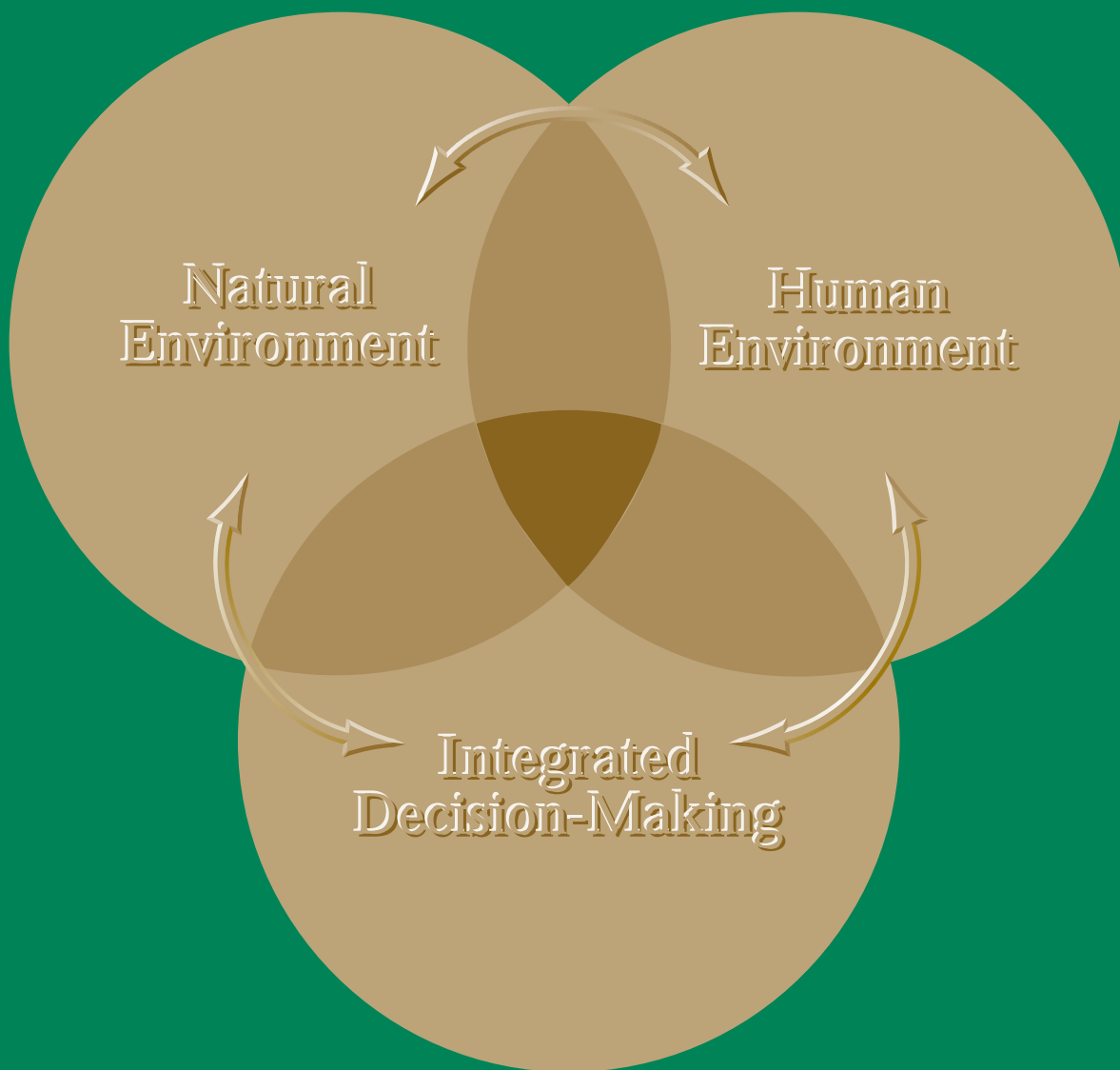


S T R A T E G I C P L A N

for
Environmental Research

Federal Highway Administration

1998 – 2003



April 1998

TABLE OF CONTENTS

Introduction	1
FHWA’s Environmental Research Program	1
Developing a Strategic Plan for Environmental Research	3
Working with Partners and Customers: An Ongoing, Cooperative Approach	5
Seeing the Whole Picture: An Integrated Approach	5
The 1998-2003 Strategic Plan for Environmental Research	7
Vision and Mission of the Environmental Research Program	9
Focus Areas and Program Goals	10
Program Goals and Objectives	12
Focus Area: Natural Environment	
Air Quality and Climate	12
Wetlands	14
Water Quality, Habitat, and Ecosystems	15
Focus Area: Human Environment	
Communities, Neighborhoods, and People	17
Environmental Justice	19
Noise	20
Cultural, Historic, Archaeological, and Scenic Resources	21
Focus Area: Integrated Decision-Making	
Integrated Transportation and Environmental Decision-Making	23
Implementation Strategies	25
Putting This Strategic Plan to Work.....	25
Coordination and Partnership	26
Dissemination and Outreach	27
Commitment to Excellence.....	29
Performance Evaluation	29

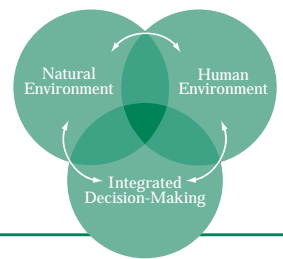
INTRODUCTION

Development of a world-class transportation system means achieving our Nation's mobility goals while ensuring that transportation decisions protect and enhance the natural environment and our communities. The transportation system is vital to our economy and quality of life, provides worldwide access to products and markets, and supports our Nation's productivity. It also provides valued mobility for people, including access to jobs, services and recreational opportunities. Yet transportation also creates unintended consequences on the natural environment and communities. Construction, maintenance, and operation of the transportation system affect air, water, soil, and biological resources, as well as neighborhoods and communities. This reality has imposed tremendous responsibilities

on the Federal Highway Administration (FHWA) that go far beyond its traditional role of enhancing mobility.

Transportation agencies must comply with various federal environmental statutes and regulations as they carry out transportation planning and project development. However, compliance with the law is only part of FHWA's obligation to the environment. FHWA is committed to environmental stewardship, striving to ensure that all of its programs and activities preserve and enhance the natural environment, the built environment, and the social environment of our Nation's communities. This commitment requires a vigorous program of research, technology transfer, and training. FHWA's Environmental Research Program is designed to meet this need.

FHWA's Environmental Research Program



FHWA's Environmental Research Program enhances our understanding of the impacts transportation facilities and services have on the environment, develops state-of-the-art tools for predicting and assessing these impacts, develops cost-effective mitigation and enhancement techniques, and provides training within and outside of FHWA. Housed within the Environmental Analysis and Environmental Operations Divisions of FHWA's Office of Environment and Planning, the Environmental Research Program has grown considerably in recent years as a direct result of a number of factors, including:

- FHWA's renewed commitment to environmental protection and enhancement, as evidenced by FHWA's Environmental Policy Statement of 1994 and the U.S. Department of Transportation and FHWA Strategic Plans, developed in 1997;
- Legislation such as the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and the Clean Air Act Amendments of 1990;

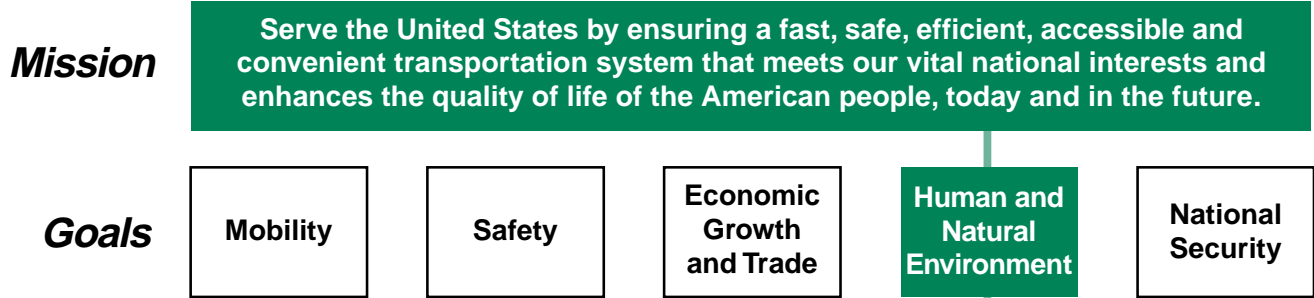
- Evolving decision-making processes in state and local governments due to ISTEA; and,
- An increasing awareness of a wide range of environmental issues that state and local transportation agencies need to address on a continuing basis.

As an important resource for environmental information and analysis, FHWA's Environmental Research Program supports a broad range of customers — including offices within FHWA, State Departments of Transportation (DOTs), Metropolitan Planning Organizations (MPOs), and other partners — who require different types of support to successfully integrate environmental concerns into transportation decision-making. The Environmental Research Program serves our customers by:

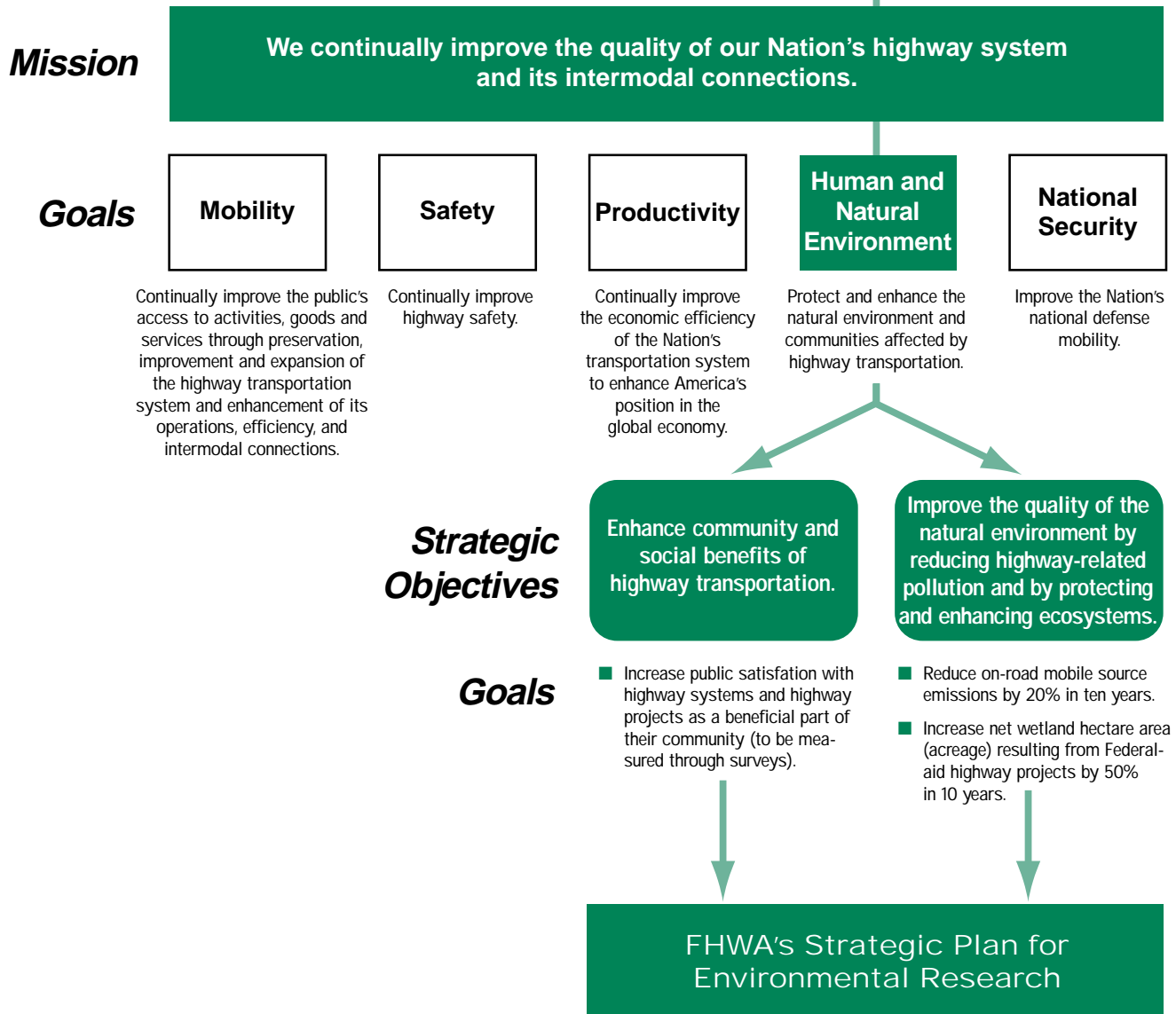
- Assisting state and local transportation decision-making;
- Supporting Federal policy development; and
- Educating and informing the public.

Figure 1: Relationship of Strategic Plans

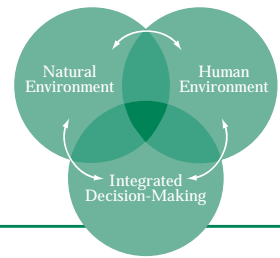
DOT's Strategic Plan



FHWA's Strategic Plan



Developing a Strategic Plan For Environmental Research



Strategies to Ensure We Meet Our Goals

This Strategic Plan for Environmental Research was developed to directly support the agency's strategic goals and objectives and the needs of its customers.¹ The U.S. Department of Transportation (DOT) Strategic Plan identifies the broad goals for the national transportation system, while the FHWA Strategic Plan sets the goals and strategies for FHWA's role within the Department. This Strategic Plan for Environmental Research was designed to ensure that FHWA's Environmental Research Program supports the missions and goals of these documents. The relationship of the Strategic Plan for Environmental Research with the U.S. DOT and FHWA Strategic Plans is illustrated in Figure 1.

The FHWA's Environmental Policy Statement (EPS) of 1994 provides further guidance for the Environmental Research Program. Through the EPS, the FHWA affirms its commitment to incorporate environmental stewardship into all policies, procedures, and decisions. The EPS emphasizes the importance of research, collaboration, technology transfer, and training, providing a clear mandate and direction for the Environmental Research Program.

Forging a Common Direction

Building on this foundation, the Environmental Research Program designed a strategic planning process to gather the perspectives and ideas of the full range of FHWA's constituents, including U.S. DOT staff and FHWA's key customers and stakeholders. Figure 2 shows the major sources of internal and external input to the Strategic Plan.

Within the DOT, staff of FHWA's Environmental Analysis and Environmental Operations Divisions collaborated with other DOT and FHWA staff to identify emerging issues, and to consider research needs and priorities. The collaborative process was used to ensure that future research would help to meet the Divisions' ongoing responsibilities, to clarify research

priorities, and to explore opportunities for cooperation among DOT and FHWA offices.

In addition, the Environmental Research Program gained new perspectives and received valuable input and recommendations from FHWA's customers and partners, especially those who are direct users of our research products and services. Major outreach efforts included the following initiatives:

- In May 1995, the FHWA, Federal Transit Administration, and Federal Railroad Administration co-sponsored a National Conference on Environmental Justice and Transportation, which brought together more than 200 grassroots environmental justice leaders, civil rights advocates, legal experts, planners, and government officials.
- In November 1996, the FHWA and the Transportation Research Board (TRB) held the Environmental Research Needs In Transportation Conference. This conference, co-sponsored by North Carolina State University and the Center for Transportation and the Environment, was attended by a broad-based group of more than 140 stakeholders in transportation and environmental research. The participants identified more than 90 specific research proposals in 13 subject areas, and recommended them as research priorities for FHWA and other transportation and environmental research agencies.
- In January 1997, the Research and Technology Coordinating Committee (RTCC) of the TRB, which provides an independent assessment of FHWA research and technology programs, released a report, titled "Clean Air and Highway Transportation: Mandates, Challenges, and Research Opportunities." The report suggests research needs, recommends changes in organization and coordination of research, and it recommends strengthening the linkages between research and policy development.
- In November 1997, a focus group for Environmen-

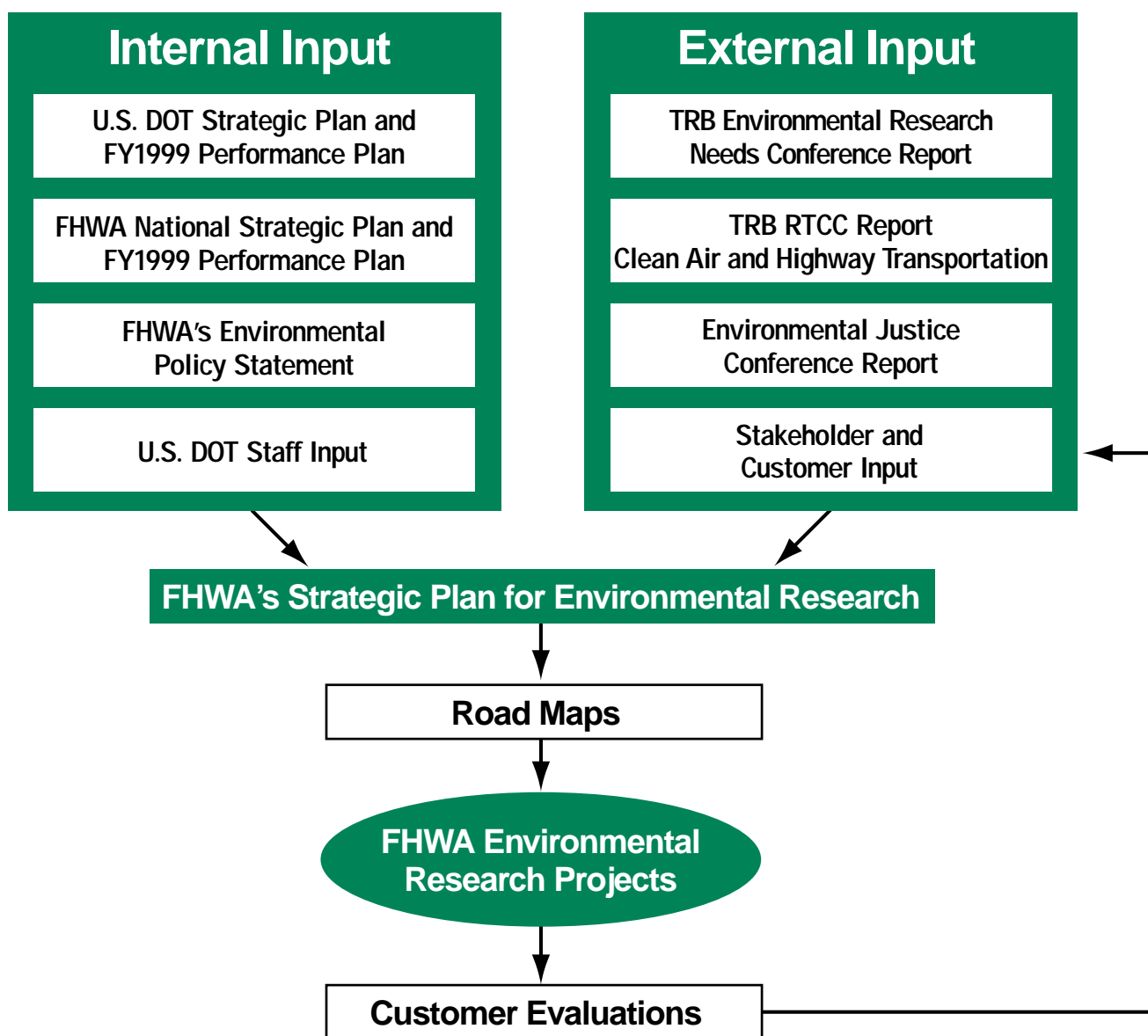
¹Copies of the DOT Strategic Plan and the FHWA Strategic Plan are available on the Internet at: <http://www.fhwa.dot.gov/environment/straprfrm.htm>. The 1994 FHWA Environmental Policy Statement is available at: <http://www.fhwa.dot.gov/environment/epsfinal.htm>. These documents are also available by calling the Environmental Analysis Division hotline at (202) 366-2069.

tal Research Program customers and partners was held to gain input on the overall direction of the Strategic Plan. The focus group provided valuable insights and recommendations on both the FHWA's Environmental Research Program and on specific ways to enhance program effectiveness.

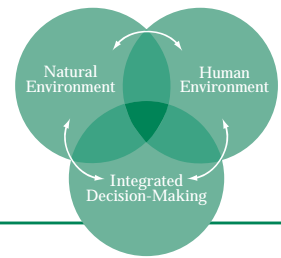
This Strategic Plan for Environmental Research incorporates many of the ideas generated by these

efforts, and is the product of an intensive process of internal review and stakeholder feedback. To support the implementation of this Strategic Plan, the Environmental Research Program is developing "road maps," which will guide the selection of specific research projects and management of outreach and dissemination activities. Ongoing program and project evaluations by customers will enable the Environmental Research Program to continually improve its research efforts.

Figure 2: Internal and External Inputs to FHWA's Strategic Plan for Environmental Research



Working With Partners and Customers: An Ongoing, Cooperative Approach



FHWA and our partners in academia, other Federal agencies, State and local governments, research institutions, the private sector, and non-governmental organizations all play vital but different roles in promoting research on transportation and the environment. The broad spectrum of organizations involved in transportation and environmental research provides a strong “infrastructure” for effective research in a complex and multi-faceted field. To take best advantage of this capacity, the Environmental Research Program works to coordinate our research activities with those of our partners. Through close communication with other research programs, opportunities are identified to exchange information, to coordinate specific research projects, to share resources, and to conduct joint research when appropriate.

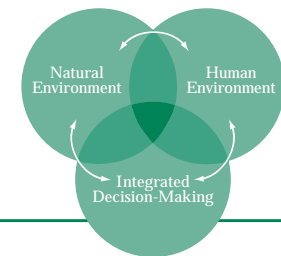
The input which the Environmental Research Program receives from our customers and stakeholders plays a crucial role in every phase of the research process — from identifying research priorities, conducting research, and applying research results, to evaluating our progress and identifying future research needs. FHWA is committed to working closely with the organizations and individuals who use our research products to ensure that we most effectively serve our ultimate customers: the individuals and communities who depend on and are affected by the Nation’s transportation system. For example, our research efforts related to air quality are coordinated with the work of the U.S.

Environmental Protection Agency (EPA). For our research focused on wetlands, we work cooperatively with EPA, the U.S. Corps of Engineers, and the U.S. Fish and Wildlife Service.

Customers and partners of the Environmental Research Program include the following:

- FHWA field offices, State Departments of Transportation (DOTs), Metropolitan Planning Organizations (MPOs), State Environmental Agencies, and local governments;
- FHWA and U.S. DOT Offices, including the Office of the Secretary (OST), the Federal Transit Agency (FTA), and the Volpe National Transportation Systems Center;
- Other Federal agencies, including the U.S. Environmental Protection Agency (EPA), the U.S. Corps of Engineers, the U.S. Fish and Wildlife Service, the Council on Environmental Quality, the Advisory Council on Historic Preservation, and others;
- The U.S. Congress;
- Environmental researchers and academic institutions;
- Community organizations, industry, and interest groups; and
- The public at large.

Seeing the Whole Picture: An Integrated Approach



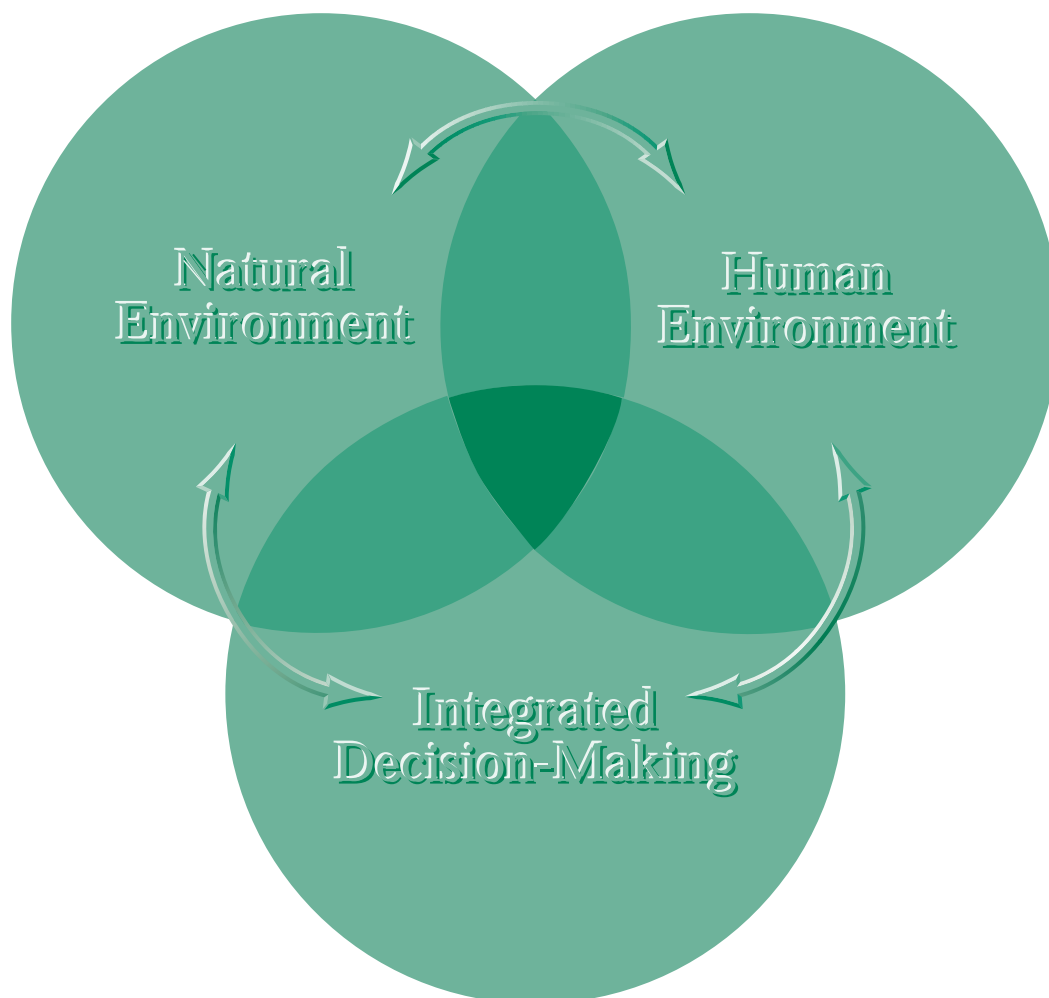
Making effective decisions about transportation requires a comprehensive look at the livability and sustainability of the natural and human environment. The Environmental Research Program recognizes that the interaction of individual effects on these environments must be fully understood to assess the impacts of transportation decisions on habitats, ecosystems, and communities.

The focus areas of FHWA’s Environmental Research

Program reflect this integrated approach. As illustrated in Figure 3, the Environmental Research Program focuses on research in three related areas: Natural Environment, Human Environment, and Integrated Decision-Making. These three focus areas support FHWA’s strategic objectives for the human and natural environment.

The important research programs and priorities within each focus area are detailed in this Strategic Plan.

**Figure 3: Interrelated Focus Areas
for the Environmental Research Program**



Today's transportation decisions often depend on the tools and knowledge developed in all three focus areas. For example, a sound decision about regional infrastructure investment priorities must consider many factors, including air and water quality, mobility, safety, habitat protection, economic development, neighborhood livability, equity, and historic preservation. Mitigation strategies designed to improve air quality may benefit wildlife habitat as well. New maintenance practices developed to protect water quality may also contribute to improved safety conditions for highway users. By promoting research to better understand the interactions among environmental responses and the cumulative effects of transportation decisions, the En-

vironmental Research Program is working to support transportation decision-making that reflects the full complexity of these decisions.

Transportation and Land Use

Land use is a critical issue currently facing communities across the Nation. How land is used affects many aspects of the natural environment, including air quality, water quality, and vegetation. Land use also has many other effects, including impacts on economic development, community values, quality of life, and mobility. The land use implications of transportation on the natural and human environment are an important aspect of the Environmental Research Program.

Research initiatives to understand the linkages between transportation and land use, and to integrate land use planning with transportation decision-making, are identified under many goals in this plan. Examples include the need to better understand land use linkages to air quality, to promote ecosystem and watershed-based planning, and to promote noise-compatible land use planning.

These and similar initiatives will continue to receive special attention within the Environmental Research Program. Other types of land use issues will be addressed by FHWA's Sustainability Initiative, as coordinated by the agency's Metropolitan Planning Division, and Intermodal and Statewide Planning Division. The Sustainability Initiative, which considers the long-term balance among environmental, economic, and equity goals and their relationship to transportation, will lead research efforts to ensure that all transportation-based land use considerations will be examined. The Environmental Research Program will work closely with these efforts, contributing expertise on the relationship of transportation to the natural and human environment.

Travel Behavior and Travel Growth

Just as land use patterns affect numerous aspects of the environment, travel growth has a variety of envi-

ronmental and community implications. Research into what promotes or curtails growth in highway travel can provide insights into the potential for mitigating environmental impacts associated with travel. The extent to which transportation projects allow or encourage travel growth needs to be clearly understood. Understanding travel growth is also important because it affects transportation investment decisions, which have various environmental impacts. FHWA research on travel behavior and induced travel is led by the Metropolitan Planning and Intermodal and Statewide Planning Divisions, with participation and support from the Environmental Research Program.

Cumulative Effects of Transportation

Research on holistic approaches to identify the cumulative and indirect effects of transportation is part of this Strategic Plan. The Strategic Plan emphasizes the development of research tools and techniques that apply, not only to project development, but also to system planning, maintenance and operations, and redevelopment. In addition, the Environmental Research Program develops training for managers to aid their decision-making on environmental and community impact assessment.

The 1998-2003 Strategic Plan For Environmental Research

This Strategic Plan for Environmental Research provides direction and focus for all areas of environmental research undertaken by, or on behalf of, FHWA's Environmental Research Program from FY 1998 to FY 2003. It articulates a vision of the desired outcomes of the program and a framework for research decisions, enabling FHWA to target scarce resources to most effectively meet its research priorities. It describes how the Environmental Research Program will continue to work

cooperatively with our partners and stakeholders. Finally, it discusses our plan to evaluate our success in meeting agency and program goals. Implementing this Strategic Plan will help ensure that resources are used wisely, that investment in research produces useful results and products, and that research effectively serves the needs of FHWA's many customers. Figure 4 provides an overview of the Strategic Plan.

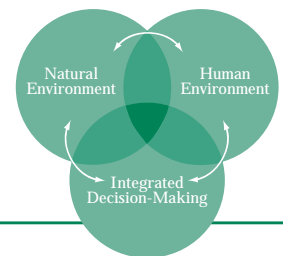
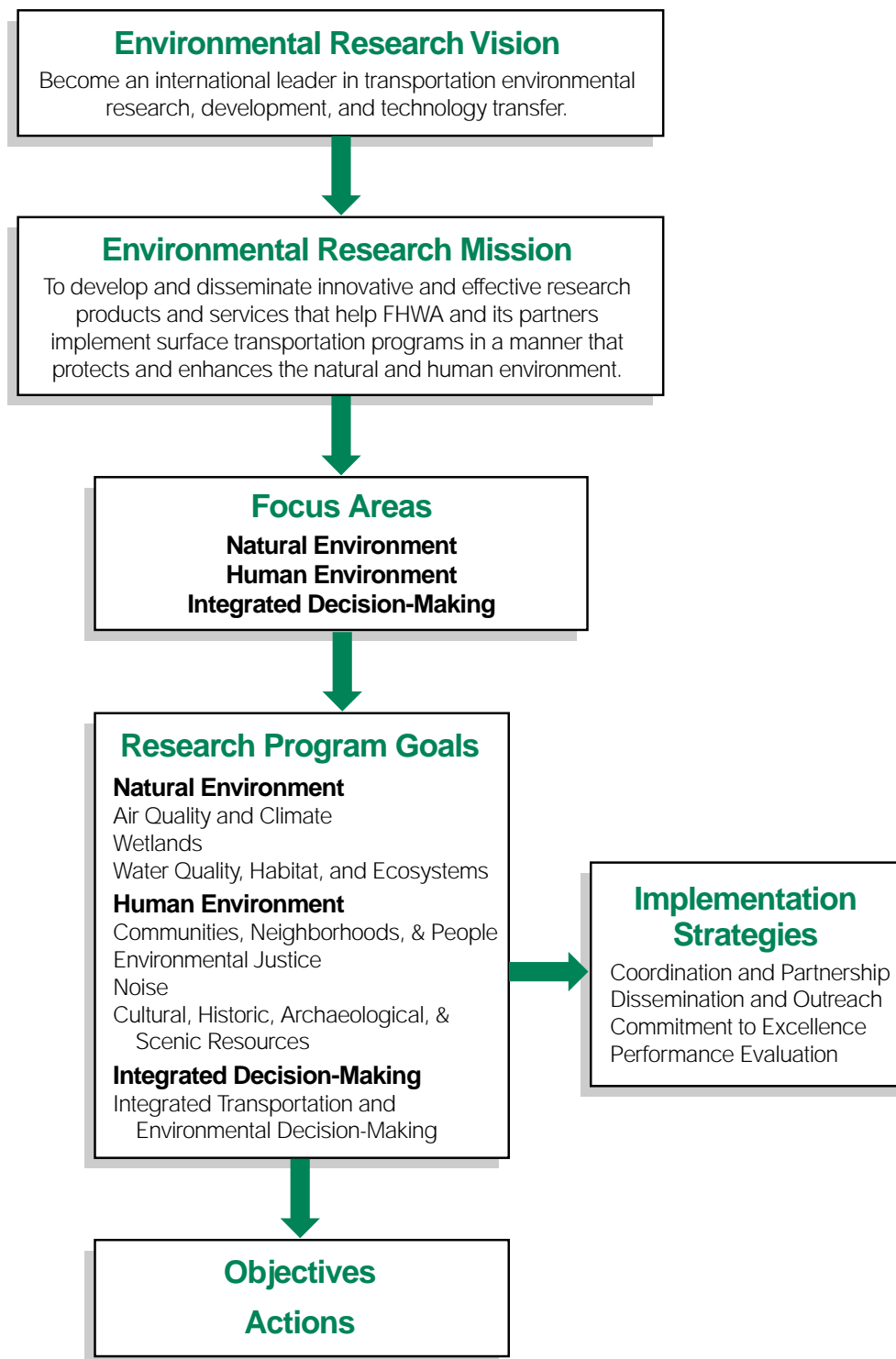


Figure 4: Overview of FHWA’s Strategic Plan for Environmental Research²



²Additional information on the Strategic Plan can be obtained from the FHWA Office of Environment and Planning web page: http://www.fhwa.dot.gov/environment/oep_home.htm

VISION AND MISSION OF THE ENVIRONMENTAL RESEARCH PROGRAM

In order to support the agency's strategic goal for the environment, FHWA's Environmental Research Program has established the following vision and mission:

Vision

Become an international leader in transportation environmental research, development, and technology transfer.

Mission

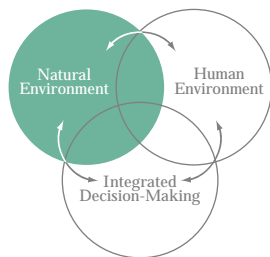
To develop and disseminate innovative and effective research products and services that help FHWA and its partners implement surface transportation programs in a manner that protects and enhances the natural and human environment.

This mission statement provides direction for all of the research activities undertaken by the Environmental Research Program. The emphasis is on results—developing information, analyses, tools, training, and technical assistance to make transportation decisions that are the most beneficial for our communities and natural environment.

FOCUS AREAS AND PROGRAM GOALS

FHWA's Environmental Research Program has established eight program goals that fall under our three focus areas. Each program goal is supported by a set of strategic research objectives. Specific research actions have been identified to achieve these objectives. The goals of the Environmental Research Program's focus areas and of the programs within each focus area are summarized below. In the following pages, the priority needs within each program area are discussed, followed by a description of the strategic objectives and supporting research actions that respond to these needs.

Focus Area: Natural Environment



Goal:

Protect and improve the quality of the natural environment by developing and disseminating the tools and expertise required to predict and assess transportation impacts, apply optimal mitigation and enhancement methods, and support environmentally sound transportation initiatives.

Programs:

Air Quality and Climate

Program Goal: Develop analytical techniques and cost-effective mitigation strategies to reduce the amount of transportation-related emissions and greenhouse gases.

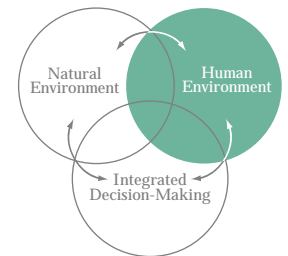
Wetlands

Program Goal: Develop tools, techniques, and methods to reduce direct and indirect adverse impacts of Federal-aid highways on wetlands and increase net wetland acreage.

Water Quality, Habitat, and Ecosystems

Program Goal: Develop tools, techniques and methods to reduce direct and indirect adverse impacts of highways on water quality, habitat, and ecosystems to preserve and enhance human health, biological productivity, and ecological diversity.

Focus Area: Human Environment



Goal:

Protect and enhance the human environment by developing and disseminating the tools, techniques and expertise required to: assess the beneficial and adverse impacts of transportation decisions on communities; apply optimal mitigation and enhancement methods; and support sound and equitable transportation plans, programs and projects.

Programs:

Communities, Neighborhoods, and People

Program Goal: Develop and disseminate the skills, tools and information needed to achieve effective transportation decision-making that protects and enhances the human environment and quality of life through full consideration of communities, neighborhoods, and people.

Environmental Justice

Program Goal: Develop and disseminate the skills, tools and information to assess, prevent and address potential discriminatory effects and disproportionately high and adverse health and environmental effects of transportation decisions on low-income and minority populations.

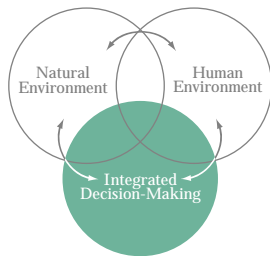
Noise

Program Goal: Develop analysis techniques, abatement methods and effective noise compatible land use planning tools to reduce the adverse impacts of noise.

Cultural, Historic, Archaeological, and Scenic Resources

Program Goal: Improve procedural and impact assessment methods for the identification, evaluation, and protection of historic and archaeological resources and scenic quality.

Focus Area: Integrated Decision-Making



Goal:

Redesign Federal environmental and transportation decision-making to ensure an integrated process at the Federal, State, tribal, and local levels that achieves the best overall public interest decisions.

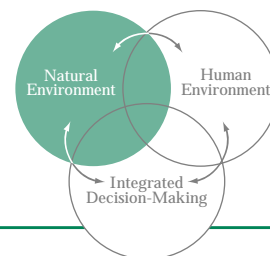
Program:³

Integrated Transportation and Environmental Decision-Making

Program Goal: Develop and disseminate skills, tools, and information to redesign Federal environmental and transportation decision-making, and to ensure an integrated process at the Federal, State, tribal, and local levels that achieves the best overall public interest decisions.

³This focus area also includes another program area, Real Estate Services, which is not within the scope of this plan. The primary responsibility for this program rests with the Office of Real Estate Services.

PROGRAM GOALS AND OBJECTIVES



Air Quality and Climate

Program Goal: Develop analytical techniques and cost-effective mitigation strategies to reduce the amount of transportation-related emissions and greenhouse gases.

Motor vehicle travel generates emissions of various air pollutants and greenhouse gases. Pollutants of particular health-based concern are called criteria pollutants, for which the U.S. Environmental Protection Agency has established National Ambient Air Quality Standards (NAAQS) that specify acceptable pollutant concentration levels. In addition to health impacts, air pollutants can reduce visibility, damage crops and vegetation, and damage materials and buildings. Air pollution also affects water quality and ecosystems. There is a broad international consensus that carbon dioxide and other greenhouse gases trap heat in the Earth's atmosphere, causing potentially harmful changes in the Earth's temperature.

The Clean Air Act Amendments (CAA) of 1990 significantly increased the emphasis on demonstrating that transportation investments do not hinder the ability of air quality nonattainment areas to achieve the NAAQS. Transportation plans must be shown to conform with the purpose of the approved State Implementation Plan (SIP), which details the steps States will take to attain the NAAQS. Reducing on-road mobile source emissions by 20 percent in 10 years is identified as a strategic objective in FHWA's National Strategic Plan. New NAAQS for small particulate matter and ozone present new challenges to urban areas to meet these standards. In addition, the threat of global climate change has important implications for transportation energy use nationwide. These pressures serve to highlight the importance of FHWA's research to support and inform policy development through targeted research and to identify strategies for reducing transportation-related emissions. In order to meet this challenge, FHWA's Environmental Research Program has identified the following strategic research objectives and activities:

Objective: Develop the analytical tools, and provide training and technical assistance, to predict emissions under the current NAAQS, greenhouse gas emissions, and emissions under the new NAAQS (ozone precursors and PM-2.5).

To ensure that transportation investments contribute to attainment of the NAAQS and support the President's global climate change initiative, U.S. DOT, States and Metropolitan Planning Organizations (MPOs) need tools to predict and assess the implications of investment on emissions. The assessment of transportation-related emissions presents challenges to the transportation sector. In particular, the new NAAQS for fine particulates (PM-2.5) raise many difficult questions for transportation professionals because much is unknown about the chemical composition of particulates and about the contribution that transportation sources make to the formation of fine particulate matter. In addition, the new NAAQS for ozone require that nonattainment areas, Regions, and States develop new strategies to address regional ozone transport. These pressures highlight the need to support and inform policy development through targeted research on pollutant formation and transport. To meet this objective, FHWA's Environmental Research Program will:

- Develop, in cooperation with the U.S. Environmental Protection Agency (EPA), a PM-2.5 emissions model.
- Develop improved methodologies to model oxides of nitrogen (NO_x), particularly from heavy duty vehicles.
- Develop improved analytical techniques for tracking and quantifying greenhouse gas emissions.
- Develop, with EPA, an integrated approach to better link transportation models with emissions models to estimate the emissions impacts of Intelligent Transportation Systems (ITS) and other transportation strategies.

- Develop improved user-friendly methodologies and guidance for States and MPOs to assess the effects of transportation investments, including Congestion Mitigation and Air Quality Improvement Program (CMAQ) projects, on air quality.
- Develop comprehensive model training packages, including CD-ROMs.

Objective: Identify and disseminate information on cost-effective strategies, including transportation control measures (TCMs) and technological innovations, to reduce emissions of criteria pollutants and greenhouse gases from transportation sources.

States and Metropolitan Planning Organizations (MPOs) need to have an array of cost-effective strategies to ensure that transportation investments contribute to air quality and greenhouse gas goals. The CMAQ program, established under the Intermodal Surface Transportation Efficiency Act (ISTEA), provides funds to States for air quality improvement projects. There is a need to enhance the effectiveness of CMAQ projects and ensure that transportation planning fully considers emissions impacts. To meet this objective, FHWA's Environmental Research Program will:

- Identify, document, and disseminate information on cost-effective local and regional transportation strategies, including ITS strategies and pricing mechanisms, that improve air quality.
- Identify and evaluate technological innovations to improve air quality.
- Analyze potential strategies to reduce greenhouse gas emissions.
- Establish effective partnerships with the Research and Special Programs Administration (RSPA), the Department of Energy, and others on global climate

change initiatives, including new vehicle technologies.

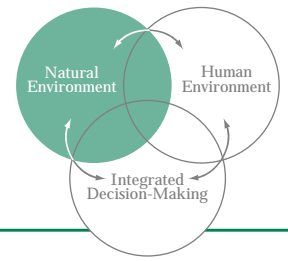
- Assess, in conjunction with other research efforts in the FHWA Office of Environment and Planning, the air quality impacts of alternative land use strategies.

Objective: Develop, implement and evaluate a campaign to educate the public and policy makers on the relationship between transportation choices and emissions impacts.

Motor vehicle emissions are affected by individual travel choices and decisions made by state and local officials on transportation investments and motor vehicle emissions programs, such as inspection and maintenance projects. In order to achieve a public consensus on strategies to reduce emissions from transportation sources, a better understanding of public perceptions and support for transportation and air quality programs is needed. To meet this objective, FHWA's Environmental Research Program will:

- Research, analyze, develop, and test communications methods, including use of the Internet, to better inform policy makers and the public about the relationship between individual transportation decisions and transportation-related emissions.
- Develop and institutionalize a national coalition of public and private transportation and air quality organizations.
- Implement a national public education campaign at three pilot and 25 additional sites on the relationship between transportation choices and emissions impacts.
- Evaluate campaign effectiveness.
- Develop and disseminate information on global climate change.

Wetlands



Program Goal: Develop tools, techniques, and methods to reduce direct and indirect adverse impacts of Federal-aid highways on wetlands and increase net wetland acreage.

Wetlands are important to both the environment and the economy. Wetlands provide a wide range of benefits that include habitat, support of commercial and recreational fisheries, reduction of flood damages, and abatement of water pollution. The construction, use, and maintenance of highway systems have direct and indirect effects on wetland resources and other aquatic ecosystems. Due to the linear nature of highway projects, many cross watercourses and some may have unavoidable adverse effects on wetlands. In addition, land use changes associated with highway construction create indirect impacts on wetland resources. Impacts to wetlands are regulated under Section 404 of the Clean Water Act.

Whereas past efforts have focused on no net loss of wetlands, recent priorities have shifted to producing net increases in wetland acreage. FHWA's National Strategic Plan sets a goal of a 50 percent increase in net wetland acreage resulting from Federal-aid highway projects in 10 years. Achieving this goal will serve as one indicator that the agency is meeting its strategic objective to protect and enhance ecosystems.

A critical challenge for FHWA is to develop information, policies, and tools to ensure resource managers and transportation decision-makers use the most efficient and effective approaches to mitigate transportation impacts on wetlands, and to replace lost wetland functions and area. Wetland managers and transportation planners and designers must emphasize integration of transportation project development with watershed-level resource management plans. The results of effective research will provide the tools to help managers, regulators, and transportation decision-makers protect and enhance watershed values and provide the scientific knowledge to build consensus for policy and regulatory decisions.

In order to meet FHWA's objective to protect and enhance ecosystems, FHWA's Environmental Research Program will focus on the following strategic objectives:

Objective: Develop tools for integrating transportation system planning and watershed-based resource

management to enhance and preserve natural resource values and functions.

Wetland mitigation needs are currently identified on a project-by-project basis, as required by the regulatory process and project design and construction schedules. This situation fosters a piecemeal approach to mitigation that might not address the management needs for watershed resources. Watershed-based planning has the potential to improve the effectiveness of mitigation, reduce mitigation costs, and help prevent adverse cumulative and indirect impacts from transportation projects. Although resource agencies are promoting watershed planning, a comprehensive watershed planning process that includes transportation issues and considerations has not been developed. To meet this need, FHWA's Environmental Research Program will:

- Develop ongoing communication and partnerships among watershed stakeholders, regulatory agencies, and the transportation community in watershed and transportation planning.
- Analyze watershed resources and recommend techniques and practices to reduce or minimize transportation impacts on watershed functions and values.
- Develop a pilot program to serve as a model for the integration of transportation system planning and watershed management.

Objective: Develop approaches to analyze and minimize indirect and cumulative impacts of highway development, reconstruction, and maintenance on wetlands.

While methods to assess direct impacts of highways on wetland function are currently being advanced, there is little understanding of the indirect and cumulative effects of highways on wetlands. These impacts are not accounted for under the Section 404 permit process. Better understanding of indirect and cumulative impacts is necessary for decision-makers to fully account for these effects in land use and transportation planning. To meet this objective, FHWA's Environmental Research Program will:

- Synthesize studies on the linkages between highway development, reconstruction, and maintenance, and indirect impacts on wetlands and water quality.
- Identify methods to assess the indirect and cumulative impacts of highway development, reconstruction, and maintenance on wetlands and water quality.

Objective: Develop and provide information on cost-effective techniques to mitigate unavoidable wetland impacts.

Compensatory mitigation for unavoidable wetland impacts typically requires DOTs to be closely involved in the development or restoration of compensation sites including land purchase; mitigation design, construction, and monitoring of replacement wetlands; and long-term maintenance. Various methods have been identified to compensate for unavoidable impacts to wetlands that may be less costly, such as wetland banking and use of fee-based compensation. Additional information on these techniques is needed to develop a consensus with regulatory agencies on the effectiveness and applicability of these methods and to ensure that state and local agencies have the capacity to carry them out effectively. In order to meet this objective, FHWA's Environmental Research Program will:

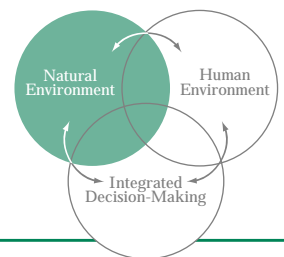
- Identify and evaluate appropriate wetland mitigation methods and techniques.
- Identify appropriate use of in-lieu fee programs and approaches.

- Work with regulatory agencies to develop consensus on cost-effective methods and approaches.
- Provide information on cost-effective mitigation methods to State and local agencies and assistance to implement them effectively.

Objective: Identify new wetlands restoration techniques along with techniques to modify existing wetland restoration designs to improve water quality and ecological results.

Annually, millions of dollars are spent on planning, design, and construction of wetlands to mitigate transportation impacts. Many projects involve particular construction techniques that are expensive and of uncertain ecological value. To truly be a steward of the environment, FHWA must ensure that the wetlands it develops are cost-effective and function in a manner that is beneficial to water quality and species. To meet this objective, FHWA's Environmental Research Program will:

- Study the relationship between wetlands, water quality, and habitat (wetlands functions).
- Evaluate techniques for improving water quality and ecological success of wetland construction projects.
- Evaluate tools to assess cumulative water quality and ecosystem impacts of highway stormwater runoff on an area-wide or watershed basis.



Water Quality, Habitat, and Ecosystems

Program Goal: Develop tools, techniques, and methods to reduce the direct and indirect adverse impacts of highways on water quality, habitat, and ecosystems to preserve and enhance human health, biological productivity, and ecological diversity.

The construction, use, and maintenance of transportation systems have potential primary and indirect effects on water quality, habitat, and ecosystems. Since all highway sections lie within or cross a watershed, all phases of infrastructure development have the poten-

tial for impacting surface and ground water resources. Pollutants in surface runoff from roadway facilities and motor vehicle emissions are delivered to surface waters and infiltrate to groundwater. In addition, maintenance of facilities, such as application of pesticides and herbicides to roadside vegetation, and de-icing may have water quality impacts. Highways have direct effects on ecosystems and species through habitat fragmentation and disruption. In some cases, roadside vegetation management practices have also introduced non-native plant species to habitats, which may

adversely affect ecosystem productivity and species diversity. In addition, hazardous waste and redevelopment of contaminated properties can impact human health. Indirect impacts of transportation on patterns of growth and future development also can have important impacts.

A number of environmental regulations define requirements related to natural resources, including the Clean Water Act, Endangered Species Act, Fish and Wildlife Coordination Act, and the Wild and Scenic Rivers Act. In addition to complying with these laws, FHWA seeks to take a proactive approach to prevent adverse impacts of highway development and redevelopment on water quality, habitat, and ecosystems. Such an approach emphasizes comprehensive watershed and ecosystem planning, rather than a piecemeal or project-based approach.

This strategic research program goal supports FHWA's strategic objective to improve the quality of the natural environment by protecting and enhancing ecosystems. To carry out this program goal, FHWA's Environmental Research Program has established the following strategic research objectives:

Objective: Develop watershed-based and other area-wide assessment techniques that identify the impact of highway development, operation, and reconstruction on water quality and ecosystems.

Studies of highway runoff have traditionally been driven by regulatory requirements relating to the constituents and concentrations present in runoff. Indirect, delayed or synergistic effects are not fully studied and there remain uncertainties about the nature of short- and long-term effects of highway runoff on surface and groundwater environments. Similarly, there is a lack of data concerning thresholds of impacts on ecosystems and species. In addition, comprehensive information on background water quality is not currently a component of impact assessment studies. Changes due to implementation of watershed-based resource management programs will require continuing research to provide the transportation community with tools for area-wide impact assessment. In order to meet these needs, FHWA's Environmental Research Program will:

- Develop techniques to determine and assess the contribution of air pollutants and atmospheric fallout to water quality degradation.
- Identify the impacts of highway development through studies of habitat function and stability and toxicological research.

- Develop new and update existing tools to characterize and predict contributions to water pollution from roads versus other watershed sources.
- Inventory and categorize the indirect impacts of highway development on water quality, habitat, and ecosystems.
- Develop training on highway water quality issues, such as erosion and sediment control and stormwater runoff.

Objective: Identify cost-effective techniques to reduce adverse impacts of highway development, reconstruction, and maintenance on water quality, watersheds, and ecosystems.

Reauthorization of the Clean Water Act and the Vice-President's Clean Water Initiative will likely provide impetus for transportation decision-makers to implement new ways to reduce water quality impacts from highways, particularly through application of water quality and wetland protection programs on a watershed basis. To achieve this objective, FHWA's Environmental Research Program will:

- Identify tools and techniques to assess the long-term effectiveness of water quality best management practices, including ultra-urban techniques.
- Identify methods to retrofit existing highway facilities to enhance and improve water quality, reduce highway runoff, and enhance the effectiveness of existing mitigation methods.

Objective: Develop highway maintenance and vegetation management guidance for protecting and restoring water quality and habitat.

Existing infrastructure, maintenance, and operation have significant impacts on water quality and habitat. In particular, roadside vegetation management and system maintenance can have significant water and ecosystem impacts. Environmental stewardship requires research to lessen adverse effects from existing infrastructure and ongoing highway activities. Methods need to be developed and communicated so that State DOTs can maintain their systems in an environmentally sensitive way and restore the natural environment. In order to do so, FHWA's Environmental Research Program will:

- Evaluate economic and ecological effects of various roadside management and maintenance techniques.

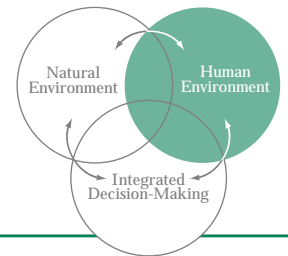
- Develop native plant restoration techniques specific to roadside use, especially following weed control projects and other rehabilitation efforts.
- Identify, assess, and promote the use of Integrated Roadside Vegetation Management (IRVM) plans on a state-by-state basis.
- Identify inventories and catalogue native plant species and their interaction with roadside habitats to understand factors affecting their sustainability.

Objective: Develop methods to assess the safe use of waste materials in highway construction, reconstruction, and maintenance, and to consider brownfields and other contaminated properties during transportation development.

Federal, State, and local agencies are under increasing pressure to consider the use of waste and recycled materials during the development, operation, and maintenance of transportation facilities. At the same time, development of transportation infrastructure will increasingly be impacted by hazardous waste issues as

regulatory requirements increase. As the ability to locate projects in areas which are free of pre-existing contamination declines, and as efforts to support the redevelopment of brownfields grow, transportation will increasingly encounter hazardous waste issues in re-use of contaminated properties. Operation and maintenance also offer opportunities to prevent creation of hazardous waste. To meet this objective, FHWA’s Environmental Research Program will:

- Identify techniques for the safe use of recycled or waste materials in highway construction.
- Identify techniques to minimize or mitigate water quality degradation and soil contamination from waste and recycled materials.
- Analyze the environmental effects, liability, and other issues associated with the use of brownfields and develop procedures to identify ways to minimize transportation agencies’ liability and other concerns associated with use of other contaminated properties.



Communities, Neighborhoods, and People

Program Goal: Develop and disseminate the skills, tools, and information needed to achieve effective transportation decision-making that protects and enhances the human environment and quality of life through full consideration of communities, neighborhoods, and people.

The 1970 Federal Highway Act, passed the same time as the National Environmental Policy Act (NEPA), places a responsibility on FHWA to fully consider adverse effects of transportation on community cohesion; public facilities; employment; tax and property values; displacement of people, businesses, and farms; and community and regional growth. The U.S. DOT and FHWA Strategic Plans and the FHWA Environmental Policy Statement highlight the importance of putting people first and fully considering communities, neighborhoods, and people in transportation decision-making. The President’s Report on Sustainable Development

underscores the importance of sustainable transportation projects that contribute to sustainable communities. The DOT Livable Communities Program emphasizes that transportation is about more than concrete, asphalt, steel, and vehicles. It is also about people’s day-to-day lives, which are affected by the location and appearance of transportation facilities, the design of streets and sidewalks, and the placement of on-street parking. FHWA initiatives in “Flexibility in Highway Design” further emphasize providing safe and community-friendly transportation projects nationwide.

A priority of the Environmental Research Program is to help FHWA, State DOTs, Federal agencies, Native American tribes, grassroot groups and the public understand how to ensure full consideration of communities, neighborhoods, and people in transportation decision-making. To meet this goal, the Environmental Research Program has established the following objectives:

Objective: Increase knowledge and understanding of how to more effectively consider during decision-making the impacts and benefits of transportation facilities on communities, neighborhoods, and people.

Transportation investments have major influences on society, with significant economic and social consequences. However, in many instances in the past, impacts on people have not received the attention they deserve. Assessing transportation impacts on communities, neighborhoods, and people alerts affected communities and residents, as well as transportation planners and decision-makers, of the likely consequences of a project, and ensures that human values and concerns receive proper attention during transportation decision-making. Having knowledge and a clear understanding of how to more effectively consider these impacts and benefits of communities, neighborhoods, and people will result in better transportation decision-making. To support this objective, the FHWA's Environmental Research Program will:

- Evaluate the effectiveness of existing knowledge, skills, and tools for assessing community and neighborhood impacts of transportation projects.
- Develop and improve methods, tools, and procedures to ensure full consideration of communities, neighborhoods, and people in transportation decision-making.
- Develop and disseminate case studies that demonstrate how transportation projects have been planned, designed, and constructed to: be neighborhood friendly; avoid, minimize, and mitigate impacts; and enhance the livability of communities and neighborhoods.
- Develop and provide training to improve the skills and expertise necessary to effectively conduct community impact assessments during the transportation decision-making process.

Objective: Identify and determine the application of existing public involvement tools and training to enhance the consideration of community, neighborhood and people concerns during transportation decision-making.

Public involvement, as part of the community impact assessment process, helps ensure that transportation policies and investments embrace the concerns of neighborhoods, communities, and society as a whole. Understanding the relationship between transportation actions and community life leads to conflict minimiza-

tion and the resolution of potential problems. Active involvement of affected parties leads to better decisions and greater acceptance of projects, while creating a sense of community ownership and enhancing agency credibility. Practitioners need to better understand the approaches needed to make public involvement effective. To meet this objective, FHWA's Environmental Research Program will:

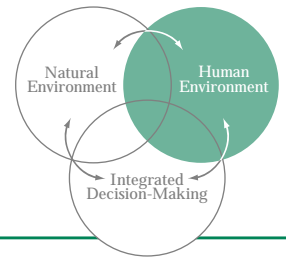
- Provide tools and methods to communicate how to meaningfully use public participation to improve transportation decision-making.
- Revise and provide training to FHWA, State DOTs, grassroot groups and other partners on public involvement as part of the transportation decision-making process.

Objective: Develop and increase knowledge and understanding of innovative options, including flexible design and enhancement activities, to ensure that transportation projects fit harmoniously within communities.

One of the greatest challenges the transportation community faces is providing safe, efficient transportation service that conserves, and even enhances the environmental, scenic, historic, and community resources that are so vital to our way of life. FHWA, along with our partners, must continue to seek opportunities to use flexible design, enhancement activities, and innovative tools to help sustain important community interests without compromising safety. This includes incorporating proactive ideas and community-oriented designs for transportation facilities to improve transportation decision-making and preserve the character of our Nation's communities. To achieve this objective, FHWA's Environmental Research Program will:

- Analyze and disseminate information on Transportation Enhancement projects, traffic calming, flexible design, and other innovative approaches to ensure that transportation systems enhance communities.
- Develop prototype procedures and case examples for streamlining implementation of transportation enhancement activities.
- Develop and provide training to State and local transportation agencies on applying flexible design concepts, Transportation Enhancement projects, traffic calming, and other innovative approaches.

Environmental Justice



Program Goal: Develop and disseminate the skills, tools, and information to assess, prevent, and address potential discriminatory effects and disproportionately high and adverse health and environmental effects of transportation decisions on low-income and minority populations.

FHWA's commitment to prevent potential discriminatory effects and disproportionately high and adverse health and environmental effects of transportation decisions on low-income and minority populations is reflected in the Environmental Policy Statement. It states: *"We must act on our obligation to foster environmental justice by ensuring that our transportation system does not unfairly affect any one segment of our society and that it equitably distributes benefits as well. To meet these goals, the FHWA must achieve an unprecedented level of collaboration and consensus-building with our partners."*

It has been FHWA's long-standing policy to actively ensure nondiscrimination in Federally-funded activities under Title VI of the 1964 Civil Rights Act. Under Title VI and related statutes, each Federal agency is required to ensure that no person is excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving Federal financial assistance on the basis of race, color, national origin, age, sex, disability, or religion.

The President's Executive Order No. 12898, and the DOT and FHWA orders on environmental justice direct that programs, policies, and activities not have a disproportionately high and adverse health and environmental effect on minority and low-income communities. These orders are a reaffirmation of the principles of Title VI and related statutes, the NEPA process, and other Federal environmental laws.

A priority of the Environmental Research Program is to help FHWA, State DOTs, grassroot groups, Native American tribes, the public, and other partners understand how to effectively assess, prevent, and address potential discriminatory effects and disproportionately high and adverse environmental and health effects of transportation decisions on low-income and minority populations.

Objective: Develop tools and techniques and disseminate information to assess, prevent, and address potential discriminatory effects and disproportionately high and adverse environmental

effects of transportation decisions on low-income and minority populations.

To prevent discriminatory and disproportionately high and adverse effects of transportation on specific populations, FHWA, State DOTs, Native American tribes, grassroot groups, the public, and other partners must be able to identify who is affected by transportation projects and whether the effects might be discriminatory or disproportionately high and adverse. Early identification of potential effects requires transportation officials to understand Title VI and environmental justice principles and have the tools and techniques to assess project effects. To support this objective, FHWA's Environmental Research Program will:

- Develop user-friendly guidance and information packages to help our partners effectively assess, prevent, and address discriminatory effects and disproportionately high and adverse effects of transportation decisions.
- Design methodologies to assess environmental and health effects on low-income and minority populations.
- Identify and determine practical ways to provide low-income and minority populations with effective access to the transportation decision-making process and its products.
- Build workable partnerships and strategies, through Community Based Meetings and other forums, among FHWA, State DOTs, grassroot groups, Native American tribes and other partners on integrating environmental justice and Title VI considerations during transportation decision-making.

Objective: Develop and improve skill levels to ensure that environmental justice and Title VI principles are effectively applied in the transportation decision-making process.

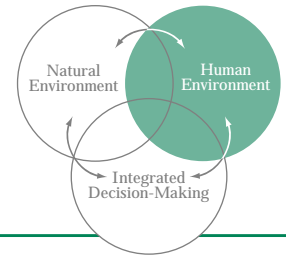
In order to ensure nondiscrimination in Federally-funded activities and prevent disproportionately high and adverse health and environment effects on low-income and minority communities, FHWA, State DOTs, grassroot groups, Native American tribes, the public and other partners must have the expertise to apply envi-

ronmental justice and nondiscrimination principles during transportation decision-making. To achieve this objective, FHWA's Environmental Research Program will:

- Develop and provide training and conduct outreach efforts to improve the skills and expertise necessary to prevent, assess, and address potential discriminatory effects and disproportionately high and adverse environmental and health effects of trans-

portation decisions on low-income and minority populations.

- Showcase the success stories, best practices, and model community initiatives, which incorporate principles of Title VI and environmental justice in transportation decisions, including the effective application of mitigation and enhancement strategies.



Noise

Program Goal: Develop analysis techniques, abatement methods, and effective noise compatible land use planning tools to reduce the adverse impacts of noise.

Noise is one of the most direct adverse environmental intrusions that people notice from highway transportation. Nearly every person in the United States is somehow affected by noise from transportation sources. Transportation noise may affect the ability of people to carry on conversations, to concentrate in work and school settings, and to sleep. As a result, noise has direct impacts on the quality of life in neighborhoods and communities and on satisfaction with our Nation's transportation system.

Noise is a major issue associated with the design and construction of new transportation systems, as well as with improvements to existing systems. There are various ways to reduce the adverse impact of highway noise on people. Traditionally, efforts have focused on noise barriers. However, noise barriers can be expensive, and they have received mixed reviews from communities. Motorists sometimes find noise barriers aesthetically unpleasing and find that they lead to a monotonous driving experience, while residents adjacent to highways greatly value the noise reduction benefits provided by barriers.

In order to meet FHWA's objective to enhance community and social benefits of highway transportation and to increase public satisfaction with highway systems, research efforts to address noise impacts will focus on the following strategic objectives:

Objective: Develop state-of-the-art analysis techniques to accurately evaluate the effects of

highway traffic and construction noise, and of abatement measures.

In order to make informed decisions to reduce noise impacts on people, transportation officials must have accurate assessments of the noise impacts and abatement opportunities resulting from proposed transportation improvements, as well as those associated with existing transportation systems. In addition, people frequently complain about the noise that results from specific pavement types and surface textures. Pavement designers need to address these concerns for tire/pavement noise, recognizing the importance that must be placed on pavement safety and durability. To meet this objective, FHWA's Environmental Research Program will:

- Complete and distribute a new generation highway traffic noise prediction model (TNM).
- Develop procedures to consider atmospheric conditions in highway traffic noise prediction.
- Investigate highway traffic noise problems related to pavement type and texture, in cooperation with pavement designers and safety specialists.
- Develop a comprehensive, multi-modal transportation noise prediction methodology, in cooperation with other transportation modes.

Objective: Develop optimal measures to abate highway traffic noise.

To reduce the overall adverse effects of highway traffic noise, transportation officials need cost-effective, state-of-the-art noise mitigation techniques that

are positively received by people. The availability of better modeling techniques and new materials provide opportunities to design barriers that are further improved, at potentially lower costs. To meet this objective, FHWA's Environmental Research Program will:

- Identify new, innovative approaches to abate the impacts of highway traffic noise.
- Develop and distribute improved, more cost-effective and aesthetically pleasing noise barrier designs.

Objective: Develop innovative methods and techniques that promote noise compatible land use planning.

The impacts of highway traffic noise should be reduced through a program of shared responsibility. Transportation officials need to encourage local governments and private developers to control new growth and development in such a way that land uses adjacent to highways are compatible with traffic noise or that adverse traffic noise effects are minimized. To meet this objective, FHWA's Environmental Research Program will:

- Develop and distribute a videotape to emphasize noise compatible land use planning.

- Investigate and distribute case studies of successful noise compatible land use planning programs.

Objective: Develop training and outreach materials to increase the knowledge and understanding of the analysis and abatement of highway traffic and construction noise.

The analysis and abatement of highway traffic noise involve a mixture of objective and subjective phenomena. Transportation officials need to improve the flow of noise-related information and communication at all levels, particularly with the general public. Highway traffic noise training and educational opportunities need to be enhanced. To meet this objective, FHWA's Environmental Research Program will:

- Develop and distribute a brochure that presents the results of successful traffic noise abatement measures.
- Develop and maintain databases and distribute noise barrier listing and barrier construction trends.
- Develop and distribute a training CD-ROM for the new generation highway traffic noise prediction model (TNM).

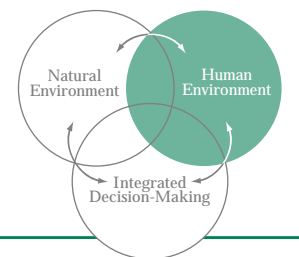
Cultural, Historic, Archaeological, And Scenic Resources

Program Goal: Improve procedural and impact assessment methods for the identification, evaluation, and protection of historic and archaeological resources and scenic quality.

Sponsors of transportation projects have a continuing responsibility to identify, evaluate, and consider project effects on cultural, historic, and archaeological resources. These resources include archaeological sites, historic structures, architectural and engineering properties, and traditional cultural properties and places historically important to Native Americans, Hawaiians, and Alaskans. Investigations are performed in compliance with Section 106 of the National Historic Preservation Act of 1966, as well as other Federal and State laws and

regulations. As project planning continues to evolve, State DOTs and other agencies are faced with a changing situation that increasingly requires the re-evaluation of existing procedures, techniques, approaches and resources. In addition, as part of FHWA's strategic objective to enhance community and social benefits of highway transportation, efforts should be made to proactively identify how transportation decisions can benefit cultural resources. Such benefits include sharing the information gained from cultural resource studies with communities to enhance cultural tourism.

To meet FHWA's strategic objective, the Environmental Research Program will focus on the following research objectives:



Objective: Develop data management techniques and predictive tools to assess the direct, indirect, and cumulative impacts of highway development, reconstruction, and maintenance on cultural resources in planning and project development.

Development resulting from transportation investment has significant impacts on cultural and historic resources. In addition, indirect and cumulative effects on cultural resources are not well defined or understood and are not consistently considered in the assessment of project effects. Many state historic preservation offices maintain files, reports, and site survey forms from investigations that have been conducted, but few have had the capacity to aggressively model and disseminate this data in cooperation with the State DOT. Early identification of potential public controversy or possible fatal flaws related to cultural resources would improve transportation decision-making. To meet this objective, FHWA's Environmental Research Program will:

- Develop a database of cultural, historic, and archaeological resources to help improve the project planning, review, and approval process.
- Develop tools, guidance, and training to improve understanding of indirect and long-term impacts of highway development on cultural, historic, and archaeological resources.
- Synthesize efforts to model the location of cultural, historic, and archaeological properties and evaluate their effectiveness for planning purposes.

Objective: Develop cost-effective approaches to preserve, rehabilitate, restore, and reconstruct cultural, historic, and scenic resources.

In addition to considering cultural resources, transportation planners and officials need cost-effective approaches to preserve, rehabilitate, and restore these resources in project planning and development. To meet this objective, FHWA's Environmental Research Program

will:

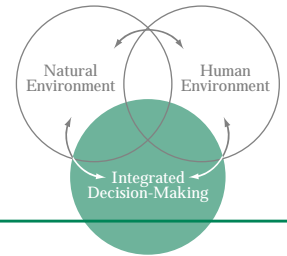
- Develop second-generation historic and archaeological preservation training materials and curricula and conduct pilot training.
- Develop decision-making guidance on preservation, restoration, and rehabilitation of historic bridges.
- Develop tools and guidance to incorporate Native American and ethnic cultural traditions into project planning.

Objective: Develop effective techniques to inform the public about the results of investigations that identify cultural, historic, and archaeological resources in their communities through a wide range of partnerships.

Although most transportation projects are funded by the public, few citizens are aware of the results of cultural resource investigations or the value of these resources. Information shared with communities could provide people with a greater appreciation of their community's historical and cultural resources. To respond to this need, the Environmental Research Program will:

- Develop partnerships with academic institutions to collate and synthesize the results of DOT-sponsored investigations and disseminate the findings to the public and preservation professionals.
- Share successful efforts by public agencies to inform the public of the results of historic and archaeological investigation.
- Synthesize and share models to help communities utilize information from transportation investigations and historic properties in their historic heritage tourism plans.
- Develop partnerships with community-based groups and with transportation agencies to encourage communities to define their cultural/historic values, as they relate to transportation planning.

Integrated Transportation and Environmental Decision-Making



Program Goal: Develop and disseminate the skills, tools, and information to redesign Federal environmental and transportation decision-making, and to ensure an integrated process at the Federal, State, tribal, and local levels that achieves the best overall public interest decisions.

The National Environmental Policy Act (NEPA) requires the Federal Government to use all practicable means and measures to create and maintain conditions under which people and nature exist in harmony. Since the passage of NEPA, the FHWA has built a framework of policies and procedures to help meet its social, economic, environmental, and transportation responsibilities.

The U.S. Department of Transportation (DOT) and the Council on Environmental Quality (CEQ) have been working together for some time to make the transportation decision-making and NEPA process more efficient and more effective. Through joint efforts with the CEQ, the U.S. DOT has brought together Federal, State, and local officials and non-governmental representatives across the country to share innovative ideas and to recommend ways to effectively integrate the NEPA process in transportation decision-making.

Building on these efforts, National Performance Review recommendations, and Congressional interest, FHWA is seeking ways to redesign Federal environmental and transportation decision-making to ensure an integrated process at the Federal, State, tribal, and local levels that achieves the best overall public interest decisions.

In order to achieve the intentions of the Intermodal Surface Transportation Efficiency Act (ISTEA), the FHWA Environmental Policy Statement, and other legislation and initiatives, FHWA and our partners must achieve and practice an environmental ethic that accomplishes transportation goals in accordance with environmental standards through shared decision-making with other stakeholders in the process. This requires environmentally-conscious leadership within transportation agencies. Furthermore, as FHWA, States, and other partners seek to meet transportation needs, we must use a shared decision-making process that balances consideration of impacts on resources and societal values with transportation needs.

A priority of the Environmental Research Program is to help FHWA, State DOTs, local entities, Federal agencies, Native American tribes and the public understand how to effectively integrate environmental and transportation decision-making to achieve decisions in the best overall public interest. To meet this goal, the Environmental Research Program has established the following strategic research objectives:

Objective: Increase decision-maker and practitioner knowledge and understanding of how to integrate and enhance environmental and transportation decision-making.

To improve the manner in which environmental considerations are incorporated in transportation decision-making, FHWA, State DOTs, Native American tribes, the public, and other partners need to understand how to best integrate environmental and transportation decision-making processes. To help in this effort, FHWA's Environmental Research Program will:

- Develop quality standards and performance measures, and identify critical factors that may impede or facilitate an integrated transportation decision-making process.
- Develop user-friendly regulations, guidance, and information packets on implementing an integrated Federal, State, and local environmental and transportation decision-making processes for surface transportation projects.
- Conduct extensive outreach to assist in the development and implementation of all efforts to integrate and enhance Federal, State, and local environmental and transportation decision-making processes for surface transportation projects.
- Conduct a demonstration project and showcase a State DOT's effort to integrate and enhance environmental and transportation decision-making at the Federal, State, local, and tribal levels.
- Showcase innovative approaches taken at the State, Regional, and/or Metropolitan level to achieve process integration.

Objective: Develop and demonstrate state-of-the-art methods, tools, and technologies to assist in integrating and enhancing the environmental and transportation decision-making process.

Transportation decisions have impacts on multiple environmental media and affect the natural and human environments in a variety of ways. An integrated transportation and environmental decision-making process is needed to achieve the best public interest decisions. To achieve this result, transportation professionals and decision-makers need state-of-the-art approaches and tools to assess the direct, cumulative, secondary, and indirect impacts and benefits of transportation decisions. To carry out this objective, FHWA's Environmental Research Program will:

- Demonstrate and evaluate the application of advanced technologies, such as geographic information systems, expert systems, visualization techniques, and interactive training techniques, including their benefits for enhancing transportation decisions and processes.
- Demonstrate jointly with our Federal partners the appropriate application of assessment methodologies

for cumulative and indirect effects of transportation decisions on the natural and human environment.

Objective: Develop and improve expertise on problem solving, consensus building, and collaborative decision-making.

FHWA's Environmental Policy Statement, national initiatives, and training courses make a commitment to actively involve our partners and all affected parties in an open, cooperative, and collaborative process. Re-design of environmental and transportation decision-making requires FHWA, State DOTs and other partners to work together to effectively implement the NEPA process as initially intended. To achieve this objective, FHWA's Environmental Research Program will:

- Design a strategic and interrelated environmental training curriculum, including courses that reflect principles of an integrated and effective environmental and transportation decision-making process.
- Showcase win-win outcomes of interagency coordination, collaboration, and decision-making on transportation projects with environmental considerations.

IMPLEMENTATION STRATEGIES

The Environmental Research Program has developed strategies to most effectively implement the goals and objectives of this Strategic Plan. These strategies enable FHWA to continue to offer a research program that is responsive, cost-effective, and of the highest quality.

The implementation strategies described here support the goals and policy on research, technology transfer, and training detailed in the FHWA 1994 Environmental Policy Statement. According to that document, it is FHWA policy to:

- Conduct active and responsive research needed to advance *state-of-the-art knowledge of transportation's linkage to and effects on the natural environment, neighborhoods, and communities*. This includes pursuing research on the health and environmental effects of transportation on, and benefits of transportation for, minority and low-income populations.
- Develop *joint research and training* efforts with Federal, State, and local transportation and environmental resource and regulatory agencies. Promote an interchange of training among these and other partners.
- Expand current efforts to *disseminate state-of-the-art information* on environmental protection, impact evaluation, mitigation, and enhancement. To this end, use forums such as experimental and demonstration projects, technical conferences and train-

ing programs, electronic bulletin boards, and other technology transfer activities to promote the incorporation of research results into practice.

- Seek, through research and application of sound management and “intelligent transportation” practices, ways to *improve the transportation design and operational characteristics* of existing and new transportation facilities from an environmental perspective.
- Expand and improve FHWA's *environmental training curriculum*, and develop environmental training targeted at managers.

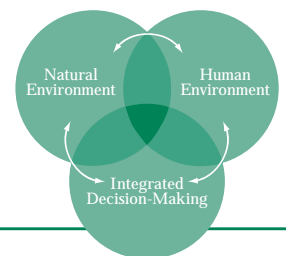
The Environmental Research Program shares this commitment to improving the processes and mechanisms through which research information and technology are shared with the transportation community. The implementation strategies which follow are designed to allow for continuous input to identify research needs, timely distribution of research products, and recognition of excellence in transportation and environmental research. Furthermore, the discussion includes mechanisms for evaluating the effectiveness of our research programs to assure their continuing responsiveness to current needs and situations.

In addition to supporting the FHWA Environmental Policy Statement, the implementation strategies presented here support the Corporate Management Strategies as they are described in the FHWA and U.S. DOT Strategic Plans.

Putting This Strategic Plan to Work

To guide the implementation of this Strategic Plan, the Environmental Research Program is developing strategic and tactical “road maps”: action plans to ensure effective and timely progress in each focus area. These road maps will guide the selection of environmental research projects that will best support FHWA's strategic objectives. The road maps lay out specific milestones and schedules to assist managers in overseeing

research progress, identify key partners and customers, specify outreach and dissemination plans, and detail the approach to program evaluation. They will assist the Environmental Research Program in targeting resources to continuously improve research efforts, ensure the usefulness of research products to customers, and identify emerging research needs in a timely manner.



Four Implementation Strategies

The implementation component of our Strategic Plan consists of four implementation strategies. For each strategy, goals, objectives, and initiatives have been identified. The implementation strategies and their associated research delivery goals are as follows:

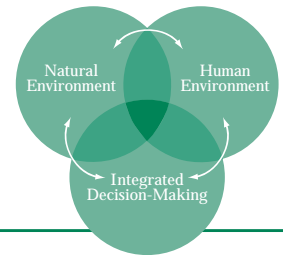
Coordination and Partnership — Work in partnership with our customers and stakeholders to identify needs, undertake research, and evaluate results.

Dissemination and Outreach — Ensure timely and effective dissemination of research so that it yields results in practice.

Commitment to Excellence — Cultivate a commitment to excellence in environmental and transportation research and a work ethic that rewards excellence.

Performance Evaluation — Continually evaluate the effectiveness of our environmental research efforts and our responsiveness to customer needs.

Coordination and Partnership



Implementation Goal: Partner with our customers and stakeholders to identify needs, undertake research, and evaluate results.

Effective communication and coordination with our customers, stakeholders, and partners is critical to successfully implement this Strategic Plan. The Environmental Research Program needs to listen to what our internal and external customers have to say about their information and training needs. In addition, a great deal of research is undertaken and supported by academic institutions, other Federal agencies, research laboratories, and private organizations. FHWA must take advantage of opportunities to coordinate and leverage research activities to get the most out of our research dollars. In accordance with this goal, FHWA's Environmental Research Program has established the following objectives:

Objective: Listen to our customers, both internal and external, to identify the quality research products and services they need.

FHWA's customers in State and local government, at the Federal level, and in the general public have specific research needs which they would like to see the Environmental Research Program address. In order to ensure that research efforts get results, FHWA must listen to its customers and develop strategies to respond to their needs. To carry out this objective, FHWA's Environmental Research Program will:

- Develop a mechanism(s) for stakeholders to provide suggestions on research needs and approaches

on an ongoing basis. This may be accomplished through an Internet access site, through trade associations and stakeholder groups, or through other mechanisms as appropriate.

- Seek input on training needs and enhance training accessibility. Collect periodic information from Divisions and Regions to assess training needs of FHWA field office staff, State and local agencies, and key stakeholder groups.

Objective: Aggressively pursue improved communication and collaboration with Federal, State, local, and tribal partners, and seek new partnerships in the transportation and environmental communities to undertake research and dissemination.

Research is conducted by other Federal agencies, agencies at the State and local levels, transportation and environmental organizations, and academic institutions. To ensure that FHWA resources are invested wisely in research, FHWA needs to know about research being conducted by others to reduce duplication or to contribute additional perspectives. FHWA may wish to undertake partnerships in carrying out research. Communication and collaboration will ensure that research results are accepted by a broad spectrum of interests with results that can be used for regulatory and policy development. To carry out this objective, FHWA's Environmental Research Program will:

- Develop mechanisms for continued coordination between FHWA and other government agencies and

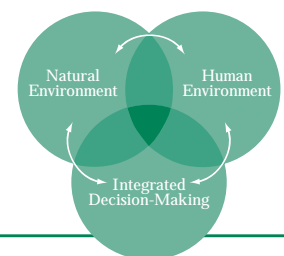
organizations that also conduct environmental research. These mechanisms would be designed to ensure coordination in research planning, problem identification, and dissemination.

- Facilitate and sponsor communications forums or workshops on research program activities among various U.S. DOT-funded entities (e.g. U.S. DOT's Volpe National Transportation Center and the Center for Transportation and the Environment (CTE)).
- Develop methods to promote collaboration on research, sharing of research results among agencies and stakeholder groups, and leveraging of research funding sources. Collaborations should include organizations such as university research centers, Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), Tribal Colleges and Universities, environmental organizations, non-government organizations (NGOs), and Transportation Research Board (e.g. National Cooperative Highway Research Program, Transit Cooperative Research Program).
- Showcase and reward collaborative approaches to research and fund leveraging arrangements between Federal agencies, Indian governing organizations, States, Metropolitan Planning Organizations (MPOs), research institutions, and NGOs.
- Establish international networks for sharing information on environmental and transportation research through scanning tours, conferences, and collaborative research efforts.
- Identify research, training, and other projects suitable for co-sponsorship, beginning in FY 1999.

Objective: Increase the participation of all institutions of higher education, including Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), Tribal Colleges and Universities, and other Minority Institutions of Higher Education (MIHEs), in transportation and environmental research.

Through academic research, FHWA hopes to better understand the complex and evolving relationships between transportation and the environment. The Transportation Environmental Research Program (TERP) is a multi-year endeavor that targets college and university participation in the FHWA research agenda. Through TERP and other innovative ventures, the FHWA Environmental Research Program is committed to increasing the involvement of HBCUs and other MIHEs in transportation environmental research. Expanded efforts will seek to encourage and increase on-campus research, and collaborations of faculty and students with FHWA. To carry out this objective, the Environmental Research Program will:

- Expand outreach of the Transportation Environmental Research Program (TERP) with colleges and universities through direct mailings.
- Assess research capabilities of HBCUs and other MIHEs, and share information with other potential partners.
- Identify innovative strategies for increasing involvement of HBCUs and MIHEs in environmental and transportation research, or, where appropriate, increasing the capacities of these institutions in particular research areas.



Dissemination and Outreach

Implementation Goal: Ensure timely and effective dissemination of research so that it yields results in practice.

If FHWA and its partners are to effectively protect and enhance the natural and human environment, the Environmental Research Program must ensure that customers receive research results and products. Moreover, customers must have the expertise needed to un-

derstand and incorporate research results into practice. Research products and results must be available to users when they need them. To meet this implementation goal, FHWA's Environmental Research Program has established the following objectives:

Objective: Design research projects and develop research products with technology transfer in mind from the outset.

Increasing the level of awareness about research programs and activities increases the effectiveness of the Environmental Research Program. A strong dissemination plan, therefore, should be an integral part of every research program. Incorporating such a plan will ensure that research products are shared with potential users in a variety of ways. To achieve this objective, FHWA's Environmental Research Program will:

- Require that all research work programs include dissemination and evaluation components and an explicit identification of the target audience for the research.
- Design research reports to be brief and concise, and geared toward their intended audiences.
- Design modeling tools as software applications, and develop manuals and informational material in user-friendly formats.

Objective: Use a wide variety of accessible outreach and communication measures to ensure that research products are received and understood by customers.

FHWA must provide a variety of accessible forums for information. The state-of-the-art in communications technology is evolving rapidly, allowing new methods to reach our customers. Research results, technical assistance, and opportunities for collaboration must be communicated in a way that is user-friendly and easy to access. To achieve this objective, FHWA's Environmental Research Program will:

- Establish a clearinghouse for research that is customer-oriented and enables users to quickly and economically find and access information, tools, or other research products.
- Use innovative means of communication such as experimental and demonstration projects, technical conferences and training programs, the Internet, interactive CDs, speakers bureaus, and other technology transfer activities.

Objective: Provide effective training and technical assistance to our transportation partners.

The information and tools developed through research must be incorporated into every stage of transportation program and project development, including policy, planning, and decision-making. Training and technical assistance will ensure that transportation partners have the expertise to most effectively use

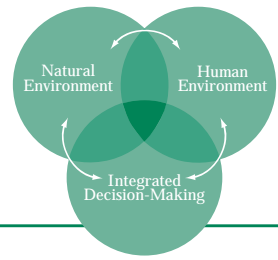
newly-developed knowledge, skills, and tools. To achieve this objective, FHWA's Environmental Research Program will:

- Develop joint training efforts with Federal, State, and local transportation and environmental resource and regulatory agencies. Promote an interchange of training among these and other partners.
- Develop environmental training specifically for managers.
- Provide mechanisms for systematic evaluation of training courses by participants, and conduct outreach to colleges and universities to incorporate relevant training into undergraduate and graduate curricula.
- Provide for training sessions via interactive video (long-distance learning courses) and ensure easy access to such sessions through the technology transfer program and through U.S. DOT-funded research institutions.

Objective: Increase the visibility of the Environmental Research Program, and elevate the level of awareness of research products and services among customers.

FHWA's customers need to be informed about research results, ongoing projects, and training and technical assistance. Elevating the visibility of the Environmental Research Program is an important step in ensuring that research yields desired outcomes. To achieve this objective, FHWA's Environmental Research Program will:

- Routinely disseminate information about research efforts in progress or recently completed, including how customers and stakeholders can access research products.
- Regularly include summaries of environmental research activities, findings, and products in newsletters and publications, and in internal updates to management within the U.S. DOT and its modal administrations.
- Increase submissions of articles about environmental research in transportation and environmental publications.
- Develop a marketing plan for the Environmental Research Program for both internal and external application.



Commitment to Excellence

Implementation Goal: Cultivate a commitment to excellence in environmental and transportation research and a work ethic that rewards excellence.

To achieve excellence in environmental and transportation research under the Environmental Research Program, FHWA staff within the Environmental Analysis and Environmental Operations Divisions will personally be involved in creating and sustaining values of environmental stewardship, organizational direction, customer focus, performance monitoring, and performance excellence. In addition, FHWA wants to recognize and support excellence in research and technology transfer by its partners and stakeholders. As part of this strategy, FHWA's Environmental Research Program has established the following objectives:

Objective: Enhance FHWA's commitment to excellence in transportation and environmental research.

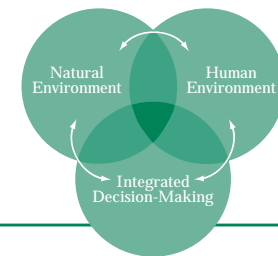
FHWA's Environmental Research Program staff are committed to the highest standards of excellence in facilitating and communicating environmental research. To support this commitment, the Environmental Research Program will:

- Link research activities to program responsibilities within FHWA.
- Recognize and reward FHWA staff excellence in facilitating and overseeing research, disseminating research results, and providing technical assistance and training.

Objective: Recognize stakeholders and partners for excellence in environmental research.

FHWA encourages excellence in the research efforts of partners and stakeholders whose work provides a tremendous amount of information that is used by our customers. To accomplish this objective, FHWA's Environmental Research Program will:

- Showcase exemplary research projects through brochures and awards for excellence in environmental research.
- Identify exemplary research products and services of partners and stakeholders in FHWA outreach efforts.



Performance Evaluation

Implementation Goal: Continually evaluate the effectiveness of our environmental research efforts and our responsiveness to customer needs.

Performance evaluation helps to determine how well the Environmental Research Program is meeting its strategic goals. It also helps to ensure that we respond to changing needs and conditions, with a continued emphasis on achieving significant and tangible results that directly contribute to FHWA's top priorities.

FHWA Performance Measures

Performance evaluation occurs at all levels of our organization. At the agency level, the FHWA National Strategic Plan identifies clear measures to evaluate our

progress in meeting each of FHWA's strategic goals. For FHWA's goal of protecting and enhancing the natural environment and communities, there are three performance indicators:

- Increase public satisfaction with highway systems and highway projects as a beneficial part of their community.
- Reduce on-road mobile source emissions by 20 percent in 10 years.
- Increase net wetland hectare area (acreage) resulting from Federal-aid highway projects by 50 percent in 10 years.

The research priorities outlined in this Environmental Research Strategic Plan directly contribute to FHWA's ability to meet these performance measures.

Environmental Research Program and Project Evaluation

The Environmental Research Program regularly evaluates our program as part of the process of identifying needs and developing work statements for future research. This evaluation involves a clear assessment of the progress made to date in meeting our objectives, the quality of the efforts completed, and identification of areas requiring additional work. Feedback from a range of partners and stakeholders is received as part of this review.

In the coming years, the Environmental Research Program will further strengthen our approach to performance evaluation. In particular, we will build our capacity to gauge customer satisfaction and increase our responsiveness to their needs through a more formal customer satisfaction evaluation process. In addition, we will develop a routine process of program review and modification based on the program objectives in this Strategic Plan for Environmental Research. At both a program-wide and project level, our performance evaluation will assess our performance in three ways:

Efficiency

Program Efficiency: Were staff and contracted resources allocated to best meet priority objectives?

Project Efficiency: Did we do what we said we would do? Were products and program milestones achieved on time and within budget?

Effectiveness

Program Effectiveness: Are we making the progress we expected toward meeting our program objectives? Were the projects that were undertaken successful in supporting the achievement of priority program objectives?

Project Effectiveness: Were products and program initiatives of high quality? Are they meeting the needs for which they were intended?

Customer Satisfaction

Program Satisfaction: How satisfied are our customers with the performance of the research program overall?

Project Satisfaction: How satisfied are our customers with specific products and program initiatives? Are available products and services reaching our intended customers? Are they being used? Are they being used effectively?

Specific objectives to achieve a more comprehensive approach to performance evaluation are:

Objective: Assess customer satisfaction with, and use of, FHWA's Environmental Research Program.

To ensure that the Environmental Research Program continuously improves its ability to meet the needs of our customers and partners, FHWA's Environmental Research Program will:

- Develop a performance and customer satisfaction reporting system to provide continuous feedback on the effectiveness and timeliness of completed research.
- Develop a process for obtaining continuous feedback of customer needs for research products and services, to inform the development of future research priorities.

Objective: Evaluate performance at meeting strategic environmental research goals and objectives.

To ensure the effectiveness of the Environmental Research Program, FHWA must periodically evaluate the effectiveness of the program at achieving strategic research goals and objectives. To meet this need, the FHWA Environmental Research Program will:

- Incorporate a plan for program-specific evaluation as part of the tactical road map for each program area, using evaluation measures and techniques appropriate to each program.
- Conduct an annual performance review, starting in FY 99, to assess progress toward achieving the strategic goals and objectives as stated in the Environmental Research Strategic Plan, and revise future plans as indicated.
- Monitor emerging trends, customer needs, and the external environment to adjust our strategic research plan as needed.