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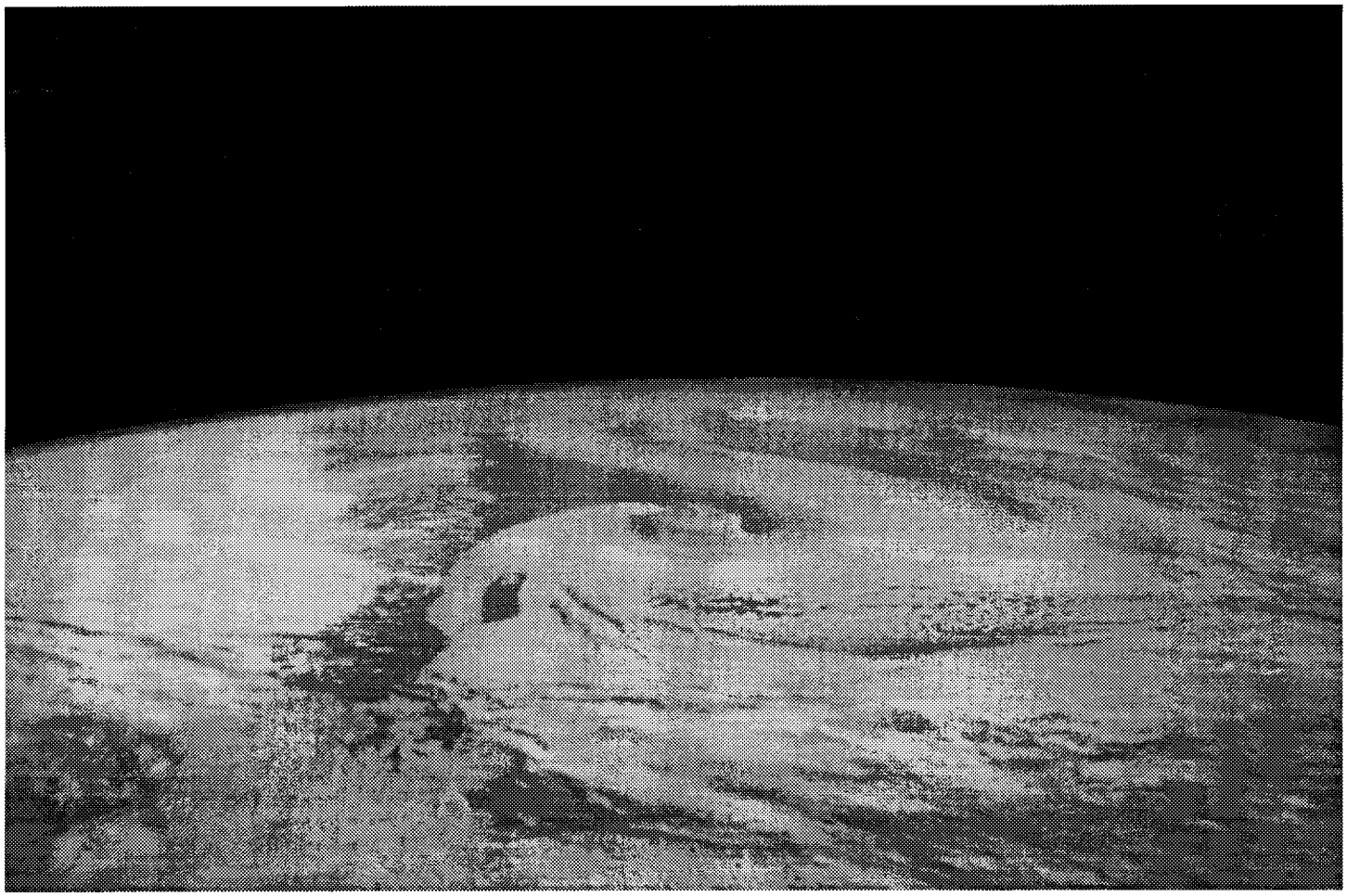
1997 Update to ORD's Strategic Plan



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April 1997

1997 Update to ORD's Strategic Plan

Office of Research and Development

U.S. Environmental Protection Agency
Washington, DC 20460

Foreword

I am pleased to present the 1997 Update to the Strategic Plan for the U.S. Environmental Protection Agency's (EPA's) Office of Research and Development (ORD). This plan summarizes the basis for the actions we have taken to respond to recommendations of numerous expert advisory groups committed to improving science at EPA. The plan serves as a framework for ORD to provide the highest possible quality environmental science to meet today's needs and lead us into the next century.

Central to our strategy is a system for determining research priorities based on risk assessment and risk management principles. We use this system to direct our resources to the nation's most important environmental issues—those areas with the greatest risk to people or the environment, those areas of greatest uncertainty in characterizing risk, and those areas with the greatest need to improve the efficacy of, or reduce the cost of, risk management.

We continue to enhance the quality of ORD's science products through independent peer review of all major aspects of the program, including research plans and proposals, science products, and even our own organization. We augment the efforts of our in-house cadre of experts through our expanding Science to Achieve Results program, which engages the best environmental scientists and technologists from United States universities and laboratories outside EPA. The plan also promotes greater partnership between ORD and our primary clients, EPA's Program and Regional Offices, as well as the external scientific community.

This plan is the foundation for ORD's future. We have designed our strategy to endure and yet be dynamic in the face of advancing scientific knowledge and understanding. While the plan details our current research planning process, long-term research goals and objectives, and near-term priority research topics, these components continue to evolve. Thus, this 1997 Update presents a snapshot of ORD's scientific and management evolution at this point in time. We are continuing to hone our strategic goals and objectives to better focus our work and align ORD's mission and activities with Agency priorities under EPA's new strategic planning process. Also, we have already begun to consider how advances in the state of environmental science and new human health and ecological issues on the horizon provide important perspectives for our 1998 planning efforts.

I take tremendous pride in being part of the team that is keeping ORD a strong and cogent scientific organization. I look forward to achieving ORD's vision for providing the scientific foundation to support EPA's mission guided by the continuing evolution of our Strategic Plan.

Robert J. Huggett
Assistant Administrator, Office of Research and Development

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List of Acronyms

AMI	Advanced Measurement Initiative
CRADA	Cooperative Research and Development Agreement
DBP	disinfection by-product
DOE	U.S. Department of Energy
EDC	endocrine-disrupting chemical
EPA	U.S. Environmental Protection Agency
GPRA	Government Performance and Results Act
IRIS	Integrated Risk Information System
LCA	life-cycle assessment
NAE	National Academy of Engineering
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NCEA	National Center for Environmental Assessment
NCERQA	National Center for Environmental Research and Quality Assurance
NERL	National Exposure Research Laboratory
NHEERL	National Health and Environmental Effects Research Laboratory
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NRMRL	National Risk Management Research Laboratory
ORD	Office of Research and Development
ORMA	Office of Resources Management and Administration
OSP	Office of Science Policy
PM	particulate matter
R&D	Research and Development
RFA	Request for Applications
SAB	Science Advisory Board
STAR	Science to Achieve Results
USGS	U.S. Geological Survey

Executive Summary

The U.S. Environmental Protection Agency's Office of Research and Development (ORD) has instituted significant changes in its organization and management procedures to provide the vision and direction for the scientific foundation of EPA's mission.

- First, ORD has aligned its organizational structure to comport with risk assessment and risk management principles and has made these principles central to our strategy for determining risk-based research priorities. In this way ORD can assure that science resources are directed to the most pressing environmental problems nationwide—pollution posing the greatest risks to people or the environment; environmental risks most difficult to understand and describe; and areas where we most need to improve the effectiveness and efficiency of managing environmental risk.
- Further, ORD has strengthened interactions with the larger scientific community in two ways:
  - By expanding our competitive extramural grants and graduate fellowship programs, we are working to stimulate research in areas vital to EPA by more broadly involving universities and other not-for-profit institutions.
  - By intensifying our peer review process, we ensure that all major facets of our science program are independently reviewed by experts external to our organization.

  Both of these activities leverage and potentiate our scientific expertise and capabilities.
- Most importantly, ORD's strategic planning and management process for selecting research priorities, instituted in 1995, has set us firmly on course to meet the science needs of today while positioning ourselves to identify and aid in resolving the environmental problems of tomorrow.

EPA's Mission

The mission of the United States Environmental Protection Agency is to protect public health and to safeguard and improve the natural environment—air, water, and land—upon which life depends. EPA's purpose is to ensure that:

- Federal environmental laws are implemented and enforced fairly and effectively.
- Environmental protection is an integral consideration in U.S. policies concerning economic growth, energy, transportation, agriculture, industry, international trade, and natural resources.
- National efforts to reduce environmental risk are based on the best available scientific information.
- All parts of society—business, state, and local government, communities, and citizens—have full access to information so that they can become full participants in preventing pollution and protecting human health and the environment.

May 6, 1996

This 1997 Update to the ORD Strategic Plan describes our revised strategy for research planning, the process for deploying our research plan, and our current research priorities.

Strategic Principles

The ORD Strategic Plan is based on nine strategic operating principles, summarized below, which draw on the many recommendations ORD has received from outside groups in recent years:

- Focus research and development on the ***greatest risks*** to people and the environment.
- Focus research on ***reducing uncertainty*** in risk assessment and ***improving cost-effectiveness*** in risk prevention and management.

- Balance ***human health and ecological*** research.
- Infuse ORD's work with a ***customer/client ethic.***
- Give priority to maintaining ***strong and viable core capabilities.***
- Nurture and support the ***development of outstanding scientists, engineers, and other environmental professionals.***
- Recruit and ***engage the best scientists from outside EPA*** through competitively awarded grants and fellowships.
- Require the highest level of ***independent peer review and quality assurance.***
- Provide the ***infrastructure*** to achieve and maintain an outstanding R&D program.

Most important of these principles is the explicit use of the risk paradigm to shape and focus our organizational structure and research agenda.

ORD's Vision, Mission, and Long-Term Goals

ORD's commitment to develop a risk-based research agenda requires us to examine our vision, mission, and goals and to develop a risk-based process for selecting and ranking those research areas of primary importance to EPA. ORD's vision and mission for the future arise from a consideration of the key role that ORD science plays within EPA and in the broader context of our nation's environmental research agenda. Our vision is that ORD will provide the scientific foundation to support EPA's mission. Our mission statement is divided into four main components: research and development, technical support, integration of scientific information, and anticipatory research. This translates into six long-term, overarching goals—broad areas of research and development where we believe ORD can and must make important contributions to EPA's mission and mandates and to our nation's overall environmental research agenda.

Setting ORD Research Priorities

Essential to meeting our long-term goals is a process we use to set priorities within the universe of possible research and to focus our efforts on those areas of primary importance to EPA's mission. Our priority-setting process involves the following steps:

- First, we ***involve all parts of EPA, including ORD's own researchers and staff, in helping us set research priorities.*** The Research Coordination Council, the Science Council, and Research Coordination Teams consisting of senior representatives from ORD's National Laboratories and Centers and EPA's Program and Regional Offices each identify important and relevant areas for our research efforts. We also work with EPA's Science Advisory Board, the National Research Council, and the private sector early in the planning process to ***obtain recommendations from the external scientific community*** regarding the major scientific directions and priorities for our research program. Based on this input, we identify potential research topics.
- We then narrow the pool of potential topics by ***selecting areas that clearly will contribute to fulfilling Agency mandates.***
- To these remaining areas falling within ORD's mission and goals, we ***apply a series of human health, ecological health, and risk management criteria to set priorities according to their potential to support effective risk assessment and enhance risk reduction***—for example, by reducing the uncertainties in risk assessment. We use comparative risk analyses, as needed, to ascertain the most pressing problems. We also consider whether the research would develop broadly applicable methods and models needed by EPA programs. We then ascertain whether ORD can make a significant contribution. Through this screening process, we set priorities among the research topics.
- We then define our specific R&D projects by ***considering each topic area in totality.*** For each topic area, we systematically examine the research needs within each component of the risk paradigm: effects, exposure, assessment, and risk management. Based on this analysis, we define a series of high-priority research activities across the risk paradigm that will produce a comprehensive set of useful risk-based results.
- Once we have identified our high-priority topics, we ***develop and implement a research program*** with specified roles for intramural and extramural participants, identifiable products, and provisions for accountability and visibility regarding progress on our commitments.

High-Priority Research

ORD has used the process described above to establish our research priorities for the next few years. Using our risk-based planning process and criteria, ORD has identified six high priorities that will receive special, expanded attention within the broader ORD program. These high priorities include three areas of research on environmental problems and three broad-based areas of research on methods and approaches that will impact many additional topics:

Environmental Problem Areas

- Safe drinking water (with a near-term focus on microbial pathogens, disinfection by-products, and arsenic)
- High-priority air pollutants (with a near-term focus on particulate matter)
- Emerging environmental issues (with a near-term focus on endocrine disruptors)

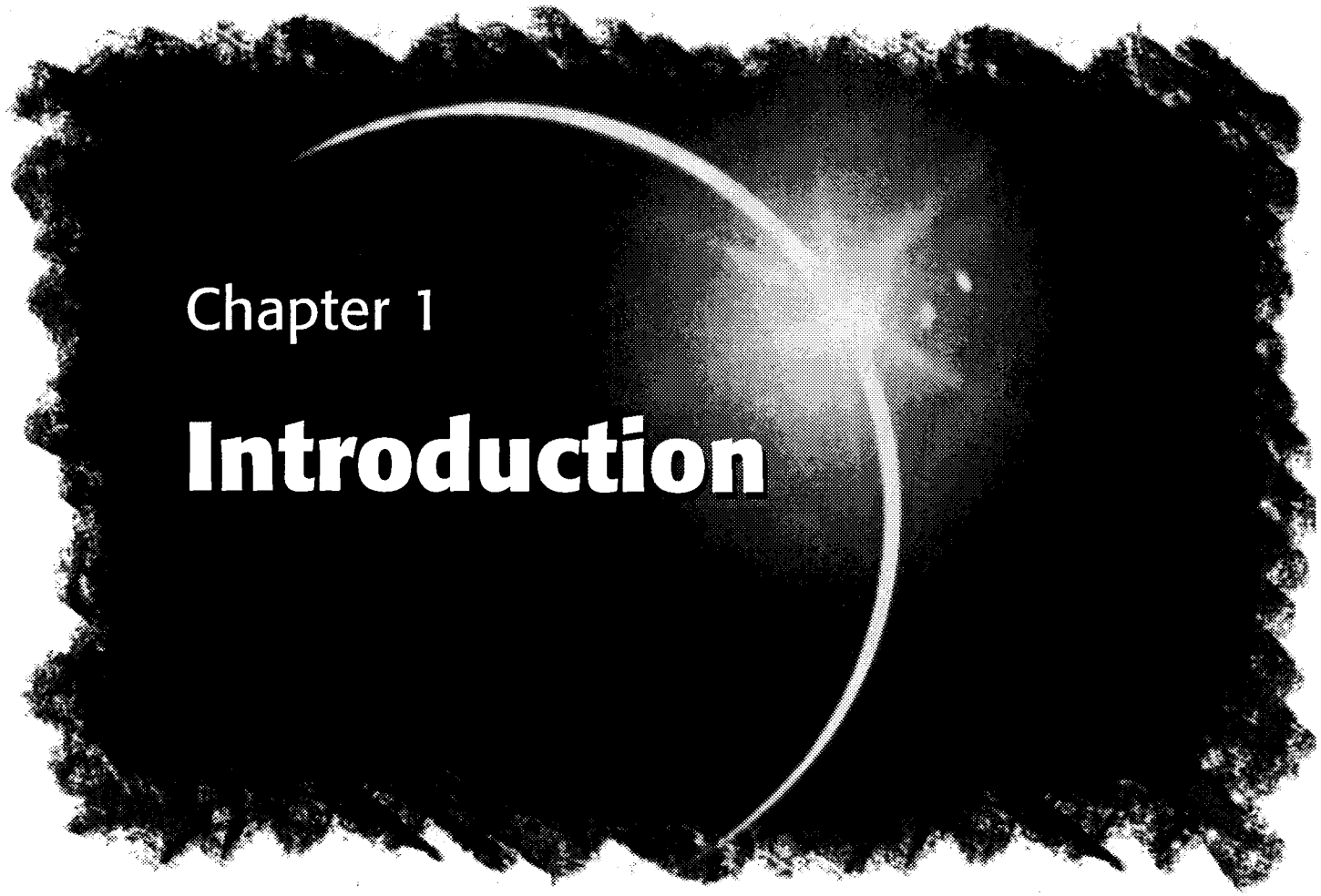
Broad-Based Methods and Approaches Areas

- Research to improve ecosystem risk assessment
- Research to improve health risk assessment
- Pollution prevention and new technologies for environmental protection

Planning for the Future

The Strategic Plan provides a blueprint for designing and implementing a research program to produce the sound science needed to support EPA's mission. In the years to come, ORD will place a continuing priority on providing the communication, infrastructure, and support necessary for successful implementation of the plan.

For ORD's stakeholders, including the EPA Program and Regional Offices, academia, the private sector, and other government agencies, the plan serves as a roadmap that explains ORD's research planning and implementation process, defines how our stakeholders contribute to this process, and specifies the goals, objectives, and products they can use to hold us accountable for our progress in environmental research. This plan is intended to serve as a practical tool for ensuring the constructive involvement of our stakeholders in establishing and executing ORD's research agenda during the coming years.



Chapter 1

Introduction

Science provides the foundation for credible environmental decision-making. It is vital to achieving a healthy population, thriving environment, and robust economy. Only through adequate knowledge about the risks to human health and ecosystems, and innovative solutions to prevent pollution and reduce risk, can we continue to enjoy a high quality of life. EPA has identified strong science and credible data as one of the guiding principles to fulfill the Agency's mission to protect human health and environmental quality. While all of EPA uses science for policy and regulatory decision-making, and various EPA offices contribute to the scientific underpinnings of the Agency's decisions, the responsibility for leadership in science at EPA and for the bulk of EPA's research and development work resides in EPA's Office of Research and Development (ORD).

ORD and the Risk Assessment/Risk Management Paradigm

We at ORD have shaped our organization and research agenda to strengthen EPA's science base and improve the Agency's and our nation's ability to effectively respond to the complex environmental challenges of the future. These efforts are based on a set of strategic principles we have developed (Table 1) that draw on the many recommendations we have received from outside groups and our own staff in recent years. The most important of these principles is the explicit use of the risk paradigm.

Risk assessment has been defined many times over the years, most notably in 1983 by the NAS (Figure 1), which consolidated and gave context to terms that had been defined in different ways up to that point. Risk assessment is the process that scientists use to understand and evaluate the magnitude and probability of risk posed to human health and ecosystems by environmental stressors, such as pollution or habitat loss or change. The resulting risk characterization, together with other public health, statutory, legal, social, economic, political, and technical factors, provides the critical input for deciding whether and how to manage the risk associated with a particular stressor. Risk management options may include both regulatory programs and voluntary activities (e.g., recycling) to reduce or eliminate the stressor or the consequences of subsequent risks.

The risk assessment process is one component of the overall process of risk management. The risk management process involves the recognition of a potential new risk and a decision by authorities to respond to concern about the risk. It includes risk assessment as well as a series of other scientific and technical activities, illustrated in Figure 2, that provide the scientific and technical data for making and implementing a risk management decision. The risk management process concludes with the selected risk management option(s) being implemented and the resulting environmental and/or public health improvements being monitored.

Figure 2 expands on the Risk Management Options portion of the original NAS paradigm to show the many scientific and technical activities, in addition to risk assessment, that are part of risk management. These

Table 1. ORD's Strategic Principles

- Focus research and development on the greatest risks to people and the environment, taking into account their potential severity, magnitude, variability, and uncertainty.
- Focus research on reducing uncertainty in risk assessment and on cost-effective approaches for preventing and managing risks.
- Balance human health and ecological research.
- Infuse ORD's work with a customer/client ethic that breaks down organizational barriers and ensures responsiveness to ORD's internal and external customers.
- Give priority to maintaining the strong and viable scientific and engineering core capabilities that allow us to conduct an intramural research and technical support program in areas of highest risk and greatest importance to the Agency.
- Through an innovative and effective human resources development program, nurture and support the development of outstanding scientists, engineers, and other environmental professionals at EPA.
- Take advantage of the creativity of the nation's best research institutions by supporting competitively awarded research grants to further EPA's critical environmental research mission.
- Ensure the quality of the science that underlies our risk assessment and risk reduction efforts by requiring the very highest level of independent peer review and quality assurance for all our science products and programs.
- Provide the infrastructure required for ORD to achieve and maintain an outstanding research and development program in environmental science.

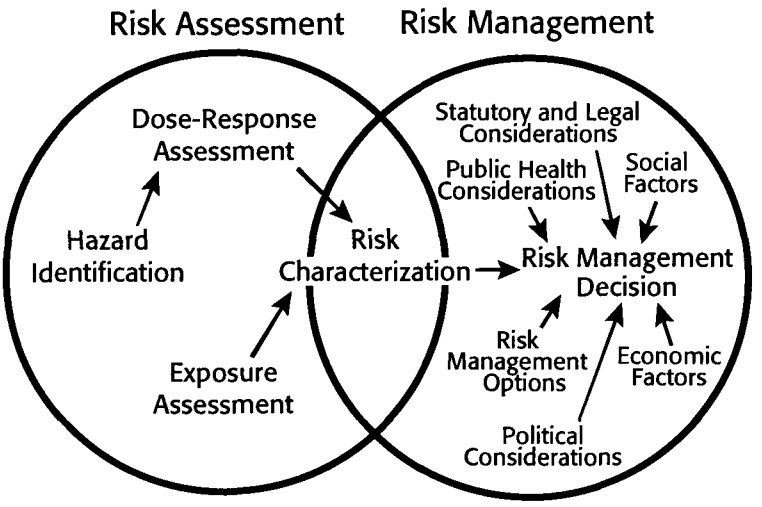
History of This Document

Work on this Strategic Plan began in 1995 by a task force comprised of staff from ORD's National Laboratories and Centers, as well as our Headquarters Offices. As we developed the plan, we consulted with our clients in EPA's Program and Regional Offices, and external stakeholders, to ensure that the plan would enable ORD to effectively meet their needs and maintain good customer relations. We also relied heavily on the advice of the National Research Council and EPA's Science Advisory Board.

In May 1996, we finalized our Strategic Plan and it has guided our program for a year. The plan has been fully peer-reviewed and reflects ORD's maturing process for evaluating and setting research priorities. The basic principles and priorities outlined in the 1996 plan remain unchanged, and substantial portions of the original text are intact. We are continually improving this process, based on our interactions with outside stakeholders and our own internal deliberations. For example, ORD staff identified several organizational improvements at our *First Annual Workshop on Managing Change.* This revision to our Strategic Plan reflects ORD's continuing evolution, as we address these recommendations. Major changes appearing in the 1997 plan include:

- Elaboration on the evaluation criteria for determining research priorities.
- Clarification of high-priority research topics/areas.
- Inclusion of information on and commitments from ORD's *First Annual Workshop on Managing Change* in Williamsburg, Virginia, December 1996.
- Expansion of the plan's discussion of technical support to EPA Program and Regional Offices.
- Information on ORD's new Information Management Plan.

Figure 1. The Risk Assessment/Risk Management Paradigm



*Adapted from:

Risk Assessment in the Federal Government: Managing the Process. National Academy of Sciences. 1983.

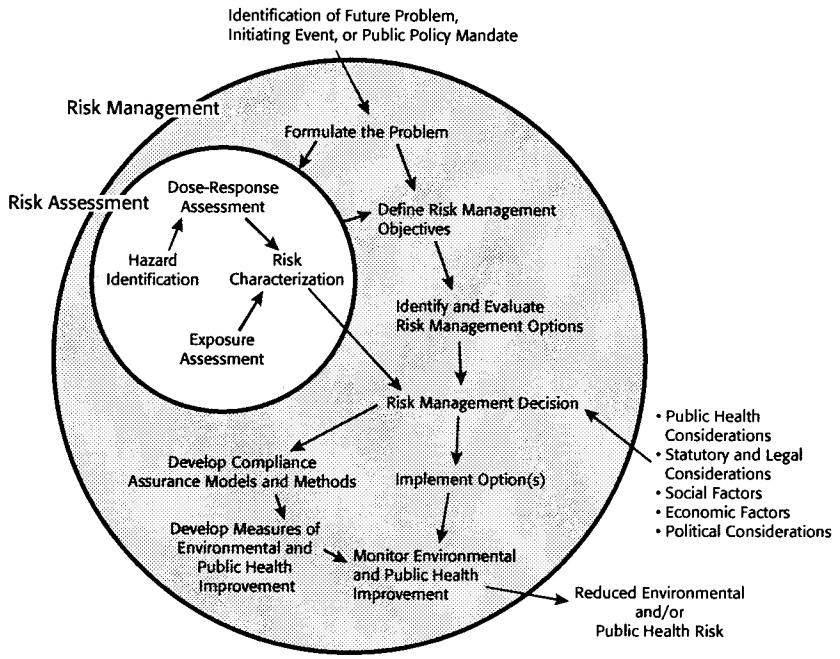
Science and Judgement in Risk Assessment. National Research Council. 1994.

The risk assessment process consists of four kinds of analyses:

- ***Hazard identification*** involves the description by scientists of the adverse effects (e.g., short-term illness, cancer, reproductive effects) that might occur due to exposure to the environmental stressor of concern. To identify potential hazards, scientists use the results of experimental studies on test organisms, reports about accidental exposure, and epidemiologic research.
- As part of the ***dose-response assessment,*** scientists determine the toxicity or potency of a stressor. The dose-response assessment describes the quantitative relationship between the exposure to a stressor and the extent of injury or disease.
- ***Exposure assessment*** involves scientists describing the nature and size of the population(s) or ecosystem(s) exposed to a stressor and the magnitude, duration, and spatial extent of exposure. It includes a description of the pathways (e.g., air, food, water) by which the stressor travels through the environment; the changes that a stressor undergoes en route; the environmental concentrations of the stressor relative to time, distance, and direction from its source; potential routes of exposure (oral, dermal, or inhalation); and the distribution of sensitive subgroups, such as pregnant women and children.
- In ***risk characterization,*** assessors use the data collected in the three previous analyses to predict the effects of human or ecological exposure to the stressor of concern. They estimate the likelihood that a population will experience any of the adverse effects associated with the stressor under known or expected conditions of exposure. This estimate can be qualitative (e.g., high or low probability) or quantitative (e.g., one in a million probability of occurrence).

The NAS paradigm was developed mainly in terms of principles relating to risk assessment and risk management for human health. While ORD recognizes that there are distinctions for ecological risk assessment and that scientific approaches to risk assessment have evolved and expanded since development of the NAS paradigm, the general principles set forth in the NAS paradigm are useful as an organizing focus for ORD's strategic thinking, and they have been supplemented by new guidelines relating to ecological risk assessment.

Figure 2. The Scientific and Technical Contributions to Risk Management



Scientific and technical activities contribute to every stage of the risk management process. Environmental risk management is initiated when a potential new environmental risk comes to light (such as an unusually high disease rate in a particular population) and authorities decide or are mandated to investigate it.

First, the ***problem must be formulated.*** This involves such activities as determining which stressor(s) (e.g., pollutants, habitat loss) is causing the problem, characterizing the sources of the stressor(s), how these stressor(s) reach target populations, and which human or ecological populations are affected. Once the problem has been sufficiently formulated, the risk assessment process can begin.

If sufficient information is available at this point, scientists and engineers can also begin to ***define risk management objectives*** (i.e., the degree to which the risk should be managed or reduced) and ***identify risk management options*** that can meet the objectives. Frequently, however, these activities must await further information, provided by the risk assessment, on which populations are at risk and how great that risk is. Once potential options have been identified, scientists and engineers ***evaluate the options*** to determine their performance and cost. Risk management options may include, for example, pollution control technologies, banning or controlling the use of certain chemicals, cleaning up or preventing access to con-taminated areas, implementing educational programs to encourage voluntary behavior changes on the part of the public or industry, and redesigning industrial processes to reduce or eliminate toxic waste production.

The resulting information on the feasibility of potential risk management options, together with the risk characterization (and public health, statutory, legal, social, economic, and political factors), is used to make a ***risk management decision.*** Typically, this will involve selecting one or more of the potential risk management options and designing a regulatory and/or nonregulatory strategy for implementing the chosen option(s).

Upon selecting a risk management strategy, scientists and engineers then ***develop compliance assurance models and methods*** (if the strategy is regulatory) and ***measures of environmental and public health improvement*** to monitor the success of the strategy in reducing risk to humans or ecosystems. Once the selected option(s) is implemented, scientists and engineers ***monitor the environmental and public health improvement.*** Monitoring data provide feedback to the risk management decision-makers about whether the risk management strategy is achieving the desired goals. Decision-makers may then amend the strategy, as necessary, based on these results. The final outcome of a successful risk management process is ***reduced environmental and/or public health risk.***

include characterizing the sources of environmental problems; identifying risk management options and evaluating their performance, cost, and effectiveness; and monitoring improvements in environmental quality and public health that result from risk management activities. ORD contributes to many of the areas depicted in Figure 2. In this way, ORD not only identifies and characterizes environmental problems but also helps to find and implement efficient, cost-effective solutions to these problems.

Audiences for This Document

This Strategic Plan is an important document for many different groups:

- Within ORD, the plan provides ***ORD staff*** with a blueprint for designing and implementing ORD's research program in the years to come. Also, it enables ORD staff to relate the individual research projects for which they are responsible to ORD's strategic goals and objectives, as well as to the Agency's environmental goal of "ensuring that the nation's environmental policies are based on the best science and information available."
- For our many ***stakeholders,*** including EPA's Program and Regional Offices, academia, the private sector, and other government agencies, the plan serves as a roadmap that:
  - Explains how we plan research and translate our plans into a research program.
  - Defines an explicit role for stakeholders in crafting and reviewing ORD's research agenda.
  - Specifies goals, objectives, and products that can be used to measure and hold us accountable for our progress in environmental research.

Critical Players and Linkages for Implementing ORD's Strategic Plan

The success of ORD's Strategic Plan relies on the contributions of many individuals, institutions, and sectors, as described below.

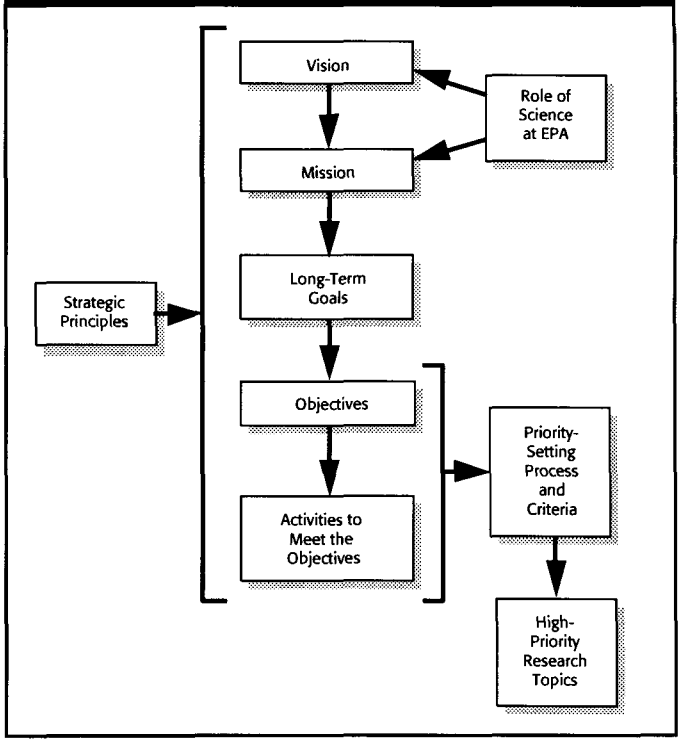
ORD Staff

First and foremost, ORD staff are crucial to the plan's success. ORD's scientists and engineers, in particular, are the repository of the core scientific and engineering capability in the Agency, as well as a vital conduit for the needs and potential contributions of ORD's research clients and partners.

Successful implementation of the Strategic Plan will depend on the success of ORD managers in communicating the plan to all our staff and in earning a sense of ownership of the plan and a shared vision of the work to be accomplished. While leadership for communicating this plan must cascade through ORD's management to our scientific, engineering, managerial, administrative, and clerical staff, ownership and implementation of the plan will depend on the expertise and dedication of our work force. ORD will place a continuing priority on "360-degree" communication and support to enable and inspire effective implementation of this plan.

At its *First Annual Workshop on Managing Change* in December 1996, ORD identified five cross-organizational improvement opportunities to improve our products, processes, and work environment. These five improvement opportunities (described in more detail on page 23 of this document) are: reducing red tape, improving communications, enhancing career development, providing adequate infrastructure to support ORD science, and integrating science with EPA's mission. In summarizing the next steps for implementing these organizational improvement measures, ORD staff

Figure 3. ORD's Strategic Plan



noted that each measure has both a "head" and "heart" component. Each measure simultaneously provides for meeting ***organizational*** (head) needs for time, information, expertise, tools, and strategic direction, as well as ***personal*** (heart) needs for empowerment, access, respect, opportunity, and alignment of each individual's work with Agency and ORD goals.

EPA Program and Regional Offices

Linkages between ORD and its primary clients (EPA's Program and Regional Offices) are essential to successful implementation of this plan. One important linkage is the day-to-day contact that ORD scientists and engineers have with EPA's Program and Regional Offices. This ongoing informal contact helps ensure that the ORD scientists and engineers involved in our planning process understand our client's needs.

In addition, this Strategic Plan establishes formal areas of linkage to ensure client input as we plan our research. We directly solicit input on priority needs and products from the Program and Regional Offices during the planning process.

ORD's Research Planning Advisors

Our planning process also relies on the contributions of many other groups who provide crucial input for formulating and executing our research program and priorities. These include other federal agencies (both directly and through the National Science and Technology Council and its Committee on Environment and Natural Resources), as well as the National Research Council, EPA's Science Advisory Board, and ORD's Board of Scientific Counselors.

ORD's Research Partners

Successful plan implementation also relies on ongoing partnerships between ORD and other research organizations in academia, the private sector, and other government agencies. These partnerships benefit all parties. They provide a common-sense and cost-effective way for ORD to utilize the special expertise residing outside our organization, while also reducing overlapping and duplicative work. Our partners enrich our research planning process and help ensure that our research products are appropriately targeted to stakeholder needs. ORD accesses and involves partner organizations in implementing our research program through a variety of cooperative arrangements and funding mechanisms.

Shared Leadership

In the context of environmental science, ORD serves both as a team leader for research planning within EPA and as a national leader within the larger scientific community for conducting the nation's environmental science. ORD implicitly shares responsibility for this leadership through our peer review protocols, which ensure both internal and external vetting of each critical step in our research process—from identifying research priorities to evaluating our eventual success.

Looking Ahead

As ORD implements its Strategic Plan in the years to come, we will strengthen our links with our clients and partners. We will work to expand our partnerships with other agencies, universities, and the private sector and to integrate our planning efforts with EPA's overall planning based on the Agency's Strategic Plan. Also, we will strive to forge links with the planning efforts of other federal agencies and other nations as appropriate.

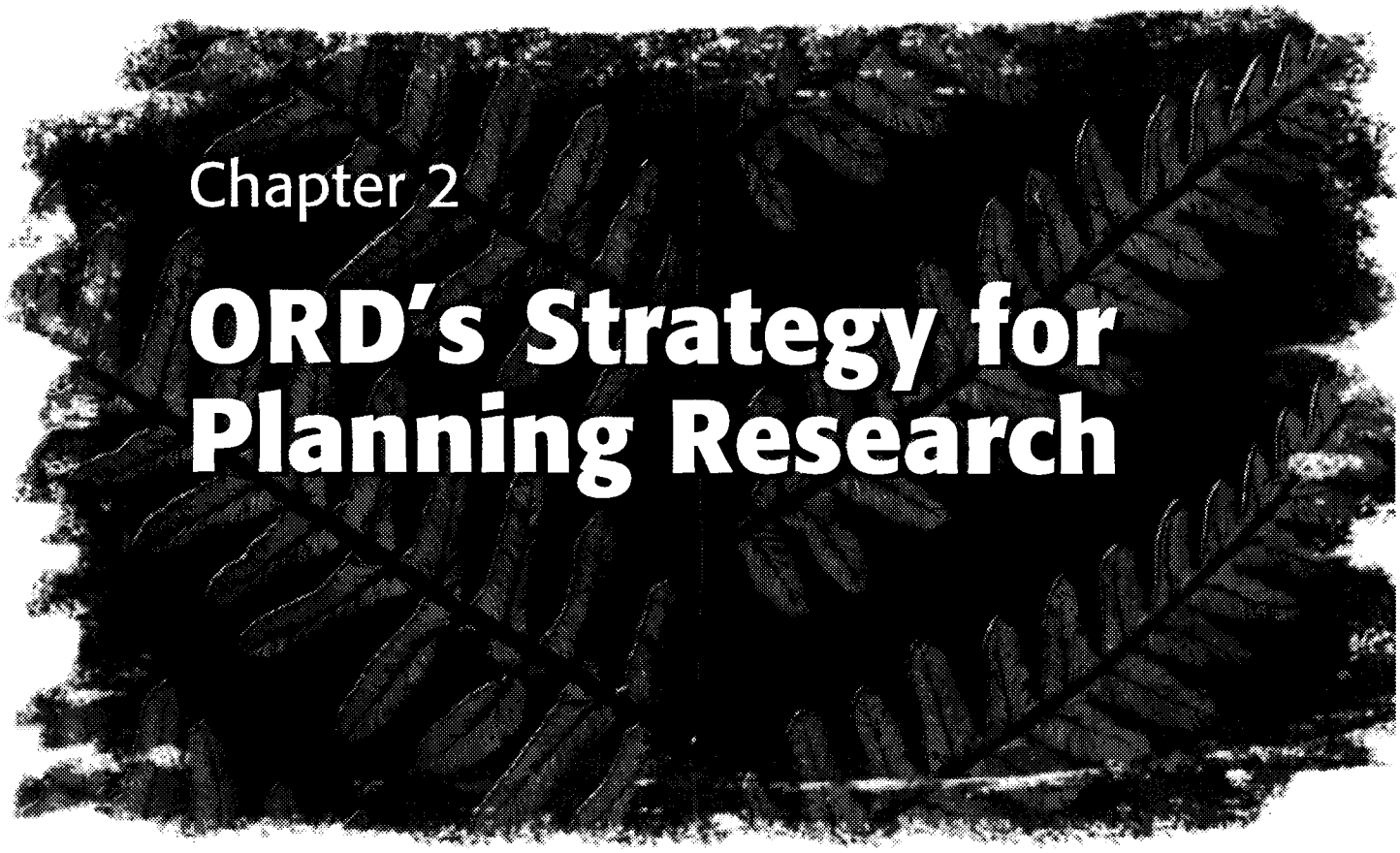
Evolution of the Strategic Plan Over Time

ORD's Strategic Plan is designed to be a robust "living" document. The plan provides a solid underpinning for ORD research that will allow us to maintain continuity and momentum in our work in the coming years, while also constructively adapting to changing EPA and national priorities over time. EPA is currently developing a new Agency strategic plan. ORD will work with other Agency offices to ensure that science is a strong element of that plan and supports Agency decision-making. We will adapt the ORD Strategic Plan as appropriate to ensure that it supports the Agency's strategy.

Additionally, we will periodically revisit and, as necessary, modify our Strategic Plan to ensure the continued productivity of ORD's research and development efforts to meet EPA, national, and international environmental goals. At the same time, we will work to ensure that, as the plan evolves, it continues to reflect goals and objectives that are shared throughout ORD.

A Roadmap for This Document

- *Chapter 2* of this plan defines strategic directions (including ORD's vision, mission, and long-term goals) for ORD research; describes how we identify specific research topics; lays out an approach to identifying emerging issues; establishes a risk-based process for determining our research priorities; and discusses the criteria used in priority setting.
- *Chapter 3* discusses ORD's new plan for information management; describes how we translate our Strategic Plan into a specific research program (including research plans, operating plans, laboratory implementation plans, and Requests for Applications); relates how we determine who does the work and when to close it out; describes how we will determine priorities for technical support; presents approaches to measuring success, as well as mechanisms for evaluation and accountability; and describes ORD's commitment to our human resources and infrastructure, including commitments to organizational improvement made at our *First Annual Workshop on Managing Change* in ORD. Finally, it identifies challenges for future consideration by ORD.
- *Chapter 4* describes the six high-priority research topics and areas selected when we applied our priority-setting process to the array of science needs identified by the Agency, and in the context of our long-term goals and objectives.
- *Appendix A* expands on ORD's long-term goals and lists the specific research objectives and activities ORD will pursue to achieve its goals.
- *Appendix B* describes ORD's organization built around the risk assessment/risk management paradigm.
- *Appendix C* describes ORD's management structure for implementing the Strategic Plan.
- *Appendix D* shows how ORD's extramural investments (in the form of Requests for Applications for research grants) relate to the high-priority research described in Chapter 4.
- *Appendix E* shows how ORD's fiscal year 1997 and 1998 program enhancements correlate to our high-priority research.



Chapter 2

ORD's Strategy for Planning Research

ORD's commitment to develop a risk-based research agenda undergirds our vision, mission, and long-term goals. This commitment also is embodied in our risk-based process for selecting and ranking those research topics of primary importance to ORD and EPA.

ORD's vision and mission for the future arise from a consideration of the importance of science at EPA and in the broader context of our nation's environmental research agenda and of ORD's key role in environmental science. Our vision, described below, represents the overall level of achievement that we will strive for in all our research and development work. Our mission statement, also described below, defines the broad areas of research and development where we believe ORD can and must make important contributions to EPA's mission and mandates and to our nation's overall environmental research agenda.

ORD's Vision

ORD will provide the scientific foundation to support EPA's mission.

ORD's Mission

ORD's mission is to:

- ***Perform research and development*** to identify, understand, and solve current and future environmental problems.
- ***Provide responsive technical support*** to EPA's mission.
- ***Integrate the work of ORD's scientific partners*** (other agencies, nations, private sector organizations, and academia).
- ***Provide leadership*** in addressing emerging environmental issues and in advancing the science and technology of risk assessment and risk management.

ORD's Key Role

Public and private sector institutions have long been significant contributors to our nation's environmental and human health research agenda. EPA's Office of Research and Development, however, is unique among scientific institutions in this country in combining research, analysis, and the integration of scientific information across the full spectrum of health and ecological issues and across both risk assessment and risk management. This broad scope has resulted in scientific and engineering expertise, physical facilities, and equipment that permit and encourage integrated multimedia and multidisciplinary research on environmental issues. As part of a regulatory Agency that establishes national priorities and sets national standards, ORD research is conducted to protect human and ecosystem health in a cost-effective manner and to provide a firm scientific and technical foundation for environmental decisions and standards.

ORD's Long-Term Goals and Objectives

ORD's four mission areas translate into six long-term, overarching goals (Table 2) that we will strive to meet in order to fulfill our mission. ORD's long-term goals and objectives are detailed in Appendix A. The objectives add another level of detail to our goals that will aid us in organizing and setting more detailed priorities in our annual research planning efforts. Some of the objectives also include a set of specific activities that we will undertake to achieve those objectives. These activities allow both internal and external stakeholders to see how we will conduct our work. Activities are listed under each objective.

We are working on refining our research goals and objectives to make them more specific and to enable us to clarify intended outcomes of ORD's science agenda. This refinement will not only better align our program with Agency-wide strategic planning, but will also allow us to track our progress toward achieving our program goals, as required by the Government Performance and Results Act of 1993 (GPRA).

Identifying Specific Research Topics

The objectives and activities listed in Appendix A of this plan provide detail about how ORD will go about meeting its long-term goals. Each objective and activity still represents a relatively broad research area. ORD, therefore, has developed a priority-setting process and criteria, illustrated in Figures 4 and 5 and described below, for identifying specific research topics that are of primary importance to our vision, mission, and goals. We will use this priority-setting process and criteria periodically

Table 2. ORD's Long-Term Goals

Mission Area	Goals
Perform research and development to identify, understand, and solve current and future environmental problems.	To develop scientifically sound approaches to assign and characterize risks to human health and the environment.
	To integrate human health and ecological assessment methods into a comprehensive multimedia assessment methodology.
	To provide common-sense and cost-effective approaches for preventing and managing risks.
Provide responsive technical support of EPA's mission.	To provide credible, state-of-the-art risk assessments, methods, models, and guidance.
Integrate the work of ORD's scientific partners.	To exchange reliable scientific, engineering, and risk assessment/risk management information among private and public stakeholders.
Provide leadership in addressing emerging environmental issues and in advancing the science and technology of risk assessment and risk management.	To provide leadership and encourage others to participate in identifying emerging environmental issues, characterizing the risks associated with these issues, and developing ways of preventing or reducing these risks.

to identify high-priority research topics that will help us achieve ORD's goals and objectives.

Each year since 1995 we have applied our priority-setting process and criteria to examine our ongoing research and identify important new initiatives. This year we have retained and refined our six priority research topics from 1996. As before, some of our priorities are specific to a particular environmental problem and others are broad-based, since they contribute basic science improvements in both risk assessment and risk management. These six research topics are described in Chapter 4 of this document.

Many topics will remain a high priority for several years. Each year, working with our program partners and external advisory bodies, we will examine the previous year's topics to add new topics as appropriate and remove previous topics for which sufficient research has been conducted.

Identifying Emerging Issues, Anticipatory Research, and Exploratory Research

In recent years, EPA has begun moving beyond environmental regulation to environmental protection in its broadest sense, including anticipating and preventing problems before they mushroom into major concerns. To support EPA in this endeavor, ORD is evaluating the best means to anticipate tomorrow's environmental problems and provide EPA with the necessary information to evaluate findings, interact with other agencies and organizations, and possibly act on early warnings of emerging environmental issues.

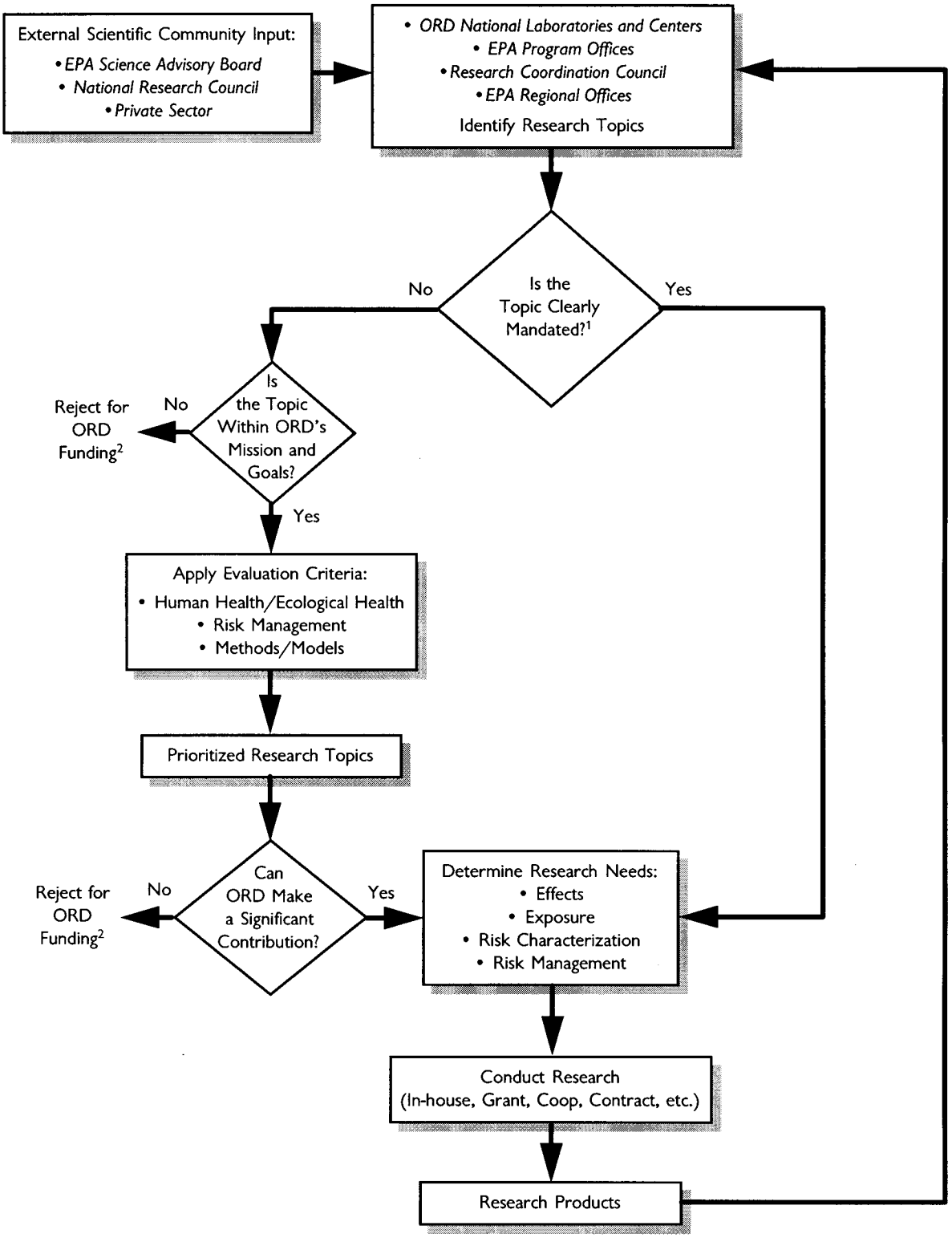
The EPA Science Advisory Board's January 1995 report *Beyond the Horizon: Using Foresight to Protect the Environmental Future* suggests many useful measures we will evaluate for possible implementation. One measure we are currently considering is the creation of "lookout panels" comprised of individuals from inside and outside the federal government to identify, screen, evaluate, and prioritize emerging issues. As a first step in this direction, the National Research Council established, at ORD's request, a Committee on Research Opportunities and Priorities for EPA. This committee was tasked with thinking creatively about ORD's research areas and identifying high-priority research topics key to solving some of our nation's most pressing current and future environmental problems. Such research could spark entirely new approaches to environmental management in the future. Each year, we will consider high-priority topics related to anticipatory research as we review and revise our research agenda.

ORD's Priority-Setting Process

ORD's priority-setting process, depicted in Figure 4, involves the following steps:

- First, we seek input from all parts of EPA, including ORD's own researchers and staff. The Research Coordination Council, the Science Council, and Research Coordination Teams (see Appendix C) consisting of senior representatives from ORD's National Laboratories and Centers, the EPA Program Offices, and EPA's Regional Offices identify the most important and relevant areas for our research efforts. (As state and local governments play a larger role in environmental protection, their research needs must also be considered at this stage.) We also work with EPA's Science Advisory Board, the National Research Council, and the private sector early in the planning process to obtain recommendations from the external scientific community regarding the major scientific directions and priorities for our research program. Finally, we consider the status and results of our recent research activities. Based on this information, ORD identifies potential research topics, for both intramural and extramural investments.
- We then separate the pool of potential topics into two categories:
  - Those that are clearly mandated because of statutory requirements or court orders (i.e., EPA may have no discretion to reject or delay the research).
  - All other topics.
- ***For all other topics,*** we narrow the pool by retaining only those that are within ORD's mission and goals.
  - We then apply a series of human health, ecological health, and risk management criteria (Figure 5) to compare the mission-related topics according to their potential to support effective risk reduction. We use comparative risk analyses to help ascertain the most pressing environmental problems. We also apply criteria to consider whether the research would develop broadly applicable methods and models needed by EPA programs. Through this screening process, we set priorities among the research topics.

Figure 4. Setting Research Priorities



[1]In other words, ORD has no discretion to reject or delay this research.
[2]EPA Program Offices and Regions may still choose to fund, using ORD labs, grants, contracts, etc., or a research source outside of ORD.