US Army Corps
of Engineers®

# USACE Environmental Operating Principles and Implementation Guidance

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# THE CHALLENGE AND PATH AHEAD

All life on earth depends upon the physical environment. While stating a reverence for nature, humans are also compelled to control it, to build shelter and harvest food. But since the industrial revolution, we have gone well beyond subsistence. Our scientific and technological capability has added enormously to our quality of life. However, those capabilities have also created environmental impacts that now span the entire globe. Despite our increasing inclination to dominate nature, we remain fully and totally dependent upon the natural world. We require its bounty – fresh air to breathe, clean water to drink, and oceans and fertile soil for food. Because survival depends upon sustained and balanced ecosystems, environmental concerns are becoming an increasingly important part of all U.S. Army Corps of Engineers' missions, decision-making, programs, and projects.

The purpose of the USACE Environmental Operating Principles is to illuminate the ways in which the U.S. Army Corps of Engineers' missions must be integrated with natural resource laws, values, and sound environmental practices. They are meant to give "corporate coherence" to the Corps work, so that people everywhere will recognize the Corps roles in, and responsibilities for, sustainable use, stewardship, and restoration of our Nation's natural resources and those of other countries in which the Corps conducts activities. And finally, the Environmental Operating Principles make evident the connection among water resources, protection of environmental health, and the security of our Nation. The Principles are vitally important to our participation in sound environmental stewardship during the Army's Transformation.

This doctrine, as an elaboration of the Environmental Operating Principles, begins to develop the direction we must take to achieve greater synergy between environmental sustainability and execution of USACE civil works and military activities. The new direction will require all of us to change our views, expectations -- our mental models if you will -- and our understanding of how our activities impact the natural world. As Peter Senge wrote about the challenge of changing mental models in *The Fifth Discipline* (1999), "We have a tendency to see the changes we need to make as being in our outer world, not in our inner world. It is challenging to think that while we redesign the manifest structures of our organizations, we must also redesign the internal structures of our 'mental models.' Our mental models are the medium through which the world and we interact. They are inextricably woven into our personal life history and sense of who we are." The challenge for us is to assure that everyone from across the Corps adjusts their mental model of our environmental responsibilities in accordance with this doctrine, while making daily project decisions and taking actions on behalf of the Corps. These individual adjustments will result in an organizational culture change over time.

The Corps recognizes that some people believe simultaneous attempts to achieve environmental sustainability and economic development are antithetical forces. The Corps does not hold this position but rather understands that we can choose to design and act either in conflict with nature or in ways that take inspiration from nature and are modeled after it. As we seek more synergy and balance, this doctrine will serve to inform and guide all Corps decisions, set within the context of the Corps Program Management Business Process.

# Environmental Operating Principles

***As an integral part of our mission, the Army Corps of Engineers will be a national leader in environmental and natural resource stewardship for present and future Generations.***

Today, the United States Army Corps of Engineers (Corps) performs multi-faceted military and civil missions in service to the Nation. These missions have both direct and indirect impacts on our natural environment. From its beginning as George Washington's engineer during the Revolutionary War, the Corps role in the life of America has steadily evolved and expanded. As a nation builder in the 19th century, the Corps helped map the frontier and survey roads and canals. In the 19th and early 20th centuries, the Corps built Army fortifications on the coast. Beginning with World War II, the Corps was given responsibility for construction of Army and, later, Air Force installations worldwide. The Corps fostered economic development of the Nation's vast navigation system to promote interstate and international commerce, and kept vital ports and harbors open. The Corps also supported the Nation's early conservation efforts, including work to establish our first National Parks. The Corps civil works mission expanded to include flood control, disaster relief, hydropower, water supply, and recreation. As society's needs and values have changed, the Corps responded with programs for wetlands and shore protection, environmental cleanup, and natural resources restoration.

Our goal was to develop Environmental Operating Principles that are broad enough to apply to this range of activities, and yet concrete enough to meaningfully guide the environmental responsibilities of the Corps in the future. The Corps, as part of the Army, continues to embrace the "four pillars" of the Army's environmental strategy summarized as follows:

- Giving immediate priority attention to sustained compliance with environmental laws and regulations
- Continuing to restore previously contaminated or impaired sites both within the Defense complex and for our civil customers, as expeditiously and fully as resources permit
- Focusing on preventing pollution and natural resources damage
- Conserving, preserving, and restoring natural and cultural resources

When the National Environmental Policy Act was passed in 1969 and signed into law on January 1, 1970, the United States established a national policy to "encourage productive and enjoyable harmony between man and his environment; promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enrich the understanding of ecological systems and natural resources important to the Nation." It is striking how contemporary this statement is and how well it and the Army's "four pillars" serve as a springboard for the Corps Environmental Operating Principles:

1. Strive to achieve Environmental Sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.

2. Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences of Corps programs and act accordingly in all appropriate circumstances.

3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.

4. Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.

5. Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work

6. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work.

7. Respect the views of individuals and groups interested in Corps activities, listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the Nation's problems that also protect and enhance the environment.

These principles will be integrated into the Program Management Business Process and other Corps decision-making at the earliest stage possible. The Corps culture must embrace these principles across all programs and projects to make them a reality.

# DOCTRINE

**1. Strive to achieve Environmental Sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life.**

## Elaboration of Principle 1

The United States Army Corps of Engineers joins all federal agencies, state and local governments, and the private sector in collaborative efforts to achieve environmental sustainability. This Principle states the ultimate goal of all the Environmental Operating Principles and echoes the commitment of environmentally responsible people throughout the world. Environmental sustainability is an aspiration that can only be achieved by the combined efforts of governmental and non-governmental actors around the globe, each doing their part, backed by the citizens of the nations of the world.

Sustainability was first placed on the international agenda in 1987 by a special United Nations (UN) independent commission led by Dr. Gro Harlem Brundtland, former Prime Minister of Norway. The Brundtland Commission defined sustainability as " … development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The Commission went on to observe that "Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs." In 1992 the Army's Environmental Strategy challenged Army leadership to recognize environmental stewardship as a strategic leadership function required for the wise management of resources. Stewardship was supported by the four pillars of **compliance** with environmental statutes; the **restoration** of contaminated sites; the **prevention** and elimination of pollution; and, the **conservation** and preservation of natural and cultural resources for future generations.

The President's Council on Sustainable Development (PCSD Report of February, 1996) defined sustainability as a balancing of three major elements: environmental health, economic prosperity and social well being. The Council further noted that these elements cannot be addressed successfully in isolation from one another, but must be integrated in order to achieve sustainable solutions. Later (1998), a joint effort between the UN Educational, Scientific and Cultural Organization (UNESCO) and the American Society of Civil Engineers (ASCE) examined sustainability in the context of water resources system design and management. This joint UNESCO/ASCE effort defined sustainable water resource systems as "those designed and managed to fully contribute to the objectives of society, now and in the future, while maintaining their ecological, environmental and hydrological integrity."

For purposes of this doctrine, the Corps defines environmental sustainability as "a synergistic process whereby environmental and economic considerations are effectively balanced through the life cycle of project planning, design, construction, operation and maintenance to improve the quality of life for present and future generations." This definition is consistent with that developed by the Brundtland Commission, the three major elements of the PCSD, and the specific definition as it relates to water resources adopted by UNESCO/ASCE.

## Situational Awareness

Since release of the Brundtland Commission's report, a great deal of effort has been devoted to further defining and operationalizing the concept of sustainable development. In both developed and developing countries, we've witnessed the impacts of human activities upon the Earth accelerating at a rate unforeseen just a few decades ago. With the population of 6 billion people increasing rapidly, the carrying capacity of natural resources in many areas of the world is being stretched and broken. Because of our dependence on natural resources and the environment, the Corps, in executing its authorized programs, must strive to sustain our Nation's ecology while providing the national and international services that the Army and society require for national security, economic stability, and improved quality of life.

## Relationship to Corps Missions/Activities

Achieving environmentally sustainable solutions requires collaboration among federal, state and local government agencies, and non-governmental organizations. This collaboration must also occur in the execution of our military mission to plan for and implement the environmental sustainability needs of the transforming Army and ultimately, the Objective Force. The best available scientific methods and information should be utilized in this effort. Above all, Corps efforts should focus on identification of reasonable and innovative alternatives and their objective evaluation to achieve sustainable solutions in civil works and military support activities.

Environmentally sustainable solutions are achieved by linking environmental and economic needs. For example, at the Marine Corps Camp Lejeune in North Carolina, military and civilian personnel worked alongside local, state, and regional stakeholders to design a sustainable installation. Their efforts touched upon 400 aspects of base operations that had significant environmental impacts including construction, maintenance, amphibious training, weapons cleaning, tactical equipment painting, green building design, procurement, energy and water conservation, alternative fuel vehicles, and bio-diversity. Their efforts produced a practical environmental management plan that enabled the Marine Corps to improve environmental performance through better resource allocation, assignment of responsibilities, and continuous evaluation using specific metrics.

The Camp Lejeune experience in successfully implementing environmentally sustainable solutions to installation problems is an excellent model for both our military and civil works programs.

**2. Recognize the interdependence of life and the physical environment, and consider environmental consequences of Corps programs and activities in all appropriate circumstances.**

## Elaboration of Principle 2

The interdependence of life and the physical environment refers to the dynamic and mutually dependent relationship among all life forms – including our own species — and the Earth's life support systems. As more ecological evidence is developed, it is becoming abundantly clear that human activities are having effects unanticipated several decades ago. Physical changes leading to environmental damage range from climate changes to the accelerated loss of species. Consequently, the Corps must recognize the effect of its activities on the life support systems and consider the consequences of its activities on the environment from both the scientific and legal perspective. Recognizing the interdependence of life and the physical environment challenges us to find synergy between the environment and our activities and to consider what kind of planet we ultimately want for ourselves and future generations. While science and engineering will help illuminate what is possible, this question must be resolved on the basis of what we, as a Nation, value and how we, as an executive agency of the Federal Government, evaluate the long-term implications of our mission execution.

## Situational Awareness

The impacts of human activities upon the Earth have expanded to a point where natural systems are being overwhelmed. An example of particular significance to the Corps would be freshwater ecosystems – the diverse communities found in lakes, rivers, and wetlands. Research has identified these ecosystems as among the most fragile and endangered of all major ecosystem types, facing increasing threats from pollution, water withdrawals, and overfishing. In addition to being ecologically rich, freshwater ecosystems play a vital role in the lives of people, providing a source of drinking and irrigation water, food, recreation, and employment. The majority of the world's population lives near or adjacent to waterways; therefore, our future treatment of this ecosystem is especially important to achieving environmentally sustainable development.

Until recently, the availability of clean, abundant supplies of water for cities, agriculture and industry was taken for granted. Today, however, our Nation faces the depletion of aquifers, lakes that are receding due to diversions, and the decline of quality wetlands. In the United States alone, water use increased from 330 million gallons a day in 1980 to 408 million gallons a day in 1990--a huge leap despite a decade of increased water conservation efforts. These facts point to the conflict emerging in water resources policy between consumptive use and the long-term needs of aquatic ecosystems. A similar set of issues was identified in the Corps recent series of "Listening Sessions." In these sessions, held during the summer and fall of 2000, many members of the public noted that they expect the federal government to seek solutions that balanced economic and environmental needs, clearly a role for Corps programs and activities.

Similarly, our Nation's military services recognized that operational training, facility development, and environmental restoration needs must be undertaken in an atmosphere that integrates considerations of all environmental factors within the planning process.

### Relationship to Corps Missions/Activities

The focus of Corps efforts, whether addressing the civil works or military needs of the Nation, should be centered on optimizing the use of our dwindling resources, on development of more environmentally efficient facility and project engineered systems, and on promoting utilization of design and engineering techniques which serve to improve ecosystem sustainability. The Corps water resources program has traditionally focused on managing the frequency and distribution of freshwater to meet the needs of a traditional, easily identifiable set of users – for flood control, agriculture, navigation, recreation, and water supply purposes. Only recently have increasing development costs, government fiscal restraint, diminishing sources of water, and a growing concern for the environment forced water managers at all levels of government to transition from a water-supply development mentality, to a water-demand management and conservation mentality. Now and in the future, Corps water management will seek to optimize the use of existing surface-water projects to address multiple objectives of flood control, navigation, agriculture, water supply, and the restoration of aquatic ecosystems.

Yet water is only one of many elements of the physical environment that we must consider in our analysis of project impacts. After all, there's virtually no natural ecosystem in the United States that hasn't been affected, either directly or indirectly, by human engineering. As the Nation's leading environmental engineering agency, the Corps should use its position to heighten awareness on the part of the Nation's civil and military leadership on the interdependence between the environment and mission execution. The Corps leadership will strive to secure adequate information on the environmental consequences of proposed actions to allow an objective assessment of all reasonable alternatives in the decision process. Consistent with this approach, in the execution of our programs and activities, the Corps will endeavor to identify and prioritize degraded ecosystems and develop alternatives for their restoration within the context of our environmental program authorities.

## 3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.

### Elaboration of Principle 3

This Principle takes the goal of achieving environmental sustainability a step further by pointing the way towards procedures that will enable us to achieve balance between human activities and sustaining the earth's ecosystems. Operationally, this Principle requires that Corps employees endeavor daily to develop options for action that not only achieve their stated goal, but also protect the environment and our quality of life. To achieve environmental sustainability, the Corps must examine all existing procedures and policies within the Project Management Business (PMB) process

and incorporate important and relevant environmental and economic factors if they have not already been made a routine part of the PMB process. The Principle states that it is essential to constantly improve models for the analysis of developmental activities and their impacts, a concept specifically elaborated upon in Principle 6.

The models should integrate the value of natural resources development ("expenditures" such as use, extraction, etc.) with environmental enhancements ("deposits," ecosystem restoration, clean up activities, etc.) to give us a more realistic picture of the impacts and positive contributions of these activities upon natural systems. With these enhanced models of reality, we can improve our understanding of the ways projects and activities can achieve traditional services, such as flood control, navigation, and military construction in an environmentally sustainable manner.

## Situational Awareness

The tools necessary to evaluate and measure environmental sustainability factors are in the early stages of development. To further improve our capabilities, we must focus our expertise, improve our evaluation techniques, and enhance our capability to objectively portray and share the results of these evaluations with all stakeholders. An example of this innovative process was the development of the so-called "Green Building" concept. The purpose of this concept was to focus efforts on planning and design with environmental compatibility as a goal. Early in that concept's development, a great deal of criticism was levied at the design concept as being too expensive. Since then, experience in planning, design, construction, and evaluation of the concept has demonstrated that these criticisms were based not only on a reluctance to change more conventional design and construction practices, but equally as important, on the failure of existing cost analysis systems to track real environmental costs of certain conventional design and construction that encouraged the inefficient use of resources. Design for environmental sustainability is more than a manifestation of an efficiency agenda. It is a means to demonstrate that any design, program, project or action can be scrutinized to achieve greater synergy with environmental considerations, but it requires innovative thinking and the willingness to take risks.

## Relationship to Corps Missions/Activities

This Operating Principle is a directive to each employee of the Corps, each manager and supervisor, and each policy maker to examine doctrine and procedures to seek balance between economic and environmental factors. The Corps is developing a cross-walk with existing procedures and policies within Civil Works and Military Programs to do just that.

Collaboration with other agencies, stakeholders, and citizen groups, as addressed in Environmental Operating Principles 6 and 7, will be essential to this process. For this level of synergy to happen, we must daily consider and balance economic and environmental concerns. To do so will require the Corps to move beyond traditional success criteria of cost, performance, and timeliness. Corps measures of success should also incorporate such metrics as the use of innovative technologies, materials, and designs to lessen the stress on the environment made by our facilities and activities. The new measures must be understandable and attainable. They should

cover both individual projects as well as macro project trends. They should not add significant complexity to the field's current Project Reviews and the Headquarters Command Management Reviews.

**4. Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.**

## Elaboration of Principle 4

The Army's Environmental Stewardship function is supported by a "pillar" that emphasizes the need for a continued focus on compliance with environmental laws. The soundness and the underlying justification for this Pillar are obvious. The values of environmental sustainability have in large part already been incorporated into the Nation's laws and mandates to governmental and private actors.

Since 1986, numerous environmental provisions have been added to the Corps civil works authorizing legislation governing various aspects of the Corps water resources program. Moreover, the Corps direct environmental role has expanded to include conducting significant cleanups of environmentally damaging contamination at military and other sites under Defense Environmental Restoration Program (DERP) and Superfund related legislation. Both the Department of Defense and the Army have issued definitive policies relating to the land and other resources under their stewardship, and have undertaken a program of environmental restoration activities at both active and formerly used defense sites. Additionally, the Army initiated a Sustainable Design and Development Program fostered by the Corps which is aimed at meeting today's needs without compromising the ability of future generations to plan, design, construct, and expand in an environmentally sound manner on military installations. These civil works and military programs activities are executed within the complex framework of the Corps authorization statutes and in accordance with our Nation's environmental laws and regulations. There is ample precedence for the Corps to undertake environmental activities that contribute to sustainable solutions both for the Army and the Nation.

Perhaps the statute that provides the strongest basis for achieving sustainable solutions is the National Environmental Policy Act of 1969 (NEPA); 42 U.S.C. 4321-4347, which establishes a national policy to " …encourage productive and enjoyable harmony between man and his environment; promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enrich the understanding of ecological systems and natural resources important to the Nation…" In addition to NEPA, the planning framework established in the Water Resources Council's Principles and Guidelines (P&G) is an important procedural guide for seeking sustainable solutions in civil works water resources projects. The P&G states that the federal objective of water and related land resources development is to contribute to national economic development in ways that are consistent with protecting the Nation's environment.

## Situational Awareness

The values of responsibility and accountability are the behavioral attributes that are at the center of how the Corps will achieve the goal of environmental sustainability in its projects and activities. Responsibility is recognizing and accepting what is expected of one's self, both professionally and personally. Accountability is the willingness to answer for one's behavior. Together, they form an essential framework for our actions. In their absence, people and institutions lack the mechanisms to assess and check their behavior against societal standards and expectations.

What is the link between responsibility and accountability and ensuring that natural systems and the quality of life as well as economic development are protected and encouraged? Responsibility and accountability must apply to all aspects of our work – administrative, technical, scientific, managerial, and in the relationships associated with these functions. To achieve environmental sustainability, engineers, environmental designers, and other practitioners must do more than what is merely convenient or conventional. We must be responsible for ensuring that everything we do is within the law. Failure to abide by the standards established by laws such as the Resource Conservation and Recovery Act, the Endangered Species Act, the Clean Water Act, the Safe Drinking Water Act, or the Clean Air Act may result in civil and criminal enforcement actions against both the Corps and individuals involved. For exampe, in 1999, 62 defendants were named in 59 federal environmental enforcement actions. While civilian federal agencies (including the Department of Energy) accounted for 33 of these actions, the Department of Defense accounted for the remaining 26, nearly half.

But more than accountability under the law, we must ensure that we stay abreast of the cutting edge of our professional disciplines and seek new and innovative technologies and solutions, encourage collaborative efforts, and effectively utilize the multiple assets these efforts will produce to yield sustainable solutions. There has been a growing awareness in corporate America of the responsibilities that organizations have towards the environment and economic development. In the private sector, the Coalition for Environmentally Responsible Economies (CERES) is an example of a growing network of private companies and organizations willing to be responsible for living up to environmental principles. CERES is an organization of over 120 non-governmental organizations and major companies, including American Airlines, Bank of America, Coca Cola, USA, Consolidated Edison, Ford Motor Company, General Motors Corporation, Nike Inc., Polaroid Corporation, and Sunoco Inc. It represents the growing understanding among companies and organizations that their economic health and market credibility rests upon the development of products and services which sustain environmental and public health. Further they also understand the need to accurately report on these products and services. Similarly, the Army Environmental Strategy challenges Army leaders to expand the scope of their responsibility and incorporate a more comprehensive and coordinated approaches to environmental stewardship. An approach aimed at increasing the Army's overall capability to define requirements, develop doctrine, train people, acquire systems, manage installations, reduce costs, and operate across the full spectrum of conflict.

Individual and corporate credibility springs from accepting responsibility and accountability. An organization's credibility is affected not only by being responsible and accountable in the short term, but also for the long-term effects of its actions. Accepting corporate responsibility also means continuously deepening our understanding of what is needed to attain environmental sustainability, and then supporting the necessary actions to make it happen whether through legal, organizational, and/or engineering and scientific means.

### Relationship to Corps Missions/Activities

Today, the public has higher expectations relative to environmental protection than in the past. Many elements of environmental protection are mandatory requirements of the law. Public service agencies are expected to have strong environmental orientations and to show proof of progress toward achieving environmental goals. This can be challenging for the Corps given the needs of the various organizations and programs we support. Our missions and activities are extremely diverse, ranging from the cleanup of hazardous and toxic waste and the design and construction of facilities on both military and civil sites, to the beneficial use of dredged material to create and restore damaged aquatic ecosystems, to the protection of citizens and their property from damaging flood events, and on to our cooperation with other federal and state agencies in response to natural and manmade disasters.

As a result, the Corps as a whole must work to be responsible and account for all of its activities, both in terms of process and outcomes, relative to environmental sustainability. Accountability begins with an understanding of the importance of achieving a sustainable world; setting expectations for changes in both individual and corporate behavior; stating clear objectives to be met for every project and activity; and researching and providing sound indicators for the evaluating and reporting environmental sustainability achievements in our projects and/or activities.

## 5. Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work.

### Elaboration of Principle 5

The definitions of key terms are essential to understanding this Operational Principle:

"**Cumulative impact**" is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (NEPA/President's Council on Environmental Quality (CEQ) Regulations - 40 C.F.R. §1508.7)

**"Mitigate"** -- Acting in a manner that improves or modifies a program, project, or decision for the benefit of the environment. To reduce; make less severe; alleviate or eliminate the environmental effects or impacts of individual or cumulative actions.

"**Seek ways and means"** -- To make good faith efforts to continue research efforts in developing solutions to complex problems, and to secure funding and other support to continuously improve our ability to assess and mitigate impacts on the environment. This phrase recognizes that science and technology do not yet exist to assess cumulative impacts in every case. Moreover, such assessments, and resulting proposals for mitigation, require funding.

Two crucial documents provide the most definitive analysis explaining cumulative impacts. The first is "Considering Cumulative Effects Under NEPA" (CEQ, 1997). This handbook has been called "the most comprehensive and useful information to date on practical methods for addressing cumulative effects in NEPA documents," by the Environmental Protection Agency (EPA). The second document is "Consideration of Cumulative Impacts in EPA Review of NEPA Documents" (EPA May 1999). This EPA document relies heavily on the CEQ handbook as its chief source of information.

Brief elaboration on the concept of cumulative impacts is presented here because of its critical importance to this Environmental Operating Principle. "The purpose of cumulative effects analysis is to ensure that federal decisions consider the full range of consequences of actions. Without incorporating cumulative effects into environmental planning and management, it will be impossible to move towards sustainable development, i.e. development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Considering Cumulative Effects Under NEPA, CEQ 1997)

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects, and any resulting environmental degradation, that should be the focus of cumulative impact analysis. While impacts can be differentiated by direct, indirect, and cumulative effects, the concept of cumulative impacts takes into account all identifiable disturbances, since cumulative impacts result in the compounding of the effects of all actions over time. Thus, the cumulative impacts of an action can be viewed as the total effects upon a resource, ecosystem, and/or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the actions. Consistent with the CEQ regulations (CEQ, 1987), effects and impacts are used synonymously in their guidance and in the Corps Environmental Operating Principles. CEQ's regulations (CEQ, 1987) explicitly state that cumulative impacts are to be evaluated along with the direct effects and indirect effects of each alternative. The Supreme Court has long held that the scope of the evaluation of such cumulative impacts is within the discretion of the implementing agency. Clearly, this must be done on a case-by-case basis within the Corps.

## Situational Awareness

This Principle is a commitment by the Corps to seek methods for both analyzing and then taking appropriate action to mitigate cumulative environmental impacts from Corps plans, programs, projects, and actions. Where necessary and appropriate, the Corps will seek the funds required to accomplish the assessments and mitigation. In some instances those assessments will be based on factual information and proven science. In other cases, little will be known about the precise impacts being addressed. In such instances, the Corps will attempt to continually improve its information base for producing sound assessment and mitigation plans. See Environmental Principle 6, which is related.

Recognizing that proper assessment of possible environmental impacts of proposed federal action is the first step in acting in an environmentally responsible manner, numerous environmental laws already require such assessments. The cornerstone of the National Environmental Policy Act (NEPA) is the environmental impact assessment (EA). The hazardous waste laws all require similar assessments in cleanup and restoration activities.

We need to appropriately collaborate with CEQ, EPA, the US Fish and Wildlife Service (FWS), the National Oceanic and Atmospheric Administration (NOAA), the US Department of Agriculture (USDA), and various non-governmental organizations (NGOs )to identify those existing processes that are reliable for analyzing cumulative impacts. We need to take advantage of ongoing and future research into this complex and difficult area of environmental impact analysis. When considering cumulative impact analysis it is important to consider, where appropriate, the entire watershed and the numerous activities that could potentially contribute to the impacts. Cumulative impacts should be considered during the entire life cycle of Corps activities including design, construction, and operation and maintenance.

## Relationship to Corps Missions/Activities

Most Corps civil works and military programs already have an active environmental assessment and mitigation component. For example, all of our existing projects constructed since the passage of NEPA have significant mitigation actions associated with them. This Principle stresses that assessment and mitigation be addressed early, and throughout a project's or program's life cycle using the best scientific information available. It also calls for additional research in building assessment and mitigation tools -- which transitions directly to our next principle.

**6. Build and share an integrated scientific, economic and social knowledge base that supports a greater understanding of the environment and the impacts of our work.**

## Elaboration of Principle 6

The Corps laboratories and experienced workforce position the Command to lead the way in developing the scientific, economic, and sociological measures used in evaluating the effects of our various projects, both civil and military, and ultimately providing an objective and reliable basis for assessing environmental impacts and benefits of a proposed program or project. The continued development of this knowledge base will also require outreach by the Corps to centers of expertise elsewhere in the government and in the private sector. Such action is consistent with the requirement in the Corps Strategic Vision to sustain recognition for its technical and professional excellence and stand ready to serve the Army and the Nation.

Our competent Corps workforce is one comprised of professionals from many disciplines, and is a strength that contributes to the Corps continued excellence in understanding and cooperating with environmental concerns among our project sponsors, other federal, state and local agencies, NGOs, and the Nation's professional engineering and design community. The Corps must be among the leaders in fostering greater appreciation and acceptance of the need for consideration of environmental sustainability factors, while meeting the Nation's civil and military needs.

The maturity of the sciences in the various disciplines involved in these activities is varied. For instance, our knowledge of ecosystem functions is incomplete when compared to the engineering sciences. Nevertheless, the Corps will use this knowledge to focus our research and development (R&D) efforts, and leverage those of others, to find better ways of achieving environmentally sustainable solutions in the future.

## Situational Awareness

This Nation's declining enrollment in science and engineering programs in our institutions of higher learning will result in a dwindling pool of qualified science and engineering professionals in the future. This will result in increasing competition for these skilled professionals from employers such as the Corps. Given this situation, the Corps must effectively utilize any specialized environmental expertise that it possesses. It also must have the capability to tap into sources of expertise that exist among other professional organizations, and federal, state and local agencies. Its success will depend on its ability to anticipate environmental problems of regional and national significance, to quickly identify the appropriate areas of technical knowledge required, and to energize interdependent knowledge coalitions both within and outside of the Corps to bring the appropriate expertise to bear on resolving the problem confronted.

The process whereby environmental sustainability factors are identified and evaluated as an integral part of the Corps program execution is a relatively new initiative that has yet to fully mature. It will evolve over time and require the input of other interested stakeholders, as further addressed in Environmental Operating Principle 7. Thus, the Corps should actively engage these interests in the development and implementation of this process.

## Relationship to Corps Missions/Activities

The Corps must continually identify its knowledge needs and resources. Corps leaders will be challenged to develop both internal and external networks that will provide efficient and timely access to information sources that will meet those knowledge needs. It also will be required to assure that others recognize and understand the extent of its knowledge resources and are provided effective channels for accessing such resources when required. Our managers should lead people to knowledge sources both within and outside of the Corps (e.g., other Army MACOMs, other federal, public, and private stakeholders). They must be able to foster cooperation and build teams with other knowledge agencies; confront and resolve both technical and social conflicts between those agencies; and, finally, develop information in support of decisions. This will demand a sophisticated human resources management style that is capable of developing people's learning capabilities by optimally developing, cross training, and positioning workers.

The Corps knowledge needs must address the environmental issues associated with current Army operational readiness concerns (e.g., unexploded ordnance cleanup, energy consumption, training range availability, etc.) as well as those arising from our performance of our many diverse civil works activities (e.g., using watersheds as an organizing principle; seeking greater balance between economics and environmental issues; sponsoring better monitoring activities; achieving environmentally sustainable solutions, etc.).

Corps leaders will have to foster a greater understanding among Corps members of the necessity for sound environmental knowledge as applied to project activities, and the learning, theory, and practice of environmental sciences in concert with the engineering and related professions. In essence, the cornerstones of the Corps environmental knowledge direction will need to include: professional environmental education of all Corps members, an internal environmental educational media effort, linking the Corps with community environmental efforts, and using Corps projects as hands-on learning and stewardship pilots for communities and educators.

As the Corps supports the Army and the Nation in solving the challenges of environmental sustainability, we must plan for future learning by filling talent voids through partnerships and personnel exchange mechanisms at the local, state, national and even international levels. This is likely to require us to work more closely with schools and universities to develop interest in the sciences and engineering.

The Corps has made a large investment in knowledge sharing through the Engineering Research and Development Community, long term training, etc. Measures need to be put in place to assure that the Corps as a whole is realizing the full potential of the benefits from these activities.

Similar to the challenges within the Corps innovative technology program, part of the challenge is designing systems (and people's use of these systems) that will deliver specific information to the people that need it. The Corps must make better use of the existing digital infrastructure if it is to be effective in terms of efficient, comprehensive knowledge acquisition, deliberation and decision-making.

**7. Respect the views of individuals and groups interested in Corps activities; listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the Nation's problems that also protect and enhance the environment.**

## Elaboration of Principle 7

All paradigms for solving societal problems are inherently incomplete, as the revolutionary analysis of mathematician, Kurt Gödel, demonstrated. Individuals and organizations outside the Corps have different mental models of the environmental issues we face as a Nation. Such individuals and organizations often have significant insights to contribute to the potential environmental solutions the Corps evaluates. Today, perhaps more than any other time in our history, we face very complex problems with economic and environmental factors that often appear to be at odds with one another. However, the diversity of opinions and ideas within our institutions provides a fertile ground for innovation. We need to encourage this type of dialogue and listen to what our citizens and organizations have to say.

This principle also charges the Corps to actively seek involvement of scientists, engineers, and other experts in academia, the private commercial sector, public interest groups and other interested federal, state and local authorities, and listen to their concerns with objectivity. The Corps recognizes its obligation to promote the interests of the Nation rather than the well-being of only those that most directly benefit from either a civil works or military action being taken.

## Situational Awareness

From June through November 2000, the Corps of Engineers conducted 14 regional Listening Sessions across the country, plus two national-level meetings to give everyone the opportunity to voice their concerns about future water resource challenges across the Nation. The purposes of the listening sessions were twofold. First, they were designed to provide everyone an opportunity to voice concerns about pressing water resources needs, problems and opportunities that impact their lives, communities and future sustainability. Second, they were to provide everyone the opportunity to tell the Corps what they believe the Federal role should be in addressing those concerns. Corps participation was limited to note taking. Consensus on water resources issues was not sought, but many of the recommendations were included in the Corps Civil Works Strategic Plan, which is currently with the Office of Management and Budget (OMB).

The Chief of Engineers has recently revitalized the Environmental Advisory Board to provide independent analyses and expert opinions on major programs and projects that impact the environment. Additionally, Corps senior leaders are conducting a dialogue with their counterparts

within the federal community to examine ways and means of collaboratively achieving environmentally sustainable water resources solutions and execution of its military environmental restoration activities. Further, discussions are also being held with congressional interests to find and encourage legislative support for synergy between development and environmental concerns.

## Relationship to Corps Missions/Activities

Why would the Corps strive to put this Principle into practice? The answer is rooted in the very fundamentals upon which our democracy is built. By treating citizens and the environment with respect today, we show consideration for future generations of humans, other species and the ecosystems upon which our continued existence depends. To do otherwise (i.e., by degrading the earth) exposes future generations to "remote tyranny." In a letter from Thomas Jefferson to James Madison, Jefferson wrote about the moral wrong of an earlier generation bankrupting or exploiting a future generation: "Earth belongs to the living... No man can by natural right oblige the lands he occupied... For if he could, he might during his own life eat up the usufruct [right to use] of the lands for several generations to come, and then the land belongs to the dead."

The Corps response to changing water resources needs over time has given rise to the diverse programs we now administer. The Corps, as a public service agency with a proud history, will continue to lead the Nation in emphasizing environmentally sustainable development. Meeting that challenge is another step in the evolution of water resources and military programs activities in response to changing societal values and needs.

# Appendices

## GLOSSARY

**Army Environmental Strategy:** In 1992 the Army's Environmental Strategy challenged Army leadership to recognize environmental stewardship as a strategic leadership function required for the wise management of resources. Stewardship was supported by the four pillars of **compliance** with environmental statutes; the **restoration** of contaminated sites; the **prevention** and elimination of pollution; and, the **conservation** and preservation of natural and cultural resources for future generations.

**Army Transformation (AT):** Initiated by Army Leaders in 1999, AT results from a thorough examination of needs established by the National Security Strategy (NSS) and National Military Strategy (NMS). The examination identified future trends and directions affecting the future world environment and related strategic challenges to the United States. The result was an innovative and forward-looking plan for a comprehensive Transformation that would apply to the entire Army, including Active Component and Reserve Component, and organizational and institutional structures. Transformation represents the necessary change in the nature and composition of the force itself. The transformed force that will achieve the Army Vision is an Objective Force that is responsive, deployable, agile, versatile, lethal, survivable, and sustainable—all of the required characteristics needed for the future.

**BRAC**: BRAC is an acronym for "Base Realignment and Closure." A BRAC site is one that is owned by, leased to, possessed by, or otherwise under the jurisdiction of Department of Defense (DOD). The BRAC program does not apply to those sites outside the U.S. jurisdiction. The goals of the BRAC program include: Close BRAC installations and transfer property as quickly, cheaply and safely as possible; and coordinate environmental cleanup and military construction projects.

**CERES Principles:** Ten codes of conduct established by the Coalition for Environmentally Responsible Economies, a U.S. coalition comprised of forward looking companies, investors and environmental groups committed to continuous environmental improvement and sustainable future.

**Corporate Responsibility**: Corporate responsibility implies mission sensibility and effectiveness often extending beyond the bounds of current circumstance and institutional boundaries but geared always to understanding the need for human dignity and the support of all life.

**Cradle to Cradle**: Describes the lifecycle assessment and optimization process used in (re)designing all products. Typical life cycle assessment scenarios look at a product from "cradle-to-grave." In a Cradle-to-Cradle; Lifecycle, at the end of a product's useful life, its materials become "food" for other systems.

**Cumulative Impact**: "The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." *NEPA CEQ Regulations - 40 C.F.R. §1508.7*

Defense Environmental Restoration Program (DERP): A program established by Congress in 1986 under Section 211 of the Superfund Amendments and Reauthorization Act (SARA) (10 U.S.C. 2701-2707 and 2810) to provide funding for cleanup of contaminated Department of Defense sites in a manner consistent with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

**Ecosystem:** An ecosystem is the network of the interactions between organisms and their environment. An ecosystem has both living and nonliving components. Living components of an ecosytem include plants and animals. Living components in all ecosystems tend to fit into particular roles or niches such as producers, consumers, and decomposers

**Environmental Advisory Board (EAB)**: A formal advisory group comprised of academics, subject matter experts, and industry leaders who meet with the Chief of Engineers for the purpose of making observations and recommendations on environmental issues facing the Corps, and to build partnerships, communication and cooperation with the environmental community and the public at large. Established in 1970 by then Chief of Engineers LTG Frederick J. Clarke, the EAB was recently revived by LTG Flowers, 50th Chief of Engineers, after a hiatus of approximately six years. The EAB operates under the Federal Advisory Committee Act (FACA).

**Environmental Sustainability:** Environmental sustainability is the dynamic under which the Earth's systems function together in a self-regulating and self-regenerating manner, maintaining a balanced interdependence while providing the essential ingredients for sustaining all life forms. It is the conceptual platform for the evolution of the Corps thought regarding the impact of its engineering endeavors upon the environment. For purposes of this doctrine, the Corps defines environmental sustainability as "a synergistic process whereby environmental and economic considerations are effectively balanced through the life cycle of project planning, design, construction, operation and maintenance to improve the quality of life for present and future generations." This definition is consistent with that developed by the Brundtland Commission, the three major elements of the PCSD, and the specific definition as it relates to water resources adopted by UNESCO/ASCE.

**FUDS:** Acronym for "Formerly Used Defense Sites." Numbering in the thousands, FUDS are those properties that the Department of Defense (includes former Army, Navy, Air Force, or other defense agencies' properties) once owned or used, but no longer controls. FUDS can range from privately owned farms to National Parks, and include residential areas, schools, colleges, and industrial areas. In terms of organizational control and policy, the FUDS Program within the Department of Defense (DoD) falls under the Defense Environmental Restoration Program (DERP). USACE is DoD's manager for the FUDS program. Program goals include: identification, investigation and cleanup of contamination from DoD hazardous substances; detection and disposal of unexploded ordnance; and demolition and removal of unsafe buildings and structures, located on a formerly owned Defense property, currently owned by a state, a municipality, or a Native Corporation in Alaska.

**FUSRAP:** Established in 1974 by the Atomic Energy Commission the Formerly Utilized Sites Remedial Action Program (FUSRAP) is a environmental remediation program comprised of 46 sites in 14 states. It addresses radiological contamination generated by activities of the Manhattan Engineer District and the Atomic Energy Commission during development of the atomic weapons in the 1940s and 50s. Its mission is to identify, investigate, and clean up or control sites where residual radioactivity exceeding current guidelines remains from the early years of the Nation's atomic energy program or other sites assigned to the Department of Energy by Congress. The 1998 Energy and Water Appropriations Bill transferred management of the FUSRAP Program to USACE. Previously, FUSRAP was managed by the U. S. Department of Energy.

**Interdependence of Life and the Physical Environment:** Interdependence of life and the physical environment refers to the dynamic and mutually dependent relationship between all life forms, the Earth's life support systems upon which they depend, and the products of human thought and activity.

**Knowledge Base:** Knowledge base is the dynamic and integrated source for our understanding of the world around us, and includes information, experience, theories, created extensions of known facts, and any information related to our ability to think, understand, and create.

**Learning Organization:** A "Learning Organization" is one in which people at all levels, individually and collectively, continuously increase their knowledge in order to produce results they really care about. The goal of a learning organization is to achieve high performance while enabling individual satisfaction and fulfillment. Information flow is key to differentiating between a traditional organization and a Learning Organization. In the former, information is filtered and directed through the hierarchy while in a Learning Organization, information and feedback flows simultaneously through all levels of the organization and each person, Central to a Learning Organization is a culture that foster a learning environment and encourages individual learning.

**Life Cycle Project Management:** A management orientation cuts across traditional functional lines to provide intensified and sustained integrated management of systems, products or projects throughout their life cycle, from initial concept through planning, execution and termination.

**Listening Sessions:** Conducted from June through November 2000, 14 regional forums and 2 national meetings between the Corps of Engineers and the public gave citizens the opportunity to voice their concerns about future water resource challenges across the Nation. Citizens voiced concerns about pressing water resources needs, problems and opportunities that impact their lives, communities and future sustainability, and also opined what the federal role should be in addressing those concerns. Corps participation was limited to note taking.

**Mental Models** - Our views and expectations, woven with our personal histories and our sense of self, that serve as the medium through which we interact with the world.

**Mitigate** - Acting in a manner that improves or modifies a program, project or decision for the benefit of the environment. To reduce; make less severe; alleviate or eliminate the environmental effects or impacts of individual or cumulative actions.

**NEPA -** The National Environmental Policy Act which perhaps provides the strongest basis for achieving sustainable solutions. NEPA establishes a national policy to "... encourage productive and enjoyable harmony between man and his environment; promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; enrich the understanding of ecological systems and natural resources important to the Nation…"

**Project Management Business Process (PMBP):** The fundamental business process that USACE uses to deliver quality projects, products, and services, including internal support services. The PMBP applies to management of programs as well as projects, and is used at all echelons of USACE. The backbone of PMBP is the practice of drawing from the diverse resources to assemble strong multi-disciplined teams, unlimited by geography or organizational boundaries, to best meet our clients' needs. The heart of the PMBP is client-focused teamwork.

**Seek Ways and Means:** To make good faith efforts to continue research efforts in developing solutions to complex problems, and to secure funding and other support to continuously improve our ability to assess and mitigate impacts on the environment.

**Superfund:** Years ago, people were less aware of how dumping chemical wastes might affect public health and the environment. On thousands of properties where such practices were intensive or continuous, the result was uncontrolled or abandoned hazardous waste sites, such as abandoned warehouses and landfills. Citizen concern over the extent of this problem led Congress to establish the Superfund Program in 1980 to locate, investigate, and clean up the worst sites nationwide. The EPA administers the Superfund program in cooperation with individual states and tribal governments.

**UXO:** Unexploded Ordnance Environmental Remediation is one of five DOD Mission Areas. UXO is explosive ordnance that remains unexploded either by design, malfunction, or for any other cause and is placed in such a manner as to constitute a hazard to people, operations, or materials.

**WRDA:** Acronym for Water Resources Development Act. A major legislative vehicle through which the Corps receives civil works authorities and funding authorization levels.