be met through radical technology breakthroughs, then industry is spurred toward innovation. When coupled with government support and incentives, this innovation can earn a profit for industry and obtain a cleaner environment for society.

Industry is also concerned about the level of environmental protection required. In the areas of air and water pollution, industry contends that the

standards are unnecessarily high, that the 90 percent improvement that has been accomplished is sufficient, that the last 10 percent would not be substantiated if subjected to a cost-benefit analysis, and that in some cases the standards for industry emissions are higher than conditions that exist naturally.

GOVERNMENT GOALS AND ROLE

Environmental issues touch every segment of U.S. society. Individual citizens are concerned about the impact of pollution on health and the quality of life as well as the economic cost of environmental protection. Industry has a significant stake in environmental regulation and how it affects corporate image, shareholder attitudes and, ultimately, business profitability. The government must balance the interests of all in order to protect the rights of the individual, maintain the welfare of the whole nation, and establish conditions conducive to sustaining economic prosperity. This task is complicated by the necessity to promote economic strength, which requires the development and utilization of resources. Environmental decisions and resource use today will determine the fate of future generations. Simply stated, the government's role is to ensure sustainable development.

Background

From the late 1960s through the early 1970s, Americans became aware of and alarmed about their deteriorating environment: life-threatening, visible smog; hazardous waste dumps intermingled with residential communities; rivers devoid of life and polluted to the point where they burned; and depletion and extinction of bird, animal, and fish species as a direct result of human activity. There was widespread public demand for government action to repair the damage and to prevent its recurrence. Congress responded to this clamor by passing the first National Environmental Policy Act in 1969, followed by a flurry of environmental legislation that addressed all aspects of the environment.

The underlying assumption of the legislation was that industry could not be trusted to do the right thing without government intercession; that manufacturers, handlers, recyclers, and users could all be assigned blame

for pollution; and that industry required a watchdog to police, investigate, cite, and punish. Litigation rather than negotiation was the modus operandi. Regulations were prescriptive in nature, not only specifying the required results, but dictating the technology necessary to achieve those results.

The EPA.. The idea of reforming the federal government's approach to pollution by consolidating diverse and disparate programs and bureaus into one federal agency had widespread support and resulted in the formation of the EPA in 1970 (Cook, 1989, 81-87). The EPA is different from other federal regulatory agencies in that the scope of its mission holds it responsible for the entire spectrum of industry. Consequently, EPA personnel must develop a broad understanding of multiple industrial processes and environmental impacts that cover industry as a whole. Additionally, the EPA is required by law to disregard cost in determining the safety standard that allows an acceptable risk and is in the best interests of society. The agency has been routinely constrained by policy conflicts between Congress and the executive branch. Congress has set ever more stringent environmental goals and deadlines that have emphasized discrete problems and policies rather than holistic solutions. Presidents, on the other hand, have had to balance environmental initiatives with a need for economic stability and growth.

Policy. The first administrator of the EPA, William Ruckelshaus, implemented an aggressive strategy to enforce the new air- and water-quality laws that led to adversarial relations with industry through the 1970s and the 1980s. Government regulations through the 1990s have been largely command-and-control oriented, implemented without regard to cost, and enforced against large industrial corporations. In the 1980s, industry began complaining about EPA's micromanagement and the command-and-control approach to implementing environmental regulations.

In the early 1990s, three events initiated a campaign for change in the federal government's approach to its role as environmental protector. First, the 1990 Clean Air Act amendments vastly widened the requirements for emission controls, affecting small businesses such as dry-cleaners, garages, auto body shops, painting contractors, and bakeries

as well as faceless corporate boardrooms. Second, a continuing economic malaise caused both the government and individuals to question the economic cost of environmental regulations. Finally, in 1992 Congress passed the Federal Facilities Compliance Act (FFCA), which mandated that government agencies follow the same environmental regulations and standards that industry did. All executive agencies thus had to factor environmental standards into their budget requirements. On the regulatory side, the EPA was forced into a position of enforcing fines and penalties against other federal executive agencies. This tense relationship added to the government's recognition that environmental regulations and the methods of implementing them needed to be revised.

By the mid-1990s, federal, state, and local governments, large and small businesses, individuals, and even most environmental organizations recognized that a change in philosophy of environmental implementation was required.

The Perspective of Industry

There is a consensus among businesses on four broad areas in which government reform is necessary:

1. Results-oriented, flexible regulations: the government should establish goals but allow flexibility in the means to attain them.

2. Good science, sound risk assessment, and intelligent risk management: the government should acknowledge that there are priorities in managing environmental risks. Governments at all levels should assess environmental risks in order to minimize the more important ones and make effective use of scarce resources.

3. Positive cost-benefit ratios: The value of the benefits that come from the regulations should exceed the cost of the regulations. The total cost to society should be estimated and weighed.

4. Encouragement of market-based approaches: industry has long known that innovation snowballs and creates its own momentum.

A Cooperative Effort for the Future

Environmental issues affect industry primarily through the government's interpretation of what is necessary to protect the environment and how that protection is to be implemented. The current complaints from legislators, industry, and individuals that the government's approach is now outdated have a legitimate basis. While industrial motivation to protect the environment may not be completely altruistic, the growing awareness that profitability and environmental protection are connected may itself be sufficient to cause industry to "do the right thing."

Environmental protection is too critical an issue for society and future generations to leave to trust and good faith alone. The government will continue to have a role in ensuring that environmental standards provide adequate protection and that industry is in fact meeting those standards. Rather than a stripping away of environmental regulations, what is needed is a new regulatory framework to give industry more flexibility in preventing pollution--but only if industry can do what is required under the current system of strict safeguards.

Environmental quality should be the touchstone that brings the United States together as a nation rather than a group of contentious issues that causes further polarization. The goal should be to prevent pollution, not just clean it up. By using financial incentives instead of dictates to discourage pollution and by putting more emphasis on results and less on how they are obtained, the United States can ensure more effective pollution prevention at lower costs. Flexible regulations must be coupled with accountability and enforcement to ensure the safety of both the environment and the public health.

Environmental solutions for the future must be the result of cooperative efforts between government and industry. The government must guard the environment and public health, but industry can and should be a willing partner rather than an adversary. The way to form such a partnership is to reach the broadest possible consensus on what constitutes adequate environmental protection and let industry harness its efficiency and ability to innovate to produce the best possible solution. Even when consensus on standards cannot be achieved, flexibility on methods to achieve them will

significantly improve the cooperative environment. Basically, the process will work better if "government steers and industry rows."

The Systems Approach

The piecemeal approach to environmental protection means that changes in standards or methods in one area of the environment may actually degrade another. For example, rejecting nuclear power as detrimental to the environment may lead to increased use of coal-fired power plants, which will increase the level of emissions that can be as harmful as nuclear wastes. Government and industry must look at the environment from a holistic perspective. A systems approach will help prevent situations in which the government passes conflicting regulations or enforces methods that actually degrade the environment rather than improve or protect it. It will also increase industry's awareness tires to improve the environment with methods that meet one standard but not another.

A Unique Opportunity for Government

The 1992 FFCA has had a discernible effect on the Department of Defense (DoD). The DOD's size and power are significant, but it is not often thought of as a landowner and operator of a large industrial complex even though it employs approximately 3 million people worldwide and manages 25 million acres of domestic land holdings and 2 million more acres overseas. Most military installations contain complex, city like developments of industrial, commercial, and residential areas and the equivalent of national parks, recreation areas, forests, and deserts. The size of its land holdings alone makes the DoD one of the largest industrial complexes and environmental managers in the United States. Prior to the passage of the FFCA, the typical attitude of a military base commander might have been: "We're in the business of protecting the nation, not the environment. Why should money be spent on the environment rather than operations or training?" Portions of nearly every U.S. military installation had been contaminated with hazardous waste that varies from acids and fuels to low-level radioactive waste. Like the civilian sector, the military used methods to handle, store, and dispose of hazardous waste that were acceptable at the time but now are considered environmentally unsound.

The DoD has identified 10,439 suspected hazardous waste sites on active military installations, and more than 100 DoD facilities are on the EPA's Superfund List.

With the passage of the FFCA, the government waived sovereign immunity, subjecting itself to the same conditions to which it subjected commercial industry. Through its operating agencies, the government, like industry, must now contend with the same legislative and EPA bureaucracies, lawyers, courts, permits, and fines, and, perhaps most important, with balancing how it commits limited (and dwindling) resources when environmental requirements conflict with operational needs.

Under these conditions, the government has a unique opportunity to be a role model for industry in protecting the environment. Agencies such as the DoD are equal to industry when it comes to compliance with environmental regulations, and the conditions under which those agencies must operate now parallel those in the private sector. Those government agencies now have the opportunity to demonstrate the ethic and the industrial efficiencies necessary to comply with government environmental requirements. The fact that the agency that enforces environmental regulations and the agencies that must follow them are both in the executive branch of the federal government provides a controlled environment of sorts. If standards or regulatory requirements are inappropriate, *regulated* agencies can identify them as such, and the *regulating* agency can lead the effort to get them changed.

A Life-Cycle Approach

Environmental concerns first began to affect industry in the form of remediation of past contamination. As the environmental, health, and financial costs of remediation were determined, it became evident that prevention of the contamination before it occurred was fiscally and environmentally necessary. As industry faced continuing problems in disposing of hazardous waste materials, it pursued process improvements to prevent the production of waste. This quest to make processes more efficient must be applied not only to production portion but also to the use of the product and its ultimate disposal. As in the case of automobiles, the

use of the product will continue to be a significant pollution source even if the production process produces no hazardous waste. In the case of some products, such as nuclear fuels, the disposal of old materials presents the most significant threat to the environment. Both industry and government must shift their focus from individual segments to the entire life-cycle. Both must assess the environmental impact of the production, use, and disposal of a product and ensure that the public and the environment are fully protected at each stage.

CONCLUSIONS

Environmental concerns are a matter of strategic importance for this nation because they involve issues that affect global stability and the continued progress of humanity. The need for sustainable development represents a serious challenge for both industry and government. The United States can continue to improve its environmental health by implementing four actions:

1. Develop a systems approach to government regulations and other environmental actions.

2. Adopt a life-cycle environmental approach to industry processes and products.

3. Make government agencies role models for industry in environmental practices.

4. Establish a cooperative partnership between government and industry for environmental protection.

These recommendations are specifically oriented to the impact of environmental issues on U.S. industry. In spite of the improvements these actions can bring about, relative to the environmental problem overall they will not represent significant progress. The truly difficult challenges lie in implementing a global approach to environmental problems that arise from industrial activity. Furthermore, environmental issues involve far more than industry. Individuals need to make a concerted effort to be responsible stewards of the earth's riches. The environment is a common

treasure for which all people bear responsibility. Until these changes occur, environmental issues will continue to challenge human survival.

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