

2002 Industry Analysis Research Paper

Global Environment, Global Industry, and Global Security: Managing the Crossroads

Abstract. The events of September 11, 2001 prompted a fresh look at the impact of human activity on the global environment. Environmental issues are increasingly at the forefront of US national security strategy. Environment, industry, and security form a complex public policy “crossroads” that will require significant attention in the future. This paper examines worldwide environmental challenges and the US Environmental Industry. Policy recommendations are provided, with emphasis on maintaining biodiversity, sustaining the use of limited natural resources, and coping more effectively and aggressively with global climate change.

Capt. Mohd Amdan Kurish, Royal Malaysian Navy

Mr. John L. Gerlaugh, OSD

Lt Col Thomas J. Hains, USAF.

Mr. Kevin E. Holt, USMC

Col. Moustapha Mouhamadou Diawara, Senegal Air Force

Cdr Eric J. Newhouse, USN

Capt. Scott A. Spencer, USN

Lt Col Kurt A. Stonerock, USAF

Dr. Gregory D. Foster, faculty

Dr. Steven E. Meyer, faculty

LTC (P) Mark A. Steenberg, USA, faculty

Janice L. Wiley, Esq., faculty



The Industrial College of the Armed Forces
National Defense University
Fort McNair, Washington, D.C. 20319-5062

Report Documentation Page

*Form Approved
OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE 2002	2. REPORT TYPE N/A	3. DATES COVERED -	
4. TITLE AND SUBTITLE 2002 Industry Analysis Research Paper: Global Environment, Global Industry, and Global Security: Managing the Crossroads		5a. CONTRACT NUMBER	
		5b. GRANT NUMBER	
		5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)		5d. PROJECT NUMBER	
		5e. TASK NUMBER	
		5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) The Industrial College of the Armed Forces National Defense University Fort McNair Washington, DC 20319-5062		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)	
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited			
13. SUPPLEMENTARY NOTES The original document contains color images.			
14. ABSTRACT			
15. SUBJECT TERMS			
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified	UU
			18. NUMBER OF PAGES 22
			19a. NAME OF RESPONSIBLE PERSON

PLACES VISITED:

Domestic:

San Francisco, California:

Bechtel Corporation

Bay Area Council

Sierra Club

Lawrence Berkeley Labs

Nautilus Institute

International Council for Local Environmental Initiatives

San Diego, California:

International Boundary and Water Commission

Naval Air Station, North Island

Naval Facilities Engineering Command, Southwest Division

Resource Trends, Inc.

Scripps Institute of Oceanography

Environmental Health Coalition

City of San Diego Environmental Services Department

Alexandria, Virginia:

City of Alexandria Sanitation Authority

Chesapeake Bay Area, Maryland:

Smithsonian Environmental Research Center

Chesapeake Bay Foundation

University of Maryland

Chesapeake Bay Program Office

Blackwater National Wildlife Refuge

International:

Istanbul, Turkey:

City of Istanbul Environmental Protection Department

Provincial Environmental Section

Peace with Nature

Turkish Straits Vessel Traffic Management System

Budapest, Hungary:

GE Hungary

US Commercial Service

Hungary Ministry of Defense

Regional Environmental Center for Central and Eastern Europe

Hungary Ministry of Environment

Association of Environmental Enterprises

Berlin, Germany:

US Embassy

Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety

P.D. Chemical Park, Bitterfeld.

Brussels, Belgium:

US Mission to the European Union

European Union Ministry of the Environment

NATO Office of the Environment

The Laws of Nature are just, but terrible. There is no weak mercy in them. Cause and consequence are inseparable and inevitable. The elements have no forbearance. The fire burns, the water drowns, the air consumes, the earth buries. And perhaps it would be well for our race if the punishment of crimes against the Laws of Man were as inevitable as the punishment of crimes against the Laws of Nature-- were Man as unerring in his judgments as Nature.

-- Henry Wadsworth Longfellow

INTRODUCTION:

The concept of limits on the use of our planet's resources is not new, but full recognition of the significant impact of these limits on industrial activity has only occurred in the last generation. Before the US Clean Water and Clean Air Acts of the 1970s, the role of industry was to dig the earth's resources out of the ground, use these resources up, and discharge the byproducts to the environment—generally without regard for the consequences. The Clean Water and Clean Air Acts established a worldwide leadership role for the United States in changing this paradigm. Industry began to factor in “externalities” (costs to society as a whole) in designing processes. An “Environmental Industry” sprang up to minimize and mitigate the consequences of human and industrial pollution.

Today, the US environmental regulatory framework is mature and fills thousands of pages at federal, state, and local levels. A period of retrenchment is in progress at the federal level. Under the Bush administration, environmental policy must be weighed not just against hazards, but also against the economic impact of compliance. In Europe, environmental awareness has risen to the level that “Green” political parties are part of the ruling coalitions of some countries. Developing nations as diverse as Hungary, Turkey, and Malaysia, which aspire to achieve economic parity with developed countries, find that they must implement significant environmental policy changes in order to “join the club.” Undeveloped countries in Africa, South America, and Asia find that the consequences of environmental mismanagement are now causing widespread disease and poverty, which in turn may contribute to political instability. These problems greatly complicate the global war on terrorism and security more generally.

This paper examines the roles of global industry, the environment, and national security, with emphasis on current conditions, challenges, and opportunities. Participants in the study visited a wide variety of domestic and overseas government groups, businesses, and non-governmental organizations. Many of these groups made claims that were diametrically at odds with other groups, and on some occasions, strong emotions bubbled to the surface. These presentations served to emphasize the increasing importance of environmental issues worldwide.

“Moronic.”—German businessman's assessment of European environmental policies that encourage the construction of wind farms in Saxony.

“Window dressing and rubbish.”—European Union regulator’s opinion of current US environmental policies.

THE INDUSTRY DEFINED:

In defining the US Environmental Industry, one can do so either narrowly or broadly. Both views are useful.

The Narrow View: The Environmental Industry includes all revenue-generating activities associated with:

- compliance with environmental regulations;
- environmental assessment, analysis, and protection;
- pollution control and waste management;
- restoration of contaminated property;
- provision and delivery of water, recovered materials, and clean energy;
- technologies and activities that contribute to increased energy and resource efficiency, higher productivity, and sustainable economic growth.

The Broad View: The Environmental Industry consists of all human activity that consumes natural resources or damages the environment and attempts to mitigate the effects of this activity on the environment.

The narrow definition will be used here in analyzing microeconomic and industry trends, but the broad definition will be used in considering public policy issues. .

CURRENT CONDITION: Healthy fragmentation

The \$205 billion US Environmental Industry is spread across 14 industry segments. These segments are generally organized in three categories: services, equipment and resources, (see figures 1 and 2).¹ In this instance, the fragmentation of the industry is more a function of the diversity of the disciplines involved, than of the numbers of companies involved in each business area. This diversity is both a strength and a weakness. Strength is derived from economic theories regarding redundancy and competitive market forces. However, industry coalition building on Capitol Hill, for example via lobby groups, is less likely due to the diverse nature of the Environmental Industry.

This diversity makes information sharing difficult as well. For example, in the aerospace industry there are approximately four major associations that represent firms’ interests as a lobbying force on Capitol Hill. The extraordinary diversity of the Environmental Industry splits interests over a wide range of industrial practices and locations, making this same necessary representation difficult. At last count there were over 170 associations that held environmental companies as the major part of their membership. The very essence of environmental protection – minimizing any activity that disturbs the

natural balance—is at odds with the robust industrial processes that allow for manufacture of such items as waste disposal hardware and water purification filters.

The US Environmental Industry	
Environmental Industry Segments	
Services	
Analytical Services	
Wastewater Treatment Works	
Solid Waste management	
Hazardous Waste Management	
Remediation/Industrial Services	
Consulting and Engineering	
Equipment	
Water Equipment and Chemicals	
Instruments and Information Systems	
Air Pollution Control Equipment	
Waste Management Equipment	
Process and Prevention Techniques	
Resources	
Water Utilities	
Resource Recovery	
Environmental Energy Sources	

Figure 1. The U.S. Environmental Industry

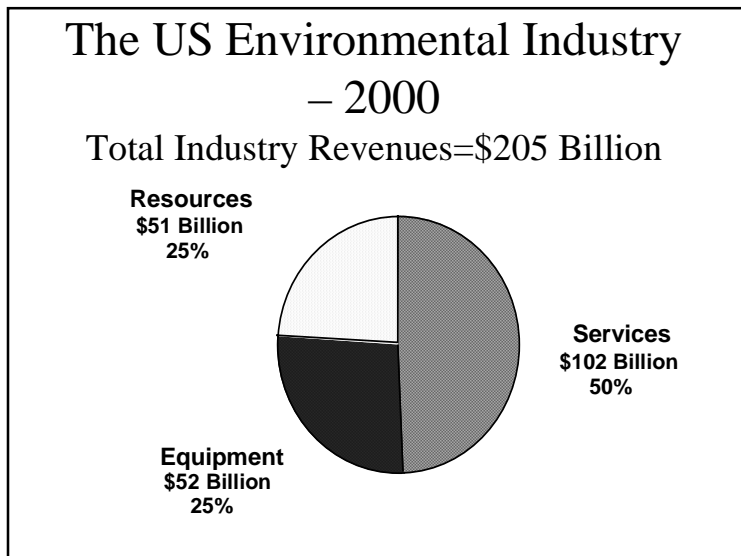


Figure 2. Environmental Industry Revenues

The Environmental Industry is subject to the regulatory mood of Washington. Born in a period of statutory and regulatory necessity during the Nixon administration, the Industry

waxes and wanes in importance with the dominant power base in Washington. Much has been written on this subject, but suffice it to say the power base shifted with the election of the Bush-Cheney team, and it remains to be seen whether the Environmental Industry will find the favor it arguably enjoyed during the Clinton-Gore administration. The industrial processes that felt the cautious and controlling hand of environmental sensitivity in times past are likely to find little such control now as a conservative administration, challenged by the war on terrorism and energy shortages, presses ahead to solve such issues. The end result may benefit some in the services side of the Industry, while niche hardware manufacturers may suffer. Federal funding sources, from research and development (R&D) grants to full-blown program solicitations are in decline, and projected to be even more so in the future.

The Industry has two major types of activities: services and hardware manufacturing. The winds of change mentioned above may benefit the services side as firms scramble to hire environmental lawyers and consultants to interpret the changes being made by the new political base.

Environmental protection is sustained, at least in part, through an elevated awareness of the damage caused by pollution and natural resource exploitation. Compliance-based federal and state regulatory pressures formed the original basis for this action. However, sustainable development has also become an important element of environmental preservation.

The 14 industry segments span are so broadly based that they tend to “self-insulate” against economic downturns. For example, despite the economic downturn of 2001, and the continued reduction in growth of the information technology industry, 2001 was a relatively strong year for the Environmental Industry as a whole.

Despite great diversity and the effect of a changing political landscape, trends in sales and shipments of goods and services within this sector are positive for the most part. For example, according to data published in May 2001 by the US Department of Commerce, Environmental Industry revenues in this country increased by 5 percent, to \$196.5 billion, over the previous year, with jobs tracking a gain of 44,815 during that period. Exports more than doubled in the period 1993-99, as the US Environmental Industry exported \$21.3 billion in goods and services -- 11 percent of the total environmental goods and services produced by the United States at the end of that period.

General projections call for continued growth in the global environmental market, although the U.S. share of that growth will diminish as the U.S. market remains flat (see Figure 3). As characterized (somewhat ambiguously) by the Department of Commerce:

“Environmental technologies, goods, and services continue to constitute an important and growing sector within the global economy. It is projected that the global market will grow to \$545 billion by 2004.”²

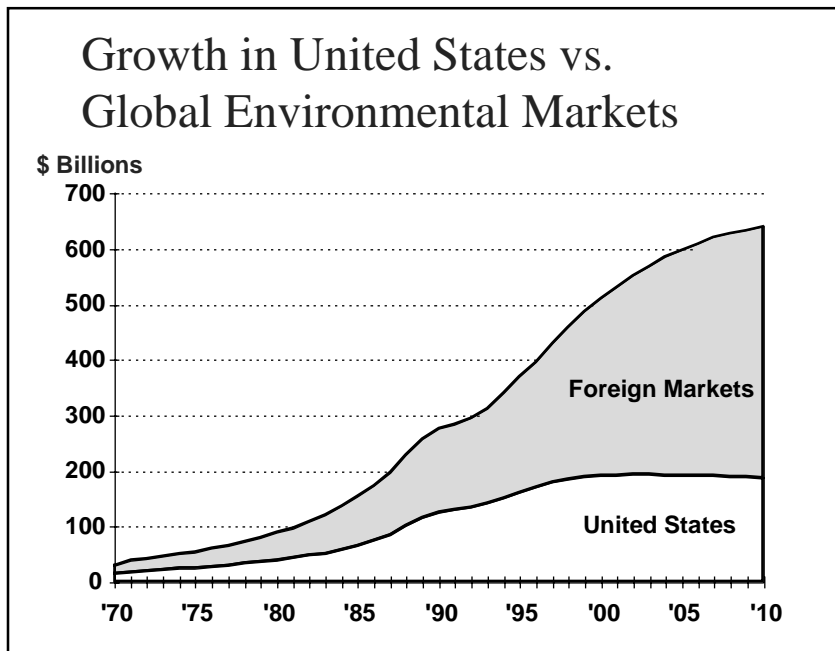


Figure 3. Growth in U.S. and Global Environmental Markets

CHALLENGES AND CONCEPTS:

In analyzing the larger role of the Environmental Industry in national security, a number of key challenges and concepts emerge.

Pollution types. Pollution takes numerous forms, each having important policy implications:

- **Air emissions** have two major sources—transportation (automobiles, trucks, and buses predominate) and power plants.
- **Wastewater** has two major types of source. Point sources flow from a single sewage pipe from a city or a factory. Non-point sources include runoff from such locations as farmlands and parking lots.
- **Waste (garbage)** may further be subdivided into hazardous and non-hazardous varieties, customarily disposed of by landfill, incineration, or recycling
- **Soil/groundwater** pollution results from dumping waste solids or liquids on the ground. Correction of this problem requires (usually) digging the contaminated soil up and transporting it to a landfill. Operations now underway at Naval Air Station North Island, California, employ a promising process for removing jet fuel waste from the soil by steam cleaning. **Radioactive waste** comes in the form of low-level waste from medical and industrial procedures, and high-level waste from spent nuclear fuel from power plants.

Remediation vs. Prevention. The correction of past environmental problems stands in marked contrast to efforts to stop pollution before it happens, by changing processes. In some cases in past years it was cheaper for a company to go ahead and pollute, then pay the fine, than it was to change the process. Attitudes are changing, and companies recognize more and more the cost effectiveness of pollution prevention.

Sustainability. This term refers to the ability of human activity to use a resource wisely and for many generations. For a process to be sustainable, it must be able to renew or return to the environment the resources it uses, or provide means for forgoing their use altogether.

- One current successful example of a sustainable process is the use of water by communities along the Potomac River in the United States. Each community in turn takes drinking water from the river and returns (tertiary) treated wastewater to the river, which is re-used downstream. We may contrast this with many communities in the less developed world, where drinking water is drawn from polluted wells or rivers and wastewater is discharged into ditches or untreated systems that in turn contaminate the drinking water for others who must use it.
- Some Non-governmental Organizations (NGOs) and European governments also consider sustainability to include social justice. This means that an industrial process that exploits or abuses workers or communities would not be considered sustainable.
- When an organization pursues sustainability, it is natural that appropriate **Sustainability Measures** also be considered developed, and applied for the purpose of evaluating progress. There are numerous indexes or systems currently available for measuring sustainability, most of which include lists of questions or quantifiable indicators that refer to desirable outcomes. As an example, the mayor of a city might use as one measure of sustainability the percentage of household waste that is recycled.

Environmental Management Systems (EMS). In efforts to demonstrate a coherent and responsible approach to environmental matters, most modern businesses use some type of EMS. The purpose of an EMS is to analyze and improve all parts of an industrial process in order to minimize or mitigate the impact on the environment. One widespread EMS is ISO 14000 (promulgated by the International Organization for Standardization). EMSs have become common, and increasingly are considered a necessary indicator of competitiveness and precondition for market entry in various parts of the world. , Almost every modern firm is also thereby an environmental firm.

The “Precautionary Principle.” This principle, which is starting to gain favor in Europe, states that if an environmental hazard could potentially exist, it should be minimized via regulation while awaiting scientific analysis of the problem. The term “potential” is sometimes liberally interpreted, and scientific analysis can take years. For this reason, the Precautionary Principle is strongly opposed by business groups who prefer to deal with regulations for known hazards only.

Integrated Product Policy (IPP). This policy is also beginning to be applied, especially in Europe. Also called the “Take-back Policy,” under this regime a manufacturer would be responsible for ultimate disposal as well as production of a product. One example of this that has been around for many years is the glass bottle deposits of many US states. This deposit encourages recycling of the bottles. A complete IPP for bottles would likely include a tax on non-biodegradable plastic bottles, which would encourage recycling or encourage manufacturers to come up with a more environmentally friendly plastic. But in a more comprehensive sense, such take-back policies and laws could be applied to such things as major appliances or automobiles.

Externalities. Externalities are (usually unrecognized) economic effects on society that typically are ignored or excluded from the scope of economic decisions. Environmental concerns usually fall into this category. For example, a manufacturer does not include the cost of disposal when deciding the price to charge for a tire. The environmental effect of the tire is an externality. Economic theory states that public policies to improve the environment must address the externality issue via taxes, regulation, or other incentives.

Climate Change. The earth is warming up as a result of burning fossil fuels (coal, petroleum, and natural gas), as well as the release of other “greenhouse gases” into the environment. There is now general scientific consensus that the earth will warm up from 1 to 7 degrees Centigrade during the next century.³ There is also considerable agreement that the industrialized world is largely responsible for this problem. Consensus begins to break down, however, in determining the significance, specific effects (e.g., precipitation patterns, sea rise, altered vegetation), and rate of this climate change. Finally, consensus dissolves into dissensus in analyzing what actions to take. The major problem is that the economies of the industrialized nations are largely fossil fueled. The current major international measure under consideration (and yet to be ratified by the United States) is the 1997 Kyoto Protocol, the proposed agreement between many industrialized nations to reduce greenhouse emissions.

Ozone depletion. This issue is frequently confused with climate change but it is completely separate. Some discharges to the atmosphere (primarily chloro-fluorocarbons from air conditioners and various industrial activities) cause “holes” in the upper atmosphere ozone layer over the earth’s poles. These holes increase the amount of ultraviolet radiation that reaches the earth’s surface, and the associated risk of skin cancers in humans and genetic mutations in plants and animals.⁴ Unlike the controversy over global warming, there is broad international consensus on the seriousness of this problem, its cause, and the required action. The 1987 Montreal Protocol, signed and ratified by most industrial nations, requires the complete phase out of ozone-depleting substances in the next few years. There is some evidence that this policy is starting to show results.

Encroachment. Prompted by the proximity of commercial and private properties to military reservations, this issue refers to the concern (primarily by the military) that increasingly stringent enforcement of environmental regulations is hampering military readiness. As one example of this concern, the US Army in Germany now has only one allowed area for live fire training, and this area is severely restricted. Such concerns, in the context of the post-September 11 war on terrorism, have led the Defense Department to seek blanket exemption from major environmental laws. Legislation that would grant such exemptions (and thereby have a palpable negative effect on contracted environmental business) is now pending before Congress.

OUTLOOK: Limited opportunity domestically, plenty of opportunity overseas

In analyzing the prospects for the US Environmental Industry, business opportunities may be divided into domestic and overseas markets. Overseas business may be further subdivided into the developed world, the developing world, and the undeveloped world.

Domestic opportunity is not totally stagnant, but little growth may be expected in the next few years. Federal environmental regulation is undergoing a period of strategic retrenchment. The Bush administration has enacted a “go slow” philosophy in enforcing some environmental regulations, and is requiring an economic analysis of new regulations as part of the public dialogue on environmental issues. Vigorous enforcement by courts, as well as state and local authorities, may be expected to continue, up to the point where significant economic impact occurs. As one example, the State of California eased enforcement of environmental regulations to allow “dirty” power plants to operate during the summer 2001 power crisis. As more and more companies institute Environmental Management Systems to reduce costs, there will be fewer opportunities for traditional “environmental” companies to clean up waste, because less waste will be generated.

One exception to flat domestic business prospects is the proposed Yucca Mountain nuclear waste repository. If this project is approved, it will generate many billions of dollars of environmental business during the next decade and beyond.

Industrialized world. The European Union (EU) leads the world in environmental awareness, with major Green party presence in several member countries. Recent elections in France and Holland, however, portend a possible rightward swing in voting that could reduce the future influence of environmental groups. Europeans demonstrate in polls that they have considerably less trust in business than U.S. citizens. The “Mad Cow Disease” scare of the 1990s in the United Kingdom is an example of an event that fostered distrust of food supplies and of business’s ability to police the environment. U.S. business opportunities overseas in the industrialized world will be available, but competition will be tough. Germany in particular is a world leader in environmental technology and exports. Japan’s economy is expected to be stagnant for at least the next five years, thereby depressing prospects for significant new environmental business in that country (even as Japan may be expected to become even more aggressive than it already is in exporting its own environmental business).

Developing world. Developing nations are finding that sound environmental policy is necessary in order to be a player in the global economy. Hungary, for example, aspires to join the EU. One condition of this will be that every town of more than 2000 inhabitants must have a wastewater treatment system.⁵ The developing world provides tremendous growth potential for US environmental firms, provided these firms are able to compete vigorously (and on a level playing field) with such powerful competitors as Germany, Japan, and France.

The situation in Malaysia and Southeast Asia is typical:

Based on the current symptoms plaguing the Southeast Asian region, environmental degradation is definitely alarming. Previous institutional and policy approaches appear to have had limited success. Though the good news is the trend appears to be changing

towards the correct economic-environmental pathway, countries in the region still have a long way to go to fulfill the environmental objectives of ASEAN Vision 2020. However, abundant opportunities are presently within reach to redirect the underlying driving force of change, create new and effective institutions and integrate environmental policies into mainstream economic planning and management.

But while environmental conditions remain problematic, the sociopolitical setting in these countries has become friendlier and much more committed to a bolder approach to environmental management. The participation of all stakeholders, including governments, international organizations, the private sector, and civil society, is increasingly considered vital in implementing the task of environmental management and sustainable development. Strong regional cooperation and commitment is the key to solving this problem. Without such cooperation, Southeast Asia could very well be heading towards environmental catastrophe. As an indicator of the seriousness of this problem, studies have shown that one in three Asians do not have access to safe drinking water, and one in two Asians has no access to sanitation services.⁶

Undeveloped world. Environmental disaster has great potential to occur in the undeveloped nations of Africa, Asia, and South America in the near future. Unfortunately the poverty of many of these countries will limit business opportunities for the US Environmental Industry. The most likely source of business will be through US foreign aid.

The situation in Africa is typical:

The African environmental industry, limited to environmental services and resource extraction (?), is very modest. For example, a United Nations Environment Program (UNEP) report of the inventory of PCB (polychlorinated biphenyl), pesticides, and POP (persistent organic pollutants) destruction facilities around the world identified a total of three facilities on the whole African continent—two in Cameroon and one in Rwanda. Even in South Africa, apart from a number of privately owned and dedicated small incinerators, no significant incineration of industrial and hazardous waste is taking place. Hospitals and clinics run their own small incinerators. Few wastewater treatment plants, water treatment plants, or recycle waste disposal industries exist throughout the continent.⁷

GOVERNMENT: GOALS AND ROLES; RECOMMENDATIONS FOR THE FUTURE

Government intervention will likely provide the only resolution when industry, national security, and the environment meet. Assistance from all stakeholders—federal agencies, state and local governments, NGOs, foreign countries, and business—will be required. The following recommendations promise to enhance global health and security, while also benefiting the US Environmental Industry.

Recommendation Number One: Ecosystem Foreign Policy.

We recommend that a modest portion of U.S. foreign policy be targeted at groups of nations that share a common ecosystem. The simplest example of this would be a river basin that drains several countries—like the Danube, which drains Central and Eastern Europe into the Black Sea. (Other examples might include the Amazon, the Congo, the Mekong, or the Nile.) The principle in this case might be stated as, “Clean rivers make good neighbors.” As an initiative to improve peaceful relations in Central and Eastern Europe, the United States should take the lead in setting up a Danube River Commission or similar entity to study and manage the cleanup of this river. Targeted foreign aid could be provided to nations to invest in wastewater treatment facilities. A condition of the US portion of the foreign aid could be that the US Environmental Industry provides the infrastructure. Such foreign aid would provide tangible, long-lasting benefits and immediately provide for meaningful contacts between feuding countries in unstable portions of the world. Maintenance of biodiversity within ecosystems could provide future benefits such as medicines from plant species. Since we already anticipate ramping up foreign aid as part of the response to September 11, the cost of this strategy would be small.

Recommendation Number Two: Clean water for the undeveloped world.

The lack of clean water in the undeveloped world causes tremendous disease, death (particularly among children) and suffering. As part of our increased foreign aid, water treatment equipment for undeveloped countries should take a high priority. The US Environmental Industry has a great deal of capability in this area. Desalinizing potable water from seawater is even an option for countries in the Middle East that lack groundwater or surface water resources due to dry climate.

Recommendation Number Three: Develop a plan to cope with global warming.

Global warming is likely to continue, particularly since technology does not yet exist which would allow industrialized nations to function without fossil fuels. What is required is a plan to cope with this warming. This plan should include:

- Computer modeling to more precisely determine the effects of climate change. What areas of the world will become deserts and which (if any) would become more fertile?
- A strategic analysis of populations affected seriously by climate change. For instance, if warming continues at its current pace, tension and competition over scarce resources such as water can reasonably be expected to intensify. The United Nations projects that, by 2025, over 40 percent of the world's population will live in water scarce regions.⁸ However, populations, cities and societies will not be mobile enough to migrate to these more attractive regions to escape water droughts and crop failures, particularly if the pace of warming continues at current rates. From a security perspective, the turmoil of such migrations, even if possible, will be traumatic.
- An analysis of the effect of climate change on military operations. As one example, it is likely that the Arctic Ocean will be ice-free within one generation, which would allow world navies to operate surface vessels in this area.

Recommendation Number Four: Expedite the Yucca Mountain nuclear waste storage facility.

The terrorist threat to the individual spent fuel storage facilities at the many nuclear plants around the country is simply too great. Nuclear plants themselves could withstand a major attack, but an attack on the spent fuel storage could injure many people. It is time to consolidate our spent fuel in one secure location. The cost of this will be many billions of dollars, but will be significantly less than the cost of a terrorist attack on spent fuel at a nuclear plant.

Recommendation Number Five: Increase federal funding to research sustainability in US energy use.

This funding should use the academic community as the major recipient. It could be argued that research in this area is just as important as research in missile defense. Areas of concern are:

- Conservation to reduce fossil fuel use.
- Alternate, non-fossil-fuel sources of energy.

Recommendation Number Six: Improve Environmental Management within the Department of Defense.

The Defense Department has taken a leadership role in environmental management, but significant improvements are still needed.

- Continue the plan to implement a formal Environmental Management System that was recently announced.
- Obtain legislative relief for the few, specific areas for which environmental encroachment is degrading readiness and no practical alternative exists.
- Conduct a vigorous public information campaign to advertise DOD environmental accomplishments.

ESSAYS ON MAJOR ISSUES:

ISO 14000 and Environmental Management Systems

Overview. ISO 14000 has firmly taken root in today's global marketplace as a certification process for sustainable, environmentally friendly business. ISO 14000 is a direct descendant of ISO 9000's Quality Management standard, which in turn is a descendant of W. Edwards Deming's principles of Total Quality Management. As more and more companies turn to ISO 14000 and similar environmental management systems, minimizing pollution becomes part of each step of industrial production. The traditional practice of cleaning up pollution at the exhaust of the smokestack is being turned on its head. Most major corporations are, in this fashion, thus becoming environmental firms.

What is ISO? The term "ISO" is actually not meant to be an acronym, but is a stand-alone term referring to the International Organization for Standardization.⁹ ISO is a non-governmental organization that sets common practices for many aspects of international business in a cooperative manner. One example of an ISO standard is the construction, shape, thickness, and other specifications for a credit card.

Most ISO standards are specific and technical. ISO 9000 and 14000 series differ significantly in that they are “management standards” rather than “technical standards.” With few specifics, ISO 9000 and ISO 14000 provide a broad overview of how a firm committed to quality and environmental friendliness, should conduct business.

ISO 14000 specifics. ISO 14000 takes TQM (Total Quality Management) principles and applies them to a process of continuous improvement in environmental quality in a firm’s operations, as a commitment from all members of the organization. As described by the ISO website:

“In the case of ISO 14000, [an organization’s processes are] going to affect whether or not everything has been done to ensure a product will have the least harmful impact on the environment, either during production or disposal, either by pollution or by depleting natural resources.”¹⁰

Some of the key elements of ISO 14000 management include:¹¹

- Strong emphasis on training
- Control of processes
- Strict procedures for interface with suppliers.
- Records and measures of performance, with audits to verify processes.
- Compliance with regulations, standards, and other requirements.

The last element is significant. While many firms work on improving the environment out of a sense of public spirit, government regulation provides important additional motivation.

Survey of two typical firms. To get a feel for the degree of implementation of ISO 14000 in US industry, public information for two typical firms was surveyed. These two companies are representative of U.S. industry as a whole, which runs the gamut from companies that fully embrace ISO 14000 to those that don’t. Each of the firms, however, had some degree of Environmental Management System in place. Neither of the firms was an “environmental” firm.

Ford Motor Company. Ford Motor Company had the strongest ISO 14000 program of any firm surveyed.¹² This perhaps was a result of the personal commitment of the CEO (William Clay Ford, Jr.) Every existing Ford plant has been ISO 14000 certified since 1998. Additionally, Ford was the first auto manufacturer to achieve ISO 14000 certification in many countries: the United Kingdom, Germany, Taiwan, Australia, Canada, and the United States. Reflecting the strong emphasis on measures of success, Ford was able to advertise many specific improvements as a result of its ISO 14000 program. To quote one official press release:

“The Lima Engine Plant was one of the first Ford North American plants to obtain ISO 14001 certification. Within a year of implementation, the Lima Plant:

- reduced water consumption by nearly 200,000 gallons per day
- eliminated production of boiler ash

- increased the use of returnable packaging from 60 percent to 99 percent on its newest engine product.”

Of note, the cost of ISO 14000 certification for the Lima plant was only \$220,000 and the training for all workers and managers took just 10 months.

The ISO 9000/14000 systems entailed a strong partnership between customers and suppliers. Ford mandated that every one of 5000 suppliers have at least one facility ISO 14000 certified by the end of 2001, and that every supplier be fully certified by July 1, 2003.¹³

General Electric (GE) Corporation. General Electric had only a few facilities certified to ISO 14000 and had many serious past environmental “sins” to atone for.¹⁴ In particular, GE was involved in protracted litigation and cleanup efforts involving polychlorinated biphenyls (PCBs) that were used in the construction of electrical equipment in the past. (The most famous area with this problem in recent news was the Hudson River.) GE utilized and advertised alternate Environmental Management Systems.

GE confronted the PCB and cleanup issues squarely. As noted on the company website:

“Currently, GE is involved in 87 active federal Superfund sites—the result of GE's longevity and diverse manufacturing history. At the majority of these sites, GE is responsible for less than five percent of the material deposited.”

GE also advertised measures to promote sustainable manufacturing. One such effort involved converting a boiler at a facility in Louisville, Kentucky to utilize recycled methane gas from a nearby landfill.

Additionally, GE improved products to achieve sustainability and environmental friendliness. One intriguing product was a natural gas fueled power generation plant that achieved 60% thermal efficiency by combining gas turbine and steam turbine machinery (most conventional power plants achieve no more than 40% efficiency). The steam was used to cool the gas turbine blades before use by the steam turbine. Reported savings for a 400-megawatt plant were on the order of \$1 million per year.

Discussion. While the degree of enthusiasm for ISO 14000 varies among US companies, it is obvious that environmental issues are increasingly important, and some environmental management system must be put in place in order to succeed in the global marketplace.

One objection to ISO 14000 is the voluntary nature of the standard. Certification is tailored to the requirements of individual countries, and the system is expected to be self-policed. This would seem to produce considerable variability and to have a marked effect on the competitiveness of U.S. and foreign firms in countries where ISO 14000 certification is required for market entry and participation. Although the ISO 14000 standard is not perfect, it at least emphasizes a culture of striving for continuous improvement. This is better than nothing, especially in countries with weak legal systems.

Finally, the distinction between so-called “environmental firms” and others has now almost totally blurred. For example, General Electric is not an environmental firm, but its new fuel-efficient power plant exemplifies the types of process improvements that improve business and the quality of the environment at the same time.

Recommendations. Within defense-related industries, we can expect that more and more firms will turn to ISO 14000 or similar Environmental Management Systems in the future. One powerful motivation for a firm to move towards ISO 14000 is cost. It should be expected that more environmentally friendly practices actually save money in the long run, especially when compared with the costs of litigation or mandated environmental remediation. ISO 14000 work practices should have little effect on the ability of an industry or firm to mobilize in the event of national emergency. Essentially, ISO 14000 or Environmental Management Systems become part of the corporate culture.

The Defense Department recently announced a plan to initiate its own Environmental Management System.¹⁵ This program should be strongly supported and considered a part of overall military transformation.

By Scott Spencer

Environmental conferences, conventions, & protocols

Overview. International agreements are challenging but necessary for effective improvement of the environment.

Global warming—stalled agreements. With the growth of federal, state and international environmental organizations in the early 1970s, commendable strides have been made toward remediation, restoration and protection of natural resources and ecosystems. Nonetheless, those achievements pale in comparison to the magnitude of the earth’s current environmental damage and frailty. As a public good, the environment is prone to abuses by the imperfect forces of a market economy. Government intervention is frequently required to provide the impetus for good stewardship by heightening awareness, shaping national will, establishing policy, offering incentives, enforcing regulations and assessing penalties.

Since the Stockholm Declaration on the Human Environment in 1972, the United Nations has sponsored over 50 conferences, conventions and protocols to responsibly address global environmental issues including marine pollution, biological diversity, trans-boundary air pollution, desertification, and potable water as essential to sustainable growth. The continuing accumulation of credible scientific data and activism of non-governmental organizations (NGOs) continues to spur and intensify political dialogue throughout the world. The next major conference, the World Summit on Sustainable Development, is slated for Johannesburg in August 2002. Each UN session has advocated greater cooperation in the areas of research, remediation and conservation and discussed challenges that industry could convert to opportunities through creativity and innovation. The outcomes of those sessions continue to broaden opportunities for an environmental industry whose definition, scope and composition are evolving and expanding.

Environmental services, products and processes are being embedded into core business lines of many major corporations.

The U.N. Conference on Environment and Development, held in Rio de Janeiro, Brazil in 1992, drew 110 heads of state, 10,000 official delegates from 150 nations and thousands of NGOs. During this conference, the UN Framework Convention on Climate Change was carefully negotiated. This convention set as its objective the stabilization of atmospheric concentrations of greenhouse gases (GHGs) and embraced the principle of “common but differentiated responsibilities.” The developed countries agreed to a non-binding aim of reducing their emissions to 1990 levels by the year 2000 and assisting developing countries in their efforts.¹⁶ The outcome of the Rio conference was Agenda 21, a non-binding global action plan to address the interrelated economic, environmental and social factors essential to create sustainable societies and development.

Unfortunately, many of the measures agreed upon at Rio were voluntary and later deemed ineffective. More aggressive and binding solutions, especially with regard to GHG emissions, were essential. As a result of the 1997 Kyoto Protocol, thirty-eight industrialized nations agreed to accept legally binding carbon dioxide emissions reduction targets. The base year selected was 1990 and the target levels are to be achieved by 2008-2012. Voluntary goals were also set for developing countries.

The Pew Center on Global Climate Change, a US think tank, formed the Business Environmental Leadership Council (BELC) in 1998 as an independent, non-profit, non-partisan organization dedicated to providing innovative solutions to address global climate change. The 37 major international corporations that joined BELC are committed to taking constructive action to define feasible measures to reduce GHGs and mitigate related concerns. The results have been dramatic. To illustrate this, DuPont reduced GHG emissions for global operations by 45% and improved energy efficiency by 15% below 1990 levels.¹⁷

Recommendations. The Bush administration recently decided not to sign the Kyoto Protocol to combat global warming, primarily due to two concerns: the failure of major developing nations such as China and India to participate, and the effect on the US economy. The negative reaction (especially in Europe) to this action will make future US participation in protocols and international environmental agreements more challenging. Despite these challenges, the United States should continue to participate vigorously in international dialogue on the environment, and take a leadership role at the upcoming Johannesburg Summit.

By Gerald Rodkey

The Yucca Mountain Nuclear Waste Repository—Time to Get Moving

Overview. The US has a sound technical plan to store nuclear waste at Yucca Mountain, Nevada. It is time to implement this plan. Further delay places our population at serious risk due to potential terrorist attacks on individual waste storage facilities at nuclear plants around the country.

Background. Nuclear waste falls into two categories. High-level waste consists of spent fuel from nuclear power plants. Low-level waste comes from various commercial sources such as hospitals or maintenance of nuclear facilities.

High-level waste is currently kept in water-filled pools or dry-storage concrete containers near power plants in over 150 sites throughout the US.¹⁸ The long radioactive half-life (many thousands of years) for high-level waste dictates the need for a sound environmental plan for storage.

Low-level waste is deemed less hazardous due to the amount of radioactive material, its quicker rate of decay, and its lower emission of radioactivity. Most of this waste is currently placed in metal boxes or drums and buried in trenches. Until 1980, much of it was stored in commercial waste sites.¹⁹ In 1980, following the Three Mile Island accident, Congress passed the Low-Level Radiation Waste Act directing every state to develop containment areas within its own borders. While this has been successful, it does not ensure a long-term solution to waste management, it does not clean-up previously contaminated sites, and the guidelines on containment do not remove potential future environmental exposure. According to the Sierra Club, there are now 45,000 radioactively contaminated or potentially contaminated low-level sites in the US.²⁰

Security issues. We currently have 100,000,000 gallons and 40,000 metric tons of this type of high-level nuclear waste scattered throughout the US with more than 161 million Americans living within 75 miles of it.²¹ This poses a threat because a terrorist attack against a high level waste facility could have significant impact on the environment. Additionally, there is risk that terrorists could obtain high-level waste and construct a so-called “dirty bomb.” A dirty bomb is a bomb containing radioactive material that, once conventionally exploded, disperses radioactive material over a wide area. A dirty bomb can also be an explosion at a nuclear waste facility that exposes the environment to a dangerous level of radioactivity. In fact, the International Atomic Energy Agency pleaded for increased security in October 2001, after an alert to the potential targeting of nuclear waste sites to “incite panic, contaminate property, and cause injury and death among civilian populations.”²² Consolidation of US waste at a single site would greatly enhance security.

Is Yucca Mountain the right choice?

Pro. The short answer is “yes,” as concluded multiple times by the National Academy of Sciences. As early as 1957, an Academy report suggested the burying of radioactive waste in geological formations as the best option for nuclear waste disposal.²³ After much analysis and discussion, Congress passed the Nuclear Waste Policy Act in 1982 as a means to identify 25 potential sites around the country. The list of sites was winnowed down in the early 1980s for technical and political reasons, and in 1985 it was narrowed to only three—Yucca Mountain, Nevada; Hanford, Washington; and Deaf Smith County, Texas. In 1987, based on input from Energy Secretary John Herrington and President Reagan, Congress selected Yucca Mountain as the single site for the development of a national nuclear waste repository.²⁴ Yucca Mountain was chosen because of its remote location (over 100 miles from Las Vegas), dry climate, deep water table (over 800 feet below the facility), and ability to contain a large quantity of high-level nuclear waste over

the next 50 years. Work to modify the site started as early as 1978. Now \$4 billion and 24 years later, Yucca Mountain is ready for its first delivery of nuclear waste.

Con. The State of Nevada and several environmental groups are arguing against Yucca Mountain.

Shipment hazards. Nuclear waste will be transported to Yucca Mountain from across the United States with 90% traveling by truck or rail from east of the Mississippi.

Shipment presents a risk from both accidents and terrorist activity to numerous large cities and hundreds of smaller towns across more than 44 states. The number of shipments would also be larger than any previously done and these would continue throughout the year. Higher than normal radioactive exposure is also possible to shipping employees and to property owners along the transportation routes.

Drinking water. Although water tables are over 800 feet below the Yucca Mountain facility, and there are numerous natural and man-made barriers, this water table is a source of drinking water for Las Vegas and parts of California.

Economic impact. Although Yucca Mountain is over 100 miles from Las Vegas, some feel this is still too close, and the operation could negatively impact tourism due to public perceptions.²⁵

Recommendations. While we debate the pros and cons of this initiative, high-level nuclear waste continues to accumulate in pools around the country. The events of September 11, 2001 showed our vulnerability to attacks within our borders. We recommend:

- Start a vigorous information campaign to educate the public on the hazards of inaction, and the safety precautions that will be taken to protect the public during shipment and storage.
- Ensure that the citizens of Nevada are adequately compensated for their selection as the optimum location for storage of high-level radioactive waste.
- Take action to start shipments to Yucca Mountain at the earliest opportunity.

By Thomas Hains

CONCLUSION:

“We should live off the interest, vice the principal, of our natural resources.”-- Dan Noble, Resource Trends, Inc.

Environmental awareness has firmly rooted itself in world culture, but our actions to become good citizens of the planet have lagged behind our words. Abysmal environmental conditions in the undeveloped world now threaten U.S. national security. The US Environmental Industry is robust and capable of mobilizing its capabilities and efforts to improve the situation. What we presently lack is a fully formed national strategy. This strategy should include:

- Teamwork with other industrialized nations to cope with complex issues such as climate change, ozone depletion, and the problems of the undeveloped world.
- Encouragement of environmental initiatives and infrastructure in developing nations.
- Environmental foreign aid in the form of simple initiatives such as clean drinking water for undeveloped nations.

ENDNOTES:

¹ An excellent overview of the environmental industry was provided by the Environmental Business Journal, published by Environmental Business International, San Diego, Volume XIII, Number 11/12, 2001, particularly the article entitled *A Crossroads in the Lifecycle of the Environmental Industry*, by Thomas W. Kabis.

² Graphs and statistics were provided by: *Environmental Industry of the United States*; US Department of Commerce, (Washington: International Trade Administration, Office of Environmental Technologies, May 2001)

³ Information on global warming provided by Scripps Institute of Oceanography, La Jolla, California, April 9, 2002.

⁴ Information on ozone depletion provided by the EU Ministry of the Environment, Brussels, Belgium, May 16, 2002.

⁵ Information on Hungary's progress towards joining the EU provided by Hungarian Ministry of the Environment, May 10, 2002.

⁶ *Asian Environmental Outlook 2001*; Asian Development Bank, (Manila: ADB, 2 March 2002), <http://www.adb.org/Documents/Books/AEO/2001/aeo1022.asp>.

⁷ *Global Environment Outlook 2000*; United Nations Environment Programme, (Nairobi, Kenya: 1999), <http://www.unep.org/geo2000>.

⁸ *Tomorrow's Markets: Global Trends and Their Implications for Business*; World Resources Institute, United Nations Environment Programme, and the World Business Council for Sustainable Development, 2002

⁹ *ISO 14000, Meet the Whole family*; International Organization for Standardization, Geneva, Switzerland; <http://www.iso.ch>

¹⁰ ISO website; <http://www.iso.ch/iso/en/iso9000-14000/tour/plain.html>

¹¹ *Basics on integrating ISO 14000 and ISO 9000*; Pollution Engineering Journal; Troy; Sep 2001; by Robert C Wilson

¹² Information on Ford Motor Company from company website: <http://www.ford.com>.

¹³ *Ford spreads the word about its EMS success*; Pollution Engineering Journal; Troy; Jul 2001; by Robert C Wilson

¹⁴ Information on General Electric Company from company website: <http://www.ge.com>

¹⁵ *DOD issues New Environmental Policy*; United States Department of Defense News Release; http://www.defenselink.mil/news/Apr2002/b04232002_bt201-02.html

¹⁶ *Global Climate Change At a Glance*; Pew Center on Global Climate Change, (Arlington, VA: Pew Center, June 2001); <http://www.pewclimate.org>

¹⁷ Pew Business Environmental Leadership Council; <http://www.pewclimate.org/belc>.

¹⁸ *NRC – Regulator of Nuclear Power*; Nuclear Regulatory Commission; <http://www.nrc.gov/reading-rm/doc-collections/nuregs/brochures/br0164/r4/>

¹⁹ *Low Level Radioactive Waste*; Sierra Club Conservation Policies; <http://www.sierraclub.org/policy/conservation/lowradio.asp>

²⁰ Ibid.

²¹ *Recommendation by the Secretary of Energy Regarding the Suitability of the Yucca Mountain Site*; Secretary of Energy Spencer Abraham, Feb 2002, <http://www.nei.org/documents/YuccaResourceBinder/>

²² *The 'Dirty Bomb' Scenario*, Time, Nov 2001; by Tony Karon

²³ *Rethinking High-Level Radioactive Waste Disposal: A Position Statement of the Board on Radioactive Waste Management*; National Academy of Sciences; (Washington: National Academy Press, 1990)

²⁴ *Recommendation by the Secretary of Energy of Candidate Sites for Site Consideration for the First Radioactive Waste Repository*; Secretary of Energy John Herrington; May 1986; <http://www.ymp.gov/new/sar.pdf>

²⁵ *A Mountain of Trouble: A Nation at Risk: Report on Impacts of the Proposed Yucca Mountain High-Level Nuclear Waste Program*; Nevada Agency for Nuclear Projects, Feb 2002, <http://www.state.nv.us/nucwaste/>