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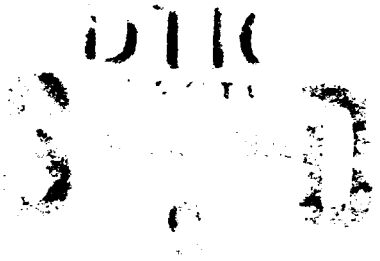
Environmental Trends—Policy Implications for the U.S. Army



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This paper provides a compilation of the environmental trends expected to most significantly influence U.S. Army mission and environmental program management in this decade, and beyond. This document reflects information gathered in mid-1991. It is a statement of observed trends with brief discussions to show relevance to the Army, sometimes stated explicitly and sometimes conveyed implicitly. It does not forecast or recommend future action. The purpose is to bring widely distributed, fragmentary information together in one ready reference. Many of the 41 trends discussed can be consolidated in various combinations to obtain vastly richer insights than possible by looking at them individually. They are deliberately presented separately in order to not foreclose discussion on other possible insights and uses of the information.

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Abstract

This paper provides a compilation of the environmental trends expected to most significantly influence U. S. Army mission and environmental program management in this decade, and beyond. This document reflects information gathered in mid-1991. It is a statement of observed trends with brief discussions to show relevance to the Army, sometimes stated explicitly and sometimes conveyed implicitly. It does not forecast or recommend future action. The purpose is to bring widely distributed, fragmentary information together in one ready reference. Many of the 41 trends discussed can be consolidated in various combinations to obtain vastly richer insights than possible by looking at them individually. They are deliberately presented separately in order to not foreclose discussion on other possible insights and uses of the information.

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The Army Environmental Policy Institute's mission is to assist the Army Secretariat in developing proactive policies and strategies to address environmental issues that may have significant future impacts on the Army. The views presented in this document do not necessarily reflect the policies or views of the respective institutions of the contributors, reviewers and staff, nor should they be construed as an official Department of the Army position, unless so designated by other authorized documents.

Numerous individuals and organizations contributed improvements to this document at various stages of drafting and redrafting. All suggestions received careful consideration. Many excellent observations would have resulted in anachronisms being created in this paper, but they will be applied to future trend analysis activities.

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1. Introduction

To make a reasonable attempt to forecast future conditions and prepare rational, response options requires studying the directions and intensities of events and processes and their interactions. The United States Army, no less than any other major organization, seeks to find its way rationally into the future Therefore, it commissioned a review of current environmental trends as a tool for locating the paths to follow. In preparing this paper, the researchers found no evidence that any federal agency is regularly collecting, analyzing, or publishing comprehensive environmental trend information in a programmed manner to ensure that reliable, current information is available. Several efforts exist, but they are each significantly narrow in some regard. This discovery was an unexpected validation of the decision to do a broad review.

This compilation of 41 environmental trends covers a wide spectrum of natural and societal factors. Far more than being a narrow coverage of technical aspects of environmental conditions, it includes trends relating environmental management issues to such factors as *societal values, political issues, legislative philosophy, regulatory* practice, compliance and enforcement, economic impacts, international relationships, environmental advocacy, privatization, conflicting imperatives (e.g., energy vs. environment), national security, technological change, and stewardship.

The literature is in full agreement on the basic concept of what a "trend" is. In paraphrase, the following Army National Guard Bureau definition captures the salient points:

> A trend is a verbal or numerical representation of a series of characteristics that can be estimated over time, providing an indication of the general direction of change. A trend may be a subjective assessment of a situation or an objective/numerical measure. A trend maybe increasing, decreasing, or static (National Guard Bureau, 1991).

Hill observes that informal trend identification and analysis are pervasive in daily life (Hill, 1978). The challenge for policy-making and program design for complex issues is to develop a disciplined process to provide the essential information from which to infer reasonably probable alternative futures to be managed. Hill goes on to mention the idea that delineating a given trend itself may not be the most important element in trend analysis. It may be that the secondary "what ifs" triggered by the trends lead to the key insights. For instance, what are the consequences if the trend continues unabated for the time period of interest; or what if it accelerates or levels off; or which forces aiding and impeding the trend will continue at what intensity; or what variables can be manipulated to affect the trend? Stokey and Zeckhauser provide a five-part framework for working through a policy analysis problem (Stokey and Zeckhauser, 1978). Interestingly, the four parts leading up to the final synthesis to produce a package of choices for action all presume a careful effort to evaluate trends of relevant factors. In short, aside from the wide range of labels and techniques in current use in the field of forecasting, trend identification and definition play major roles, whether basic data are highly subjective (as in gauging societal values), quantitative (as in tracking waste generation rates), or highly subject to single event occurrences (as in predicting technological breakthroughs).

This report provides a compilation of the major, discernible natural and societal trends related to environmental management issues at this time in the United States. This material is provided as a tool to readers who may need additional resources to round out the information they possess, as they attempt to estimate what the future may hold in the way of environmental constraints, obligations, and opportunities for their activity, program, or mission. Analytical remarks are used only to make the trend points clear, not to give exhaustive and exhausting discussions of each. Thus, one has a chance to get a general view related to one's interests without getting lost in excessive detail.

The researchers obtained this information from a variety of publications and direct communication with subject-matter experts. This document provides insights into: a) trends in purposeful action

currently affecting environmental management and b) trends of forces shaping society's thinking. The former provide bases for extrapolating continued action. The latter provide bases for projecting direction and intensity of future requirements and programs. The 41 trends described on the following pages draw a picture of dynamic change portending a period in which policies and methods that became "tradition" in the past 20 years will be sorely tested. Many of those policies and methods will be overtaken by new events and knowledge and will be replaced by other policies and methods. The U. S. Army, like private sector organizations and others in the public sector, must adjust.

While study has already shown that many of these 41 trends can beneficially be arranged and re-arranged into numerous broad groupings, there is much to be gained by keeping them separate for the information they each provide. Three working groups at the Army's 19-20 August 1991 Environmental Trends and Policy Workshop in Champaign, Illinois, independently discovered that grouping sets of these 41 trends could be desirable because of relationships obvious to each group (Army Environmental Policy Institute, 1991).

The working groups did have considerable internal difficulty deciding which trends to include in each set. And, the three groups' sets varied radically. In joint session, they decided that grouping and cross-linking the trends are essential to obtaining maximum value from the information; but, aspects of a specific issue under study must guide the grouping, not convenience or superficial logic. For example, trend number seven observing that state and local government involvement in environmental programs increased in the 1980s and into the 1990s clearly can be put with almost any of the other trends. The benefits of joining this trend with another depend upon whether the main issue of interest will be affected by significant state or local intrusion into that topical area. It is not possible, *a priori*, to pick only one main issue area, to the exclusion of other major issue areas, for which such intrusion would be important.

Another example could be the need to place the several water quality related trend statements into a number of mix-and-match subsets when focusing on a variety of issues like: a) point source

discharge compliance, b) non-point source runoff control, c) wetlands preservation, d) drinking water control, e) underground storage tank management, and f) energy production (allocation for consumption and cooling). There is not one meaningful set of water related trends, but many. Just as trend number one points to increasing cross-media environmental concerns and action, so must one view most, if not all, of the media-specific trend statements as having some relevance to trend statements for all other media.

Stover and Gordon lay heavy stress on the need to break away from linear thinking, to do what they refer to as cross-impact analysis (Stover and Gordon, 1978). That is, look intently at inter-trend influences as a way to add robustness to any analysis performed with the information. Workshop experience by subject matter experts and the Stover and Gordon article support each other in arguing against *a priori* clustering of the trend data, in order to reduce the risk of accidentally closing mental doors. Therefore, presenting individual trend statements with accompanying discussions, as found here, permits the reader to make many combinations of potential interest for evaluation and study.

1.1 Purpose

This environmental trend compilation is intended to provide policy-makers, program managers, and researchers with a view of the most prominent forces (and their directions) at work in mid-1991, setting the stage for coming years. It is an informational tool to be used as needed by each reader. It is not an advisory or position paper. It is the starting point to provide data needed to build a long-term Army Environmental Policy Institute trend analysis process, which is one of the Institute's charter responsibilities. Finally, it has already served as the discussion centerpiece of the Institute-sponsored 19-20 August 1991 Environmental Trends and Policy Workshop, in Champaign, Illinois.

1.2 Scope

The focus is on trends expected to have direct or strong secondary effects on the U. S. Army mission and environmental program management. While some material is general enough to have worldwide implications for the Army, the paper directs itself to areas under full jurisdiction of the United States. One advisory note: the differentiation between a trend and a forecast is that a trend has been observed retrospectively over time (but may be stated as an extrapolation into the future for emphasis), whereas a forecast is a prediction of what will or probably will occur. The researchers' task for this report was to find and articulate trends. Forecasting is the reader's option.

1.3 Approach

The research consultants reviewed current professional and popular literature across a wide variety of disciplines involved in: law, public opinion, technical regulation, technology, and analysis and development of environmental advocacy programs. They also interviewed additional experts inside and outside of the Army, as a validity check on their findings and conclusions.

2. Significant Environmental Trends

1. Increased recognition of cross-media environmental problems has been experienced. Anticipate emphasis will increase.

—(USEPA, OPPE and OSWER Strategic Plans for FY 1993-1996, Jan. 16, 1991)

Cross-media environmental initiatives have been impeded by EPA's organizational structure, which is along media lines (e.g., water, air, hazardous waste), and the fact that almost all federal environmental legislation that has been enacted is by medium (Clean Air Act, Clean Water Act, Safe Drinking Water Act, etc.). As long as the environmental legislation, regulation, and enforcement are media specific, the regulated community will curtail cross-media investments, unless the investments are advantageous based on cost. The potential for cross-media efforts appears to be best for pollution prevention initiatives. There is general agreement that environmental protection cannot be segregated by media and still be effective. There are examples where compliance with a regulation written under one law results in environmental degradation of other media.

One step in recognizing cross-media environmental problems is to perform comprehensive installation or facility audits. Another possible cross-media initiative would be writing integrated permits.

There have been recommendations for Congress to write a single comprehensive environmental law replacing the media laws. The likelihood of this becoming a reality in the near term is considered remote.

2. Pollution prevention (emphasis on avoiding pollutant generation as compared to pollutant capture or pollution damage repair) has gained momentum in the past five years; expect continued emphasis on prevention in the shape of government programs, legislation, and resource dedication both within the government and the private sector.

—(USEPA, OSWER Strategic Plan for 1993-1996, Nov. 30, 1990)

Congress has been pushing the administration and EPA on pollution prevention for the past several years. The EPA prepared its "Pollution Prevention Research Plan: Report to Congress" in March 1990. EPA initially had its pollution prevention program in the Programs and Planning Office, but moved it to the Office of Toxic Substances. Proposed legislation would set it up as a separate office at EPA with its own assistant administrator.

Industry has led the way in pollution prevention. For example, 3M has had a vigorous program that has resulted in large dollar savings both in cost avoidance and actual cost reductions. Companies such as 3M recognize that pollution prevention is good business. While early efforts focused on material substitution and process changes for existing items, pollution prevention has now been extended to initial new product evaluations.

The Pollution Prevention Act of 1990 was passed by Congress and signed into law as part of the budget reconciliation effort. It stated the following as national policy: to prevent or reduce pollution at the source wherever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible; pollution that cannot be prevented or recycled, should be treated in an environmentally safe manner whenever feasible, and disposal and/or release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

The Act covers both hazardous and non-hazardous waste and includes source reduction, but excludes most forms of recycling. EPA is charged with setting up a source reduction clearinghouse on management, technical, and operational approaches to source reduction at facilities. Companies required to file under SARA Section 313 Toxic Releases Inventory (TRI) provisions, (federal facilities are not currently required to report) must provide information on pollution prevention and recycling activities with each annual filing for each facility. The submittal covers actual and forecast data.

3. **Support for prioritizing environmental problems based on risk is increasing.**
—(USEPA, Unfinished Business: A Comparative Assessment of Environmental Problems, 1987 and USEPA, Setting Priorities and Strategies for Environmental Protection, 1990)

Relative risk received national attention in 1986-87 when EPA had an internal group compare the relative risk of 31 problems within 4 broad categories of risk: human cancer risk, human non-cancer health risk, ecological risk, and welfare risk. They also looked at residual risk, which was defined as the risk remaining after compliance. The EPA group published its results in Unfinished Business: A Comparative Assessment of Environmental Problems. The overall conclusion was that the problems identified by the group that were judged to pose the most serious risk were not necessarily the problems that Congress and EPA had targeted for most aggressive action.

In 1989, EPA Administrator William K. Reilly had the EPA Science Advisory Board (SAB) review Unfinished Business. As a result, the SAB made 10 recommendations that EPA should follow: (1) target its environmental protection efforts on the basis of opportunities for the greatest risk reduction, (2) attach as much importance to reducing ecological risk as it does to reducing human health risk, (3) improve the data and analytical methodologies that support the assessment, comparison, and reduction of different environmental risks, (4) reflect risk-based priorities in its strategic planning processes, (5) reflect risk-based priorities in its budget progress, (6) with the nation as a whole, make greater use of all the tools available to reduce risk, (7) emphasize pollution prevention as the preferred option for reducing risk, (8) increase its efforts to integrate environmental considerations into broader aspects of public policy in as fundamental a manner as are economic concerns, (9) work to improve public understanding of environmental risks and train a professional work force to help reduce them, and (10) develop improved analytical

methods to value natural resources and to account for long-term environmental effects in its economic analyses.

4. **Concern with international environmental problems (global warming and deforestation) has increased substantially.**
—(Telephone survey of environmental interest groups and review of public opinion literature: both performed by Life Systems, Inc., in preparing this trends survey, July, 1991)

The World Commission on Environmental Development published its findings after four years of investigation and meetings (World Commission of Environment and Development, 1987). The published findings became semi-popular. One can debate whether the study played a major factor in shaping world opinion or if it just documented it. Regardless, the Commission did report and identify that global economy and global ecology are related in new ways and that unlike earlier assessments, which considered economic growth impacting the environment, they recognized that impacts of ecological stress would affect economic growth. The 1992 U. N. Conference on Environment and Development, to be held in Rio de Janeiro, Brazil, will focus increased attention on global environmental concerns. There has also been increased attention focused on global warming, ozone depletion, deforestation, and acid deposition. Studies underway will be providing information to better define the impacts.

5/6. **United States spending on environmental problems is rising significantly. Resource allocation is changing among media (land, air water).**
—(USEPA, Environmental Investments: The Cost of a Clean Environment, Nov., 1990)

Overall United States pollution control costs are projected by EPA to increase to be between 2.6 - 2.8 percent of GNP by 2000. This compares to GNP

percentages of 0.9 in 1972, 1.9 in 1987 and 2.1 in 1990. Federal costs for DoD and DoE site cleanup will raise federal pollution control costs to about 8% of the federal budget.
—(USEPA, Environmental Investments: The Cost of a Clean Environment, Nov., 1990)

In the EPA Administrator's preface and executive summary of Environmental Investments: The Cost of a Clean Environment, the following points are identified as standing out from the report: the increased spending on environmental problems is having obvious consequences at all levels of government and industry and if the trend continues into the next century, this spending could adversely affect the United State's competitiveness in world markets. Further, that while the costs of pollution control are rising, there are still many unmet environmental needs. Administrator Reilly voiced concern about the price tag of meeting the growing environmental demands while recognizing that the American public wants more in the way of environmental improvements. The report concludes that the total annualized cost for pollution control activities in the United States, at 7 percent interest, has increased and is projected to increase as follows:

Total Annualized Costs	1972	1987	1990	2000 Present	2000 Full
In billions of 1986 dollars	26	85	100	148	160
In billions of estimated 1990 dollars	30	98	115	171	185
As Percent of GNP	0.9	1.9	2.1	2.6	2.8

The present implementation option assumes that implementation levels of existing programs will remain the same as for 1987. The full implementation option assumes the investments needed to attain the National Ambient Air Quality Standard for Ozone and the fishable/swimmable goals of the Clean Water Act nationwide by the year 2000. The report found that although total annualized costs are

increasing, the rate of increase is decreasing. The increase in the early 1970s was around 14 percent, this dropped to 6 to 8 percent in the mid-1980s, and is projected to fall to about 3 percent in the late 1990s (assuming full implementation). Comparing media shares of pollution control expenditures for 1987 to 1997 projections, the major increase is expected to be in land costs, with air and radiation costs remaining about the same, while water costs would decline. The percentages are shown below:

Media Shares of Pollution Control Expenditures (percent of total)	1987	1997
Air and Radiation Costs	28.9	27.1
Water Costs	42.9	35.7
Land Costs	26.0	33.9
Chemical Control Costs	1.2	1.9
Multi-media Costs	1.1	1.5

7. **Increased state and local government involvement in environmental programs was experienced in the 1980s and into the 1990s.**
—(Government Accounting Office, Environmental Protection, Meeting Public Expectations with Limited Resources, June, 1990)

Governments below the federal level became more involved in environmental issues for two reasons: (1) the federal government imposed responsibilities upon them and (2) state legislatures, city councils, etc., reacting to public opinion enacted their own environmental laws and regulations. State governments faced a dilemma, because for the most part, the responsibilities were passed to them without any federal funds. There is considerable controversy over increased state involvement because it is argued that national strategies are critical to most environmental problems. In addition, most states and certainly almost all local governments do not have the

expertise to establish, implement, and enforce programs. The counter argument is that state and local governments will be more responsive to local problems.

There is also some discussion that state and local governments can be more innovative in their legislation. However, most analysts conclude that just the opposite has occurred to date. The impact on the Army could be significant because increased state and local government involvement increases the likelihood of the Army having to address different requirements based on location. Most federal environmental legislation is written such that state and local governments can enact more restrictive laws and regulations, but they are not permitted to be less restrictive.

Under the Clean Air Act Amendments of 1990, states will have more active roles in permitting and enforcing and continue to have the option of establishing their own more stringent requirements. States are currently delegated considerable authority to set enforceable discharge permit limits (National Pollution Discharge Elimination System — NPDES) under the Clean Water Act.

8. **Using market incentives, such as those incorporated into the Clean Air Act, is gaining favor.**
—(Numerous articles and reports including GAO, Environmental Protection, Meeting Public Expectations with Limited Resources, June, 1990)

The objective of market incentives or market mechanisms is to give polluters a financial reason to reduce pollution without specifying how the reductions are to be made. Market incentives could include fines or non-compliance fees, where the amount of the fine determines the incentive to comply. A tradeable emission or discharge permit allows a polluter to trade with others to achieve the least cost-reduction in pollution. Public disclosure of information on pollutants and taxes levied on discharges in proportion to the amount or unit of pollution are also market incentives. Taxes could be applied to materials entering or leaving the plant. The GAO in its report gave the example of a tax on sulfur emissions from a coal-burning power

plant. A tax could be placed on both the coal used to produce the power, and on the electricity generated by the plant.

Market incentive proponents cite the advantages of potential cost savings, increased flexibility, and innovation promotion.

The Clean Air Act Amendments of 1990 provided the first major opportunity that EPA has had to integrate the market-based approach with a regulatory regime. Two earlier examples of market-based approaches are the air emissions trading program that was started in 1974 and the lead trading program started in 1982. Under the latter program, refineries that added less lead to the gasoline than EPA allowed could sell extra lead rights to refineries that wanted to add more lead than allowed. Critiques of both examples indicated that they were effective in reducing the cost of normal compliance.

Some states, including California, Colorado, and Wisconsin, have developed emission trading programs. Colorado's trading program involved water pollution rights for a single reservoir, Dillon Reservoir. Wisconsin's program was for water pollution permit trading for the Fox River.

9. Environmental legislation at all government levels shows no signs of easing. There could be a move to consolidate some of the laws, eliminating some of the contradictions and overlaps and addressing cross-media concerns.

—(Numerous citations for first statement, GAO testimony to Congress, Observations on the EPA's Budget Request for FY 1992, March 13, 1991)

There is now consensus that the environment has emerged as a core value in American culture. It has also become a core value in many other industrialized nations and is approaching a core value in most developing nations. It's a permanent issue on the national and global agenda; no one can consider it a fad or a "transient" issue. Public opinion survey data throughout three decades supports this, as does the extensive growth and strength of environmental groups. Politicians and leaders in industry have recognized this. Those who

were early to recognize this have generally benefited from their early investments. The Army will continue to face tougher environmental legislation throughout the world.

10. **Federal environmental enforcement (both criminal and civil) has increased significantly in the past five years. Federal enforcement driven by the significant number of Superfund cases has grown dramatically in the 1980s. Federal enforcement at the Department of Justice appears to be limited more by the number of attorneys assigned to the enforcement section than by the number of opportunities. Anticipate a shift in enforcement distribution with more Clean Air Act enforcement in the 1990s.**
—(USEPA, 1990a. United States Environmental Protection Agency. Enforcement Accomplishments Report: FY 1989. Washington, DC: USEPA Office of Enforcement. USEPA, 1990b. United States Environmental Protection Agency. Memorandum: USEPA and state enforcement information. Washington, DC: USEPA Office of Enforcement. USEPA, 1990c. United States Environmental Protection Agency. Memorandum: Final enforcement four-year strategic plan. Washington, DC: USEPA Office of Enforcement. USEPA, 1988a. United States Environmental Protection Agency. USEPA scoreboard 1989; the Bush Administration's first year. Washington, DC: USEPA Office of Enforcement. USEPA, 1988b. United States Environmental Protection Agency. Memorandum: USEPA and state enforcement information. Washington, DC: USEPA Office of Enforcement)

The proposed Federal Facilities Compliance Act, which would waive sovereign immunity, would have a major enforcement impact on the Army. If this proposed act becomes law, the federal govern-

ment will be subject to certain state and local litigation. Enforcing criminal provisions of environmental legislation would have a significant impact on the Army because it would make responsible individuals very cautious and could affect the Army's ability to recruit and retain environmental personnel.

11. **Public opinion continues to strongly support environmental protection programs. It is currently at its highest level.**
—(Lester, James P., Environmental Politics and Policy: Theories and Evidence, results of data base searches of environmental public opinion polls from 1975 to 1990 and EPA, OARM Strategic Plan FY 1991-1995, Nov., 1990)

Public opinion is significant to the Army, not only on a national basis (U. S. or host country), but also on a local, regional, and state basis. Communicating with the public and regulators, providing publicity on successes, and community involvement are important to influencing public opinion. The national public opinion, although not specifically reflective of local opinion particularly on local environmental issues, is indicative of an overall high interest and concern for environmental protection. The public considers the environment an important matter and one that needs attention and resources dedicated to it.

12. **Environmental interest group membership continues to grow, and these groups continue to be a significant factor in shaping environmental policy. Coalitions of environmental groups will become more popular. Interest groups are likely to increase their attention on international/global environmental problems.**
—(Vig, N.J. and M.E. Kraft, *Environmental Policy in the 1990s: Toward a New Agenda*, Congressional Quarterly Press, 1990 and Comp, T. Allan, Blueprint

for the Environment: A Plan for Federal Action, Howe Bros., 1989)

Environmental interest groups are substantially more powerful than one might conclude from their membership numbers. Even though memberships increased sharply in the 1980s, only about 7 percent of the United States population are members of an environmental interest group. Much of their power comes from their ability to effectively use the courts and the media. These groups' significant success in forming coalitions such as that which produced The Blueprint for the Environment, a Plan for Federal Action (they presented it to President Bush the day after he took office) will lead to more coalition action by environmental groups. These groups have become an effective Congressional lobby, and have been successful recently in getting attention on global and transboundary environmental problems. There is growing need to consider environmental interest groups in decision-making and to remain abreast of these groups' agendas.

13. **Public understanding/perception of environmental problems and risk is improving modestly. Education programs are getting more attention; however, the complex, multidisciplinary aspects and scientific uncertainty associated with the environment contribute to a poor level of understanding. Considering there are 72 million illiterate people in the U. S., and this number is growing, it isn't likely that a majority of the public will have a good understanding of many environmental problems.** —(Comp, T. Allan, Blueprint for the Environment: A Plan for Federal Action, Howe Bros., 1989)

The National Environmental Education Act was signed into law in early 1990. EPA established an Office of Environmental Education with a mandate to foster and enhance the environmental ethic in society by improving the environmental literacy of our youth

and increasing public awareness of environmental problems. The program emphasizes four specific themes: wisely using natural resources, preventing environmental problems, the importance of environmentally sensitive personal behavior, and the need for additional action at the community level to address environmental problems. The education program focuses on kindergarten through 12th grade (K-12) students, as well as college and university-level training. The K-12 program has three broad objectives; to encourage states to increase the amount of environmental education, to ensure that environmental issues are part of the environmental education curriculum, and to infuse environmental education topics into all basic subjects. The college-level program is aimed at improving teacher training by: adding courses in environmental education to the school of education curricula; incorporating environmental education in liberal arts curricula; and motivating students to pursue environmentally-oriented careers by helping to create internship opportunities in non-profit, public sector and private sector settings. The program also includes community college and technical school students by developing two-year degree programs in environmental specialties and by expanding two-year school training programs to provide environmentally-oriented worker training.

Environmental interest groups and the media also have a role to play in improving the environmental literacy of the public. It is not unusual to see articles addressing local, regional, national, or international environmental problems as front page stories. Through outreach programs and environmental training of all of its personnel, the Army can contribute to improving environmental literacy. Environmental literacy can be considered a subset of the nation's bigger program to improve our science literacy. This program is part of the national education plan.

14. Privatizing environmental services by all levels of government will gain momentum.
—(Environmental Business 1991 Conference, Boston)

Government agencies, particularly local and state agencies,

are turning to privatization as a form of cost-cutting for many services, including environmental services. The widest environmental application of privatization is in designing, constructing, and operating solid waste disposal facilities, including waste-to-energy plants. Communities are electing to use turn-key operations. This means that a contractor provides a product that is *fully* ready to use. Communities, particularly smaller ones, have also used privately owned water companies to provide water treatment and distribution. Some military bases contract for base service support. It is important to note that privatization, while it may extend liability to include the contractor, does not remove the government from liability considerations. Government contractors will continue to seek indemnification from the government for operating environmental services. A potential impact of privatization on the Army is the involvement of contractors in regional operations into which the Army enters with a community.

15. **The demand for environmental professionals continues to grow within the government and throughout the private sector. Personnel shortages will become more acute.**
—(USEPA, Science Advisory Board, Future Risk: Research Strategies for the 1990s)

A primary factor contributing to the environmental professional shortage is the large number of U. S. scientists projected to retire over the next 15 years. For example, 80 percent of the research chemists in the 10 largest chemical companies in the United States will retire by 2005. The pool of potential replacements for these scientists and engineers is limited because many high schools do not produce technically literate graduates; only 6 percent of the high school graduates read at the college level, while 13 percent are functionally illiterate and less than 10 percent can solve multi-step problems in mathematics. Adding to the problem is the shift in demographics. In 1982, 74 percent of the 5- to 17-year-olds were white; by 2020, this number is projected to be 53 percent. There is a severe lack of role models for minority students in science and

engineering with blacks accounting for less than 1 percent of the university professors. While the supply side of the equation dwindles, the demand side for environmental professionals continues, as requirements for monitoring, facility design, and operation continue, and environmental concerns become more deeply integrated into all activities. The Army is not well-positioned to recruit and retain environmental staff. This appears to be particularly true at the installation level because of grade levels and the absence of a career path.

16. **The conflict between more U. S. energy production and environmental protection and land preservation, which has been going on for quite a few years, will continue.**
—(Public opinion survey data base results and Rosenbaum, Walter A., *Environmental Politics and Policy*, Congressional Quarterly Press, 1991)

The United States continues to be the world's leading energy consumer. The prospects of this changing are unlikely. The U. S. energy and environmental policies have not been integrated into a national plan for per capita energy reduction. Energy conservation is not being emphasized. The impact on the Army could ultimately affect the fuel economy and types of fuel for its vehicles, ships, and aircraft, and the amount and types of training conducted.

17. **It is unlikely that the decentralized and fragmented Congressional responsibilities (many committees and subcommittees) will change. As the environment becomes a larger issue (one involving greater funding and/or a separate department), Congress will probably exercise more oversight.**
—(Rosenbaum, Walter A., *The Politics of Environmental Policy*, Congressional Quarterly Press, 1991)

Table 2-1 shows the congressional committees involved in environmental matters:

Table 2-1 Congressional Environment-Related Committees

Committee	Jurisdiction	Subcommittees
House Committee on Energy and Commerce	Production, regulation, and conservation of energy resources; public health and quarantine; biomedical research and development; oversight of activities affecting nuclear and other energy sources	Health and Environment Transportation and Hazardous Materials Oversight and Investigations
Senate Committee on Energy and Natural Resources	Environmental issues arising from energy development; outer continental shelf leasing; international energy, nuclear waste; Antarctica	Mineral Resources Development and Production Public Lands, National Parks and Forests Water and Power Energy Regulation and Conservation

Committee	Jurisdiction	Subcommittees
House Committee on Public Works and Transportation	Oil and other pollution of navigable waters; flood control and improvements of rivers and harbors; public works for the benefit of navigation	Water Resources Investigations and Oversight
Senate Committee on Environment and Public Works	Air and noise pollution; environmental aspects of outer continental shelf lands and deepwater ports; environmental effects of toxic substances (other than pesticides); environmental policy, research, and development; fisheries and wildlife; nonmilitary environmental regulation and control of nuclear energy; water pollution and ocean dumping; solid waste disposal and recycling; environmental protection, resource utilization and conservation matters in general	Environmental Protection Hazardous Wastes and Toxic Substances Superfund and Environmental Oversight

Committee	Jurisdiction	Subcommittees
House Committee on Merchant Marine and Fisheries	Oceanography, coastal zone management; fisheries and wildlife; Outer Continental Shelf Lands Act; the Coast Guard and navigation in general; international fishing agreements	Oceanography Fisheries and Wildlife Conservation and the Environment Coast Guard and Navigation Oversight and Investigations
House Committee on Interior and Insular Affairs	Public lands, including national forests and national parks; mineral resources on public lands; regulation of domestic nuclear energy industry; irrigation and reclamation programs	Energy and Environment Mining and Natural Resources National Parks and Public Lands Insular and International Affairs Water, Power and Offshore Energy Resources Oversight and Investigations

For the Army to be proactive, it must know what these subcommittees and committees are doing and thinking about doing. Congress, in its oversight role and role of enacting legislation, has an obviously strong influence on the Army's environmental program. In addition, the Congressional role in budget approval further adds to its influence.

18. **Concern for natural resource damage is gaining attention. Expect this to gain momentum.**
—(Langeweg, I.F., Concern for Tomorrow: A National Environmental Survey, 1985-2010, National Institute of Public Health and Environmental Protection, Bilthoven, The Netherlands, 1989)

Natural resources are typically defined as: a non-replaceable natural resource such as fossil energy and minerals and replaceable natural resources such as wildlife, topsoil, forests, groundwater, fresh surface water, and the oceans. Natural resource damages associated with environmental law are focusing on replaceable natural resources. Superfund contains provisions for natural resource damage claims. There have been actions in the courts to reclaim damages to fish, wildlife, and groundwater. Since the Army controls large acreage, it also has responsibility over an appreciable amount of the nation's natural resources. The Army has the liability for protecting these resources and has the requirement to monitor and assess them.

19. **Expanding "feebate" usage is receiving increased attention. This attention will probably be at the state and local government level. Feebates on automobiles, based on their fuel consumption, is a likely initial target.**
—(Cutter Information Group, Global Environmental Change Report, Volume 3, Number 13, 1991)

A feebate (fee + rebate) involves collecting fees and issuing funds equal to the amount collected. Feebates are being used in the

Quebec province to encourage the purchase of economically fuel-efficient vehicles. Persons buying fuel-efficient cars receive fees collected from persons buying gas guzzlers. It is an attempt to change behavior by charging fees large enough to affect the buyer's decision. Feebates should not have any direct impact on the Army unless the state or local entity attempts to apply a feebate to items the Army would procure.

20. **The cleanup of DoE sites could take some attention off the cleanup of other hazardous waste sites, including DoD sites.**
—(DoE presentation at Environmental Business 1991 Conference, Boston, MA)

DoE is lagging behind DoD in its program to clean up its hazardous waste sites. Although DoE has considerably fewer sites than DoD, the fact that DOE sites contain radioactive materials creates substantial public anxiety. The past secrecy surrounding the activities at those sites contributes to public concern. The DoE sites have become a national environmental agenda item. DoE is requesting considerable funding for its cleanup program. A recent estimate was that DoE would need approximately $41 billion for cleanup over the FY 93 to 97 period. This is about four times the DERP budget for the same period. Cleaning up DoD sites will continue to be important. DoD has committed to a program which it must complete to gain public trust.

21. **There is increased emphasis on the control of non-point source water pollution.**
—(*Cleaning Up the Water Act*, The Environmental Forum, Volume 8, Number 4, July/August, 1991)

The Clean Water Act Amendments proposed under Senate Bill 1081 contain increased emphasis on non-point source pollution, combined sewer overflows, and audits. The impact of non-point source pollution control on the Army is associated with its large real

estate holdings: agricultural use leasing, erosion, and sediments resulting from military training, metals associated with ranges, plus runoff associated with construction and petroleum product use (e.g., drips, minor spills and deposition of aerosols). Non-point issues being discussed include:

- Providing incentives that would allow trading of point and non-point pollution "rights;" coordinating between U. S. Department of Agriculture's non-point source pollution control programs under the 1990 Farm Bill and EPA's Clean Water Act responsibilities
- Protecting key water bodies such as the Chesapeake Bay and the Great Lakes
- Considering a focus on receiving water uses and standards as a basis for management rather than specification of discharge control technology
- Improving non-point source controls on federal lands
- Requiring enforceable best management practices on targeted watersheds.

22. **The fate of indoor air pollution regulation is questionable. General consensus is that indoor air pollution is a significant risk; however, it appears that the Administration is reluctant to include indoor air pollution as a primary agenda issue. EPA will conduct studies to determine the extent of the problem.**
—(USEPA, Office of Research and Development, draft, Four-year Strategic Research Plan, Nov., 1990)

EPA has established an indoor air division and the government has an interagency committee for indoor air quality. The indoor air division's mission includes:

- Establishing EPA policy by carrying out risk-management studies using available data on exposures and health risk associated with indoor air pollutants
- Developing data on sources; determining exposure and health risks when information gaps exist
- Developing and implementing strategies that would abate present levels of exposure to indoor air pollutants
- Working regulatory programs within EPA and other agencies to inhibit or otherwise restrict products that would exacerbate the present levels of exposures
- Disseminating information to educate the public about indoor air pollution and associated health risks.

The impact on the Army would involve building design and operation. This would have implications for energy use, and for maintenance, operation, modification and construction costs.

23. Environmental audits of industrial, manufacturing and commercial facilities are becoming more common.

—(Consensus from telephone survey of firms and industrial associations performed by Life Systems, Inc. in preparing this trend study, July, 1991)

Environmental audits can either be conducted internally (that is, by staff of the organization that owns the facility), or they can be conducted by an outside group as part of a mandated requirement. The likelihood of increases in both internal and external audits is high. It is likely that cross-media concerns will result in more comprehensive audits and that the audits will require or be tied to additional monitoring and reporting of environmental emissions. As audits become more common, expect to see standard procedures and methods developed for conducting them. Besides the resources the audits themselves will

require, there is also the implication that they will identify more violations or potential violations and raise concerns requiring action. The Army recognizes the need to audit, as reflected by requirements in Army Regulation 200-1 establishing the Environmental Compliance Assessment System.

24. Environmental assessments are becoming standard for commercial property purchases and corporate acquisitions.

—(Berz, David R., *Prime Time for Property Transfer Laws*, The Environmental Forum, March/April, 1989)

New Jersey, Connecticut, and Illinois have state laws requiring environmental assessments for commercial property transactions. Additional states are likely to enact similar laws. Because of liability concerns, both buyers and lending institutions are requiring environmental assessments associated with property transfer more frequently. The assessments usually use a two-phase procedure. The initial phase is a record review to determine what types of activities occurred at the site and if there is a likelihood of residual pollution. If the probability is sufficient, a second phase including sampling and analysis is performed to determine the extent of the contamination. If environmental assessments become more common, requirements are likely to be extended to government property transfers. The Army has a voluntary program, as directed by Army Regulation 200-1, but state requirements could differ significantly.

25. Ecological protection is moving toward having a priority equal to human health.

—(EPA, OSWER Strategic Plan for 1993-1996, November 30, 1990)

Elevating ecological protection is the result of recognizing the links between ecological protection and human health and welfare. EPA's Science Advisory Board recommended this approach, and Administrator Reilly has endorsed it. These links are beginning to be

reflected in EPA's strategic plans. Although ecological protection may not be given a priority exactly equal to human health for some time, it no doubt will become a more important factor in decision-making. The impact on the Army is that in order to provide ecological protection, the Army faces significant requirements for ecological surveys, inventorying and response to inquiries. This will be reflected in preparation of Army environmental impact assessments and statements and risk assessments done for Army hazardous waste sites. The implications are far-reaching.

26. **Anticipate the routine involvement of more disciplines than are currently active in environmental decision-making.**
—(Rosenbaum, Walter A., *Environmental Politics and Policy*, Congressional Quarterly Press, 1991)

Involving more disciplines in environmental decision-making is driven in part by the degree of integration of environmental decisions into other policy-making. For the Army, this means that persons familiar with procurement, research and development, manufacturing processes, packaging, public affairs, and law must routinely be involved. The increase in cross-media concerns will also require more interdisciplinary involvement. This places a requirement on the Army to train its staff to be environmentally aware. This could also have staffing and organizational impacts on the Army.

27. **There will be an increase in user/buyer fees for things that pollute, such as chemicals and pesticides, with the fees being made available for environmental protection programs.**
—(Tolba, Dr. Mostafa K., *Down to Earth Economics*, Business Week, June 18, 1990)

Instituting user/buyer fees is one method of controlling items that cause significant pollution. Fees can also be used to generate funds that would be directly applied to environmental protection

initiatives. User/buyer fees could increase the cost for the Army to acquire certain materials. It would be a factor to take into consideration on procurement decisions and in material selection as a part of research and development.

28. **Pressure is growing to build more solid waste-to-energy plants as landfill availability shrinks.**
—(National Solid Waste Management Association, Land Fill Capacity in the Year 2000, Washington, DC, 1989)

Alternatives to landfills as a solid waste disposal method appear to be inevitable. Waste-to-energy plants become more attractive as energy and waste disposal costs increase. Combustion technology improvement is a factor, as are waste segregation methods and fuel energy value of wastes. Recycling effectiveness will be a factor for these plants as will air pollution regulations. The impact on the Army is not likely to be significant unless an Army installation agrees to join in a regional facility project. Most Army installations would not generate sufficient solid waste to make a waste-to-energy plant efficient with the current state of technology.

29. **There is increasing concern over groundwater quality degradation and depletion.**
—(USDA, Soil and Water Resources Conservation Act, 1980 Appraisal, 1981)

These concerns are likely to be more intense in areas where groundwater is the only water source. Competition for water between agriculture, industry, commercial, and household uses are particularly acute in the West and Southwest. Drought conditions have put emphasis on the problem. Local governments have been slow to consider water availability as a regulator for growth. Army installations that rely on groundwater as their primary supplemental water supply source and are competing with others withdrawing from the same aquifer will face the greatest impact. Protecting groundwater

from all forms of pollution, including underground storage tanks and disposal sites, will require the Army to invest in more monitoring as a tool for managing protection programs.

30. **Combined sewer overflow control and storm water control is receiving more emphasis.**
—(*Cleaning Up the Water Act*, The Environmental Forum, Volume 8, Number 4, July/August, 1991)

Passage of the Clean Water Act Amendments will determine just what additional attention is given to combined sewer overflow (CSO). It is probably safe to say that there will be some requirements for CSO. This would impact installations that have a single sewer system that carries both wastewater and storm water runoff. No data were compiled on the number of Army installations having combined sewer systems. Since this approach was popular before 1970, it is probable that a few Army installations built in that era have combined sewer systems. Senate Bill 1081, as introduced, requires on a nation-wide basis that all treatment plants have the capacity to treat the heaviest rainfall of the year that the area would receive in a six-hour period. It provides for treatment plants to be upgraded within a period of seven years. This is a fairly controversial issue and it may not pass in its proposed form. Counter proposals suggest considering the water quality impact and the relative risk to health from the CSO. EPA's position, although not official, appears to support a flexible approach. If the legislation passes, requiring CSO treatment, it could require a major construction program for Army plants not in compliance. It could also impact non-complying regional facilities to which the Army is connected.

31. **The wetlands controversy is continuing.**
—(*Cleaning Up the Water Act*, The Environmental Forum, Volume 8, Number 4, July/August, 1991)

The wetlands issue may also be tied into the Clean Water Act Amendments. On 9 August 1991, the Administration announced its

multi-agency wetlands policy, which includes the following:

- All Section 404 program permits would be deemed approved within six months if an agency does not extend a deadline for good cause as determined by the U. S. Army Corps of Engineers
- Legislation should be passed expanding the authority of the Section 404 program to include additional activities that may destroy wetlands; currently the law focuses on dredging and filling
- States should increase their roles in the wetlands permit process. The Administration is to issue guidance for state programs that must achieve on balance the same environmental benefits.

The wetlands controversy brings into conflict environmental interest groups representing economic development and agricultural interests. Separate legislation addressing wetlands has been introduced into the 102nd Congress during its first session. The wetlands delineation manual was published 14 August 1991. It was released for a 60-day public comment period immediately afterwards. Giver the high level of controversy, it will surely see revision.

32. **EPA and others (government and non-government) are experiencing pressure to use indicators of environmental quality, not indicators of activity (dollars spent, contracts awarded, lawsuits, etc.)**
—(GAO, Environmental Protection Agency: Protecting Human Health and the Environment Through Improved Management, August, 1988)

Debate will continue over which are the best environmental quality indicators; however there is agreement that merely measuring activities, such as the items mentioned above, does not properly portray an environmental program's effectiveness. This provides

growing opportunity to demonstrate leadership in this area by taking the initiative of collecting data on indicators and reporting the results. As requirements or guidelines are developed for measuring and reporting environmental indicators, there will be accompanying pressure to fully disclose the information collected. In order to collect data on indicators, there will be requirements for additional monitoring and data analysis. This will mean added cost and more personnel.

33. **A lobby is growing to encourage the United States to adopt an "environmental friendly" seal on products. Germany and Japan have already implemented this. An independent jury awards the seals.**
—(Cutter Information Corporation, Global Environmental Change Report, Volume 3. Number 13, 1991)

If the United States uses a system of either a voluntary or mandatory environmentally friendly seal, there could be some pressure on the government to procure environmentally friendly materials whenever it has an option. This would impact the Army's procurement system.

34. **Greater emphasis is being placed on objectively collecting and analyzing environmental statistics at the federal level (similar to labor and economic statistics collection and analysis) and in some states.**
—(GAO, *Environmental Protection: Meeting Public Expectations with United Resources*, Report to Congress, June, 1991 and GAO Testimony, Creation of a Department of the Environment (S.2006), February, 1990)

This trend is tied to environmental indicators (see Number 32). However, this represents the "big picture" of recognizing environmental statistics on a nationwide basis as an indicator of the

nation's well-being. This would be compared to economic indicators such as GNP and housing starts, and labor statistics such as unemployment and new jobs. If this does become a requirement, there would be an impact on the Army to collect and report these environmental statistics for consolidation, validation, and presentation. The existence of such data invites further scrutiny by outside sources.

35. **Criteria for classifying hazardous materials is becoming more stringent.**
—(Comp, T. Allan, Blueprint for the Environment: A Plan for Federal Action, Howe Brothers, 1989)

The more items that are classified as hazardous, the greater the need will be for alternatives to landfill disposal. Classifying wastes as hazardous also increases the emphasis on pollution prevention, including material substitution.

36. **Establishing water quality criteria for in-stream sediment constituents (heavy metals, etc.) and protecting wildlife is receiving increased attention.**
—(*Cleaning Up the Water Act*, The Environmental Forum, Volume 8, Number 4, July/August, 1991)

This trend, like several others, is tied to the Clean Water Act Amendments. There is no doubt that if water quality criteria are established for sediments and wildlife, they will be more restrictive and require more treatment and monitoring to confirm compliance. Protecting wildlife ties into elevating ecological protection to a priority equal to human health (see Number 25).

37. **Municipal solid waste trends include:**
    a. **Paper and paperboard have been and are projected to continue to be the most prevalent solid waste material**
    b. **Plastics generation increased the most of any material category in the past three decades.**

Plastics generation is projected to continue to increase but at a decreasing rate

c. **Metals, glass, foodwastes, and yard waste generation appear to be decreasing in proportion to other solid waste categories.**

—(USEPA, Office of Solid Waste, Characterization of Municipal Solid Waste in the US: 1960 to 2000, Washington, DC., 1990).

These trends relate to municipal solid waste; they may not apply to typical Army installations. Effectiveness of recycling programs will determine how much of these wastes require disposal. The recycling potential for paper, plastic, glass, and metals is high. The Army could influence its solid waste generation by influencing packaging materials for items it procures. However, for commissary and post exchange items, the Army probably does not have sufficient procurement clout to induce or force manufacturers to use packaging that generates less waste.

38. **Waste generation and landfill capacity are on a collision course. Landfill disposal capacity in the United States has been decreasing.**

—(National Solid Waste Management Association, Landfill Capacity in the Year 2000, Washington, DC, 1989)

The Army, like the nation, is losing its landfill capacity. This will put pressure on the Army to use off-site disposal or seek alternatives to landfills. This would increase both the hauling and per ton disposal costs. The Army may also face pressure to use its land as solid waste disposal sites for neighboring communities.

39. **Underground storage of storm and stream runoff is gaining favor in areas facing water shortages as an alternative to surface storage.**

—(*Water: Rethinking Management in an Age of Scarcity*, Worldwatch Paper, paper, 62, Worldwatch Institute, 1984)

This approach will be a factor where evaporation rates are high and water demands are high in relationship to supply. Do not anticipate this to generate a significant impact on the Army.

40. The trend of decreases in forest and crop acreage in the United States and increases in range acreage and urban areas is projected to increase for the next 50 years.

—(USDA, Forest Service, An Analysis of the Wildlife and Fish Situation in U. S., 1989-2040, September, 1989)

The impact of decreases in forest and crop acreage could result in pressure on the Army to maintain forest acreage it has and continue or possibly expand leasing land for farming.

41. Industry, in cooperation with EPA, has voluntarily increased pollution abatement/prevention and environmental control activities. One recent example is the Industrial Toxic Project (33-50 Program).

—(Ember, Lois R., *Strategies for Reducing Pollution at The Source are Gaining Ground*, Chemical & Engineering News, July 8, 1991).

The Industrial Toxic Project is referred to as the 33-50 Program since firms signing up fo e program agree to reduce release of specific toxic emissions on 17 chemicals by 33 percent in 1992 and 50 percent by 1995. A number of large firms have committed to the program. There will be pressure on government agencies to follow suit or even demonstrate leadership by going beyond what the private sector is doing.

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Appendix A

Index to Trends

Relevant trend numbers are provided for key words and phrases. Trends with general relationship are shown to the right of the main key word or phrase.

Key words	Trend Identification Numbers
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Acronym Glossary

CSO	Combined sewer overflow
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DoE	Department of Energy
DoJ	Department of Justice
EPA	Environmental Protection Agency
FY	Fiscal Year
GAO	Government Accounting Office
GNP	Gross National Product
K-12	Kindergarten through 12th grade
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System (permit)
OARM	Office of Administration and Resource Management
OPPE	Office of Policy, Planning and Evaluation (EPA)
SAB	Science Advisory Board (EPA)
OSWER	Office of Solid Waste and Emergency Response (EPA)
SARA	Superfund Amendments and Reauthorization Act
TRI	Toxic Releases Inventory
USDA	U.S. Department of Agriculture
U.N.	United Nations
USEPA	U.S. Environmental Protection Agency (same as EPA)