Sustainable Transportation Practices

in Europe

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Sustainable Transportation Practices in Europe

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FHWA International Technology Exchange Programs

The FHWA's international programs focus on meeting the growing demands of its partners at the Federal, State, and local levels for access to information on state-of-the-art technology and the best practices used worldwide. While the FHWA is considered a world leader in highway transportation, the domestic highway community is very interested in the advanced technologies being developed by other countries, as well as innovative organizational and financing techniques used by the FHWA's international counterparts.

International Technology Scanning Program

The International Technology Scanning Program accesses and evaluates foreign technologies and innovations that could significantly benefit U.S. highway transportation systems. Access to foreign innovations is strengthened by U.S. participation in the technical committees of international highway organizations and through bilateral technical exchange agreements with selected nations. The program has undertaken cooperatives with the American Association of State Highway Transportation Officials and its Select Committee on International Activities, and the Transportation Research Board's National Highway Research Cooperative Program (Panel 20-36), the private sector, and academia.

The FHWA and its partners jointly determine priority topic areas. Teams of specialists in the specific areas of expertise being investigated are formed and sent to countries where significant advances and innovations have been made in technology, management

practices, organizational structure, program delivery, and financing. Teams usually include Federal and State highway officials, private sector and industry association representatives, as well as members of the academic community.

The FHWA has organized more than 40 of these reviews and disseminated results nationwide. Topics have encompassed pavements, bridge construction and maintenance, contracting, intermodal transport, organizational management, winter road maintenance, safety, intelligent transportation systems, planning, and policy. Findings are recommended for follow-up with further research and pilot or demonstration projects to verify adaptability to the United States. Information about the scan findings and results of pilot programs is then disseminated nationally to State and local highway transportation officials and the private sector for implementation.

This program has resulted in significant improvements and savings in road program technologies and practices throughout the United States, particularly in the areas of structures, pavements, safety, and winter road maintenance. Joint research and technology-sharing projects have also been launched with international counterparts, further conserving resources and advancing the state of the art.

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Executive Summary

In the United States, the transportation community has shown an increasing interest in sustainable transportation and its linkages to land use and urban development patterns, economic growth, environmental impacts, and social equity. In addressing this interest, many U.S. transportation agencies are re-examining their policies, planning approaches, and evaluation methods and are considering changes to every aspect of practice, from the materials and designs used in construction to the kinds of alternatives considered for implementation. Federal, State, and local agencies as well as private organizations are working to translate the broad goals of sustainability into specific transportation policies, objectives, and programs. This international scanning review was undertaken to examine how other developed countries are addressing sustainable transportation issues.

Sweden, Germany, the Netherlands and the United Kingdom were identified as nations that have been actively addressing sustainable transportation issues for several years. To more closely examine these countries' experiences and consider their applicability in the United States, the U.S. Department of Transportation's Federal Highway Administration (FHWA) sponsored a study group that traveled to the four countries in the period September 17 through October 3, 1999. The study group included representatives from the U.S. Department of Transportation, the American Association of State Highway and Transportation Officials (AASHTO), metropolitan planning organizations, city and county governments, and academia. In each country, the group met with officials engaged in sustainable transportation efforts and also shared information on U.S. practices with their international counterparts. The meetings were held in Stockholm, Sweden; Berlin, Germany; The Hague and Rotterdam, the Netherlands; and Edinburgh,

Scotland. In each city, study group members were able to visit projects, try out the transportation systems, and observe development patterns, experiencing first-hand prime examples of sustainable transportation as recommended by each country's representatives.

The meetings covered the following topics:

- the context in which planning and decision making for transportation and development occurs;
- definitions of sustainability;
- the policies and planning practices used in pursuit of sustainability, especially linkages among land use and urban development, economic growth, environmental impacts, and social equity;
- sustainable transportation and sustainable development strategies; and
- case studies and implementation examples. A set of amplifying questions elaborating upon the panel's interests in these topics (see Appendix A) was provided in advance to the European participants and was used to structure the meetings and discussions.

In each country, the study group noted differences in context that must be considered in assessing the potential for adoption of similar policies and practices in the United States. Key differences include slower growth than in many U.S. states and metropolitan areas, relatively homogeneous populations, higher development densities, and more extensive and more heavily utilized transit systems. At the same time, many similarities were noted, including growing auto ownership and use, suburban development, and public interest in community amenities and quality of life. The differences suggest that some translation

for American settings will be necessary, while the shared concerns and objectives point to opportunities for mutual exchange and learning.

Members of the U.S. study team identified a number of items that might be considered for implementation in the United States. In the area of policy, team members were especially interested in the European emphasis on policy consistency and cooperative problem solving among agencies with somewhat different objectives. Team members took special note of the policy harmonization efforts being undertaken at the European Union (EU), national, state/province, and local levels. These efforts identify policy conflicts and then turn to negotiations to remove them, following up with new policies and practices as necessary.

Team members also noted that European practice frequently matches operating responsibility for transit and highway systems with control over funding for those systems, and often assigns such responsibility and control to local or regional agencies. Team members saw this as a logical extension of policies related to the Transportation Equity Act for the 21st Century (TEA-21).

Planning approaches that might be adopted in the United States include visioning processes to develop shared goals, strategic planning for both the long term and mid term, and backcasting to test to see what strategies would be needed to meet goals. Another policy item with high potential for the United States is the use of performance standards along with monitoring and reporting on progress. This policy could be coupled, as it is in the countries visited, with fiscal incentives for actions supportive of adopted goals.

All of the specific measures being used in the countries visited were thought to have potential applicability to the United States, recognizing the wide range of conditions among the States and metropolitan areas. Of particular interest to team members were car-sharing and projects aiming to educate the public about the costs of driving, as well as the possibilities for joint development to help pay for expensive but socially and environmentally attractive project designs.

Finally, there was considerable interest in the strategic use of new technologies for the advancement of sustainable development goals, and for creative designs using biotechnologies, recycled materials, and other context-sensitive approaches to build and rebuild transportation infrastructure that better fits its environment.

Overview

Background

In the United States, the transportation community has shown an increasing interest in sustainable transportation and its linkages to land use and urban development patterns, economic growth, environmental impacts, and social equity. Many U.S. transportation agencies are re-examining their policies, planning approaches, and evaluation methods and are considering changes to every aspect of practice, from the materials and designs used in construction to the kinds of alternatives considered for implementation. Federal, State and local agencies as well as private organizations are working to translate the broad goals of sustainability into specific transportation policies, objectives, and programs.

Objectives

Sweden, Germany, the Netherlands, and the United Kingdom were identified as nations that have been actively addressing sustainable transportation issues for several years. To more closely examine these countries' experiences and consider their applicability in the United States, the FHWA sponsored a study group that traveled to the four countries in the period September 17 through October 3, 1999. In each country, the group met with officials engaged in sustainable transportation efforts and also shared information on U.S. practices with their international counterparts.

The meetings were held in Stockholm, Sweden; Berlin, Germany; The Hague and Rotterdam, the Netherlands; and Edinburgh, Scotland. In each city, study group members were able to visit projects, try out the transportation systems, and observe development

patterns, experiencing first-hand prime examples of sustainable transportation as recommended by each country's representatives.

Areas of Study

The topics covered in the meetings included:

- the context in which planning and decision making for transportation and development occurs;
- definitions of sustainability;
- the policies and planning practices used in pursuit of sustainability, especially linkages among land use and urban development, economic growth, environmental impacts, and social equity;
- sustainable transportation and sustainable development strategies; and
- case studies and implementation examples.

A set of amplifying questions (see Appendix A) elaborating upon the panel's interests in these topics was provided in advance to the European participants and was used to structure the meetings and discussions.

Sponsoring Organizations

The study group included representatives from the FHWA, AASHTO, metropolitan planning organizations, city and county governments, and academia. Funding for this review was provided by FHWA's Office of International Programs, the Transportation and Community and Systems Preservation Program (TCSP), and the National Cooperative Highway Research Program (NCHRP) Panel 20-36. Brief biographical sketches of scan team participants are included in Appendix B, and a list of European contacts is presented in Appendix C.

Team Members

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Observations

Definitions of Sustainability

All of the countries we visited use some variation of the Brundtland definition of sustainability — meeting the needs of the present without compromising the ability of future generations to meet their own needs — as the starting point for their efforts on sustainable development. CO_2 reduction, as called for in the Kyoto Protocol and other agreements, is an important objective for the EU and for each of the member countries visited. In Europe, however, sustainability is seen as a much broader concept having economic and social as well as environmental dimensions. Sustainable development is viewed as development that improves service quality, the standard of living, and quality of life, while at the same time protecting and enhancing the natural environment and honoring local culture and history.

Each host country recognizes that transportation is an important tool to help meet overall sustainability objectives. Attributes of sustainable transportation follow from the expanded definition of sustainable development: Sustainable transportation is safe, high quality, and accessible to all; ecologically sound; economical; and a positive contributor to regional development. Specific goals for sustainable transportation include improved service quality and quality of access to goods and services, safety, improved air quality, noise reduction, improved water quality, protection of habitat and open space, historic preservation, reduced carbon emissions, increased social equity, economic development, and a satisfying quality of life, plus local goals consistent with the overall objective.

We observed a high degree of agreement on the goals and objectives of sustainable development and sustainable transportation among the countries we visited and at various

levels of government (national, state, regional, local). According to our hosts, this common understanding and approach is the result of long-term and ongoing efforts to build consensus through international negotiations and EU policy development, bolstered by the emphasis on leadership, education, and use of incentives to win support and develop a sense of common cause among all levels of government.

Policies and Practices

The following were key features of sustainable development and sustainable transportation in all of the countries we visited:

- Commitments
- Collaboration
- Incentives
- Planning Processes
- Performance Measures
- Leadership

Commitments

In each country visited, commitments to strive for sustainable development have been made both at the national level and at other levels of government. At the national level, the country has committed to take steps to reduce CO_2 emissions expeditiously and to redesign sectoral policies to accomplish that end. Other levels of government have pledged to help meet the national commitment through cooperative problem solving and "policy harmonization." This latter concept involves the systematic review and evaluation of policies to identify policy conflicts, negotiations to remove them, and follow-up with new policies and practices.

Collaboration

The policies and practices used to pursue sustainability in each country recognize the importance of collaboration, both as a means of reaching agreement on specific goals and objectives and as a way of pursuing specific strategies. The countries visited are using collaborative strategic planning to identify and evaluate ways to move toward sustainability and as a way to pursue specific strategies. Through collaborative processes, they are devising performance measures with which to assess progress. Collaborations involve the different levels of government, different agencies, citizens, and the private sector.

Incentives

Incentives are a third key element of the European strategy for promoting sustainable development and sustainable transportation. In the countries visited, it is recognized that local government and the private sector — businesses and citizens — make many land development and transportation decisions that individually and cumulatively have a strong impact on sustainability. Therefore, incentives are used to encourage and reward action consistent with national policy, often through the use of taxation and finance policies. It is recognized that, while the EU and national governments consider CO_2 emissions reduction a critical policy objective, local governments and the general public typically have more immediate concerns about transportation, such as costs, convenience, noise, speeding, and traffic. However, initiatives to alleviate these local problems often reduce CO_2 emissions as well, thus contributing to a larger sustainability strategy. European practices encourage and reward such local initiatives by:

- offering local governments financial incentives for aligning their policies and practices with national objectives;
- funding planning efforts that help build local understanding and support for a move in the direction toward greater sustainability;
- giving priority to local projects that meet sustainability criteria; and
- supporting trial demonstrations of new ideas to see what works.

Planning Processes

What makes sustainable transportation planning practice different in Europe is that social, economic, and environmental objectives are an integral part of sustainable transportation planning, rather than constraints or the focus of mitigation efforts. This change in perspective has led the Europeans to develop new procedures and methods for developing and evaluating transportation plans, including:

- visioning processes to develop shared goals for the future development of communities and regions.
- backcasting to investigate what strategies would be needed to meet specified goals.
- strategic mid-term and long-term planning to identify barriers and opportunities and to plan step by step how to move toward desired ends and implement needed programs and projects.

Performance Measures

Performance measures are a key element of sustainable development and sustainable transportation planning and implementation. These measures are established to evaluate conditions over time, assess progress, and determine the effectiveness of specific policies and actions. Performance measures are increasingly being developed as part of

participatory, collaborative planning processes, and they focus on outcomes rather than inputs and outputs. Both quantitative and qualitative assessments are being carried out using these measures, and a collaborative process is increasingly being used in assessments as well.

Furthermore, performance measurement is a major focus of attention at all levels of government, and there is a very high degree of agreement on its goals and objectives as well as on the specific metrics for measuring progress. The study team noted that national and local officials often used the same language in discussing transportation issues and priorities and in explaining how they measured results.

Leadership

Finally, leadership is a critical feature of the European strategy for sustainability. The leadership starts at the top, with EU policies that create a strong framework for national and local policies and actions. In addition, specific institutional changes have been implemented to promote sustainable development.

First, European policies on sustainability have made transport agencies directly responsible for the social, economic, and environmental performance of their systems. According to the European officials we visited, this is leading to a changed set of priorities. The new priorities emphasize access and exchange rather than trips per se, give greater attention to the less environmentally damaging modes, focus on optimizing the use of existing capacity, and seek improvements in vehicle technology. Sustainability considerations are reflected in the types of projects pursued, project location decisions, design and landscaping, and the choice of materials used.

Second, responsibility for transportation has been redesigned to encourage responsible action, for example, by making urban/metropolitan agencies responsible for urban/metro transport, and by matching operating responsibility with authority over funding. Leadership in sustainable development and sustainable transportation also is exhibited in several other ways. An important policy is to lead by example, i.e., to show good practices in government first.

Strategies for Sustainable Transportation

A variety of specific strategies are being pursued to increase the sustainability of the transport system in each of the countries we visited. Many of these strategies emphasize better operations and management of existing facilities and better design and operations processes for new facilities. In fact, in each country the overall approach to sustainable development and sustainable transportation is described as doing a number of small things as part of a larger, strategic program. As the previous discussion of policies indicated, the countries are trying out measures that address the following:

- Land use-transportation relationships
- Transit
- Bicycling and pedestrian improvements
- Highways and the automobile
- New technologies and operations

Land Use-Transportation Relationships

The coordination of land use and transportation is a key element in European efforts to improve sustainability. Local and regional land-use strategies are viewed as important ways to manage transportation demand and transportation impacts. In each country,

policies governing the location of land uses are designed to reduce trip lengths and facilitate the use of transit, biking, and walking — an approach referred to by many of those we met as the "short trip" land development strategy.

Specific land-use strategies include the revitalization of existing centers, infill and brownfields redevelopment, the placement of high-density development near transit, development in and contiguous to existing centers already served by transit, and planning for compact, mixed-use suburban development that is both walkable and sufficiently dense to support transit services. Although recent suburban development is lower density and more oriented to the auto than is the development in the urban core and older suburbs, the new development is still typically laid out with a mix of uses at a density that makes walking and biking practical for many trips and that can be effectively served by transit. Big box retail does exist in suburban locations, however, and is the topic of considerable debate. Policies discouraging single-use, stand-alone developments such as shopping malls have been adopted in a few instances.

Transit

Transit improvements are another key element of the European strategy for sustainability, although in each of the countries we visited transit mode share has been declining overall. The relative decline of transit reflects the fact that a growing percentage of the population has access to private automobiles, and ownership and use are increasing at rates faster than in the United States. As in the United States, subsidies for transit have been a topic of considerable debate, and subsidies have been reduced in recent years but are still provided as a matter of social and environmental policy.

Specific strategies to improve transit service include the development of extensive systems of priority lanes for buses, high-quality architecture and landscaping at transit stations and stops, planning for door-to-door service (including walk and bike access planning as part of transit planning), improved intermodal transfers, and high-quality customer information services.

Bicycling and Pedestrian Improvements

The denser land-use patterns found in European cities and suburbs make short trips conducive to biking and walking a realistic option for many. Infrastructure investments that create safe, comfortable facilities for the use of these modes further support biking and walking.

Even though winters can be harsh in these countries, bicycling is recognized as an important transport mode, particularly for short trips. Extensive systems of bikeways, bike parking, and facilities for bikes on transit have been established. Traffic controls, including signalization and signage, are designed to accommodate the slower speeds and accelerations of bicycles and to improve bike visibility and safety.

In urban centers, high-quality pedestrian spaces are plentiful, and more are being created by widening sidewalks, calming traffic, creating vehicle-free or vehicle-restricted zones, and bulbing out sidewalks at intersections to facilitate pedestrian crossings. The pedestrian-filled streets enjoy a feeling of vitality and safety (borne out by street crime statistics far lower than in U.S. cities of comparable size). Suburban towns and rural villages also are improving the infrastructure for bikes and pedestrians, with traffic calming a common practice.

Highways and the Automobile

While considerable emphasis is given to alternative transport modes, highways, automobiles, and trucks are increasingly central to European transport, and most policy initiative efforts focus on their management rather than on efforts to halt their use.

Fuel taxes several times those in the United States do provide impetus for members of the public to consider alternatives, but such taxes have not deterred high levels of auto ownership and growing auto use (although per capita auto trips and travel are still only about half that of the United States). Parking is often scarce or expensive. Heavy traffic is found in most urban centers, on trunk line roads, and in tourist areas. Auto-related air pollution affects not only urban areas, but also has damaged crops and forests.

Beyond using tax policy to influence travel choices, government agencies also have been testing public information campaigns that attempt to get the public to reflect upon the impacts of auto use and to consider trip chaining and scheduling to reduce harmful effects. At the same time, the value of the automobile for personal mobility is respected, as evidenced by car-sharing programs designed to provide households the convenience of occasional automobile use without necessitating ownership or costly rentals.

The Europeans are pursuing highway safety as a major aim of their sustainable development programs. Tough enforcement against drinking and driving is already an established program in several of the countries visited. Both speed management and traffic calming are part of newer programs aimed at a goal of improved safety and, in particular, a greatly reduced number of highway deaths. In addition, managing truck operations and regulating vehicles with the objective of improving truck safety is a current topic of considerable discussion.

New designs for highways are considered important ways to make transportation more sustainable, and in a number of projects the Europeans are experimenting with designs that aim to improve urban livability while providing good service quality. Streets and highways are being built and rebuilt to reduce negative impacts, in some cases by undergrounding major facilities. Parking also is placed underground in many areas, and is priced according to the resulting (high) cost. Joint development of air rights and partnerships with developers and owners of nearby properties are being used to help finance these costly projects. Traffic calming is widely used on residential districts and on major streets in shopping districts; the installations are made of high-quality materials and are well designed and landscaped.

Efforts are also under way to help protect biodiversity through good planning, location, design, and maintenance practices. For example, both on new facilities and in reconstruction projects, designers are creating animal crossing corridors. Bridge construction and reconstruction pays attention to the aquatic ecosystem and provides for fish and amphibian movements. On a number of highway projects, shoulders and medians are being preserved as habitat by maintaining, or reestablishing, appropriate plant species and ecosystems. Other examples of project design aimed at supporting a healthy environment include using bioengineering techniques to create environmentally sound, aesthetic structures; selecting materials to reduce noise and other environmental impacts; and incorporating recycled materials into structures and pavements.

New Technologies and Operations

New technologies also are playing important roles in the quest for sustainable transportation. Alternative-fueled vehicles are being tested both for transit and for

personal cars, to reduce pollution and carbon emissions. In addition, intelligent transportation systems (ITS) technologies are being promoted to help auto and truck drivers plan trips more effectively, avoid bottlenecks, and travel at speeds that reduce congestion and improve safety. Improvements in truck technology are being sought, and incentives for truck emissions reduction include both emissions pricing and restrictions on the use of "dirty" trucks in sensitive areas. Road pricing is discussed as a way to properly reflect the social and environmental costs of auto use but, as in the United States, it is being approached with considerable caution, because public support for it is mixed at best. Indeed, high fuel taxes have been the subject of several trucker strikes and political debates in recent years.

A rail network that is somewhat less conducive to freight movements than that of the United States makes the Europeans relatively dependent on trucking, although rail freight improvements are actively under consideration. Meanwhile, advanced logistics and operations improvements are being implemented systematically, aiming to seamlessly move goods from ports to markets, maximize the capacity of existing facilities, reduce congestion, improve safety, and cut down on the need for facility expansion.

Specific Examples From the Countries Visited

Each of the countries visited had its own approaches and emphases for sustainable transportation, demonstrating the flexibility of the overall concept and the feasibility of shaping responses to match local conditions and preferences within a consistent overall framework and direction. A review of the key strategies and measures for each country and city visited illustrates the varied approaches.

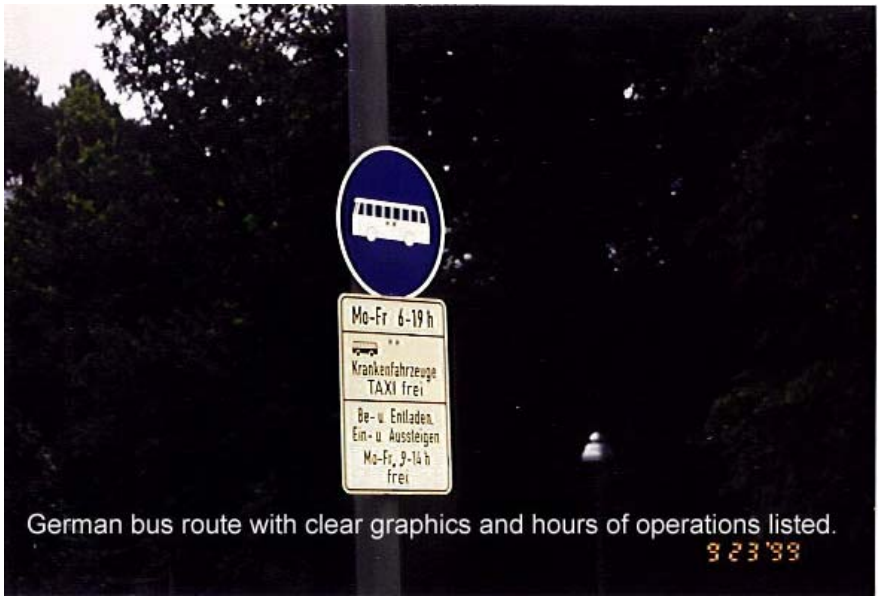
Germany – Berlin

The German hosts described their overall strategy for sustainability as to work within the EU framework, developing and applying local regulations rather than proposing an overall package of measures for the whole country. They described the approach as resting on a qualitative vision of a sustainable future, with quantitative criteria — standards for noise, air quality, acidification, CO_2 reduction, and the like — driving action.

The basic German approaches for developing a sustainable transportation system are multimodal planning and least-cost planning. Important guiding principles are planning to: 1) avoid motor trips when possible, 2) shift trips to less damaging modes, and 3) optimize road capacity while simultaneously 4) improving vehicle technology, and 5) deploying telecommunications and ITS technologies to make traffic flow smoothly and efficiently.

Land-use strategies are designed to support trip reductions (shorter trips and shifts to less damaging modes). The key strategies are density and mixed use, regional development that is focused along key transport corridors and at the crossing of transit lines, and land-

use plans and policies that reinforce existing centers and discourage or ban greenfield stand-alone malls.



German bus route with clear graphics and hours of operations listed.

User fees to reflect full cost have been actively discussed, but are not yet supported by the public, except perhaps for trucks. Public education on transportation costs, impacts, and options for changes is considered a critical element of any plan for sustainable transport.

Specific examples of sustainable development and sustainable transport in Germany are heavily focused on management and operations. Few new roads are being considered; instead, upgrades (including widening of some facilities) and highway management (using both conventional means and ITS) are being emphasized. German officials expect logistics to play an important role, helping to manage highway construction and maintenance impacts and, along with ITS, to manage freight movements. Speed advisories are being used to help reduce congestion, although the efficacy of this

approach is still under study. Truck impact management is another important policy thrust, with vehicle taxes, fuel taxes, and time restrictions all part of the policy package. In addition, there is an increasing emphasis on rail and sea freight.

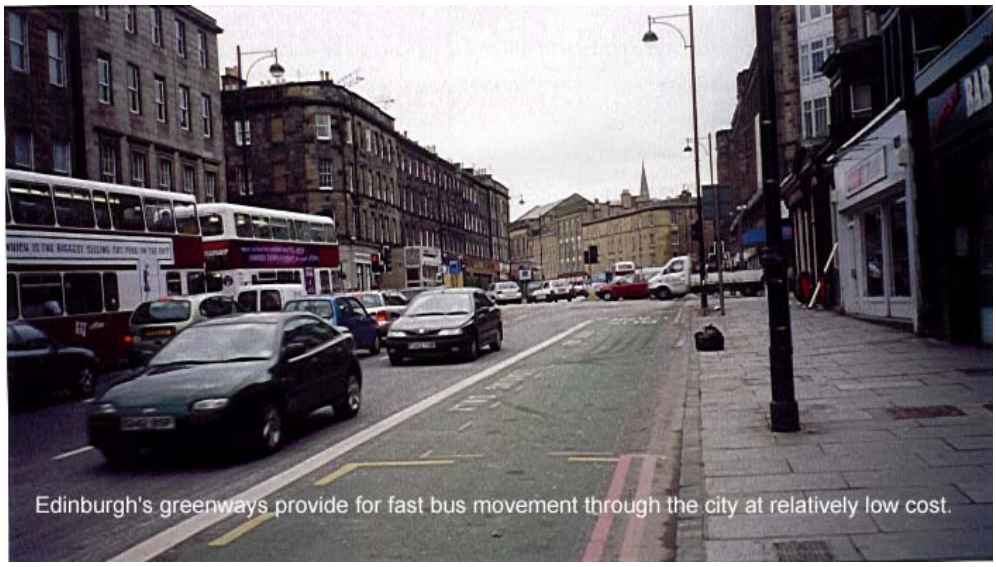
Urban policies are shaped by federal regulations on urban development that aim for compact growth, well matched to pedestrian, bike, and transit access. Under this policy, land development and transport improvements are to be matched to provide for cost-effective transportation and modal choices. Transit-friendly policies are emphasized, including dedicated bus lanes, good transit connections to major destinations such as airports and rail terminals, and bicycle facilities that are well connected to rail. Well-designed parking and transit facilities aim to enhance the urban streetscape and, in the case of transit, to make the transit rider's experience pleasant and convenient.

High design buses serve high design stations.

Other sustainable development policies include tougher emissions standards for vehicles and promotion of alternate fuels for vehicles. On the design side, tunnels are being used to reduce congestion and lower urban impact, and recycled materials are increasingly being incorporated into construction and reconstruction.

Scotland – Edinburgh

Scottish officials reported that their main strategies for sustainable transportation emphasize coordinated transportation and land development at the local and regional levels, give priority to transit and nonmotorized modes of transport, and rely on public education to help residents make informed and sophisticated travel choices. In this approach, central city vitality is to be coupled with compact and contiguous suburban development, supporting a focus on exchange (or access) rather than movement. When motorized transportation is needed, the priority is to make public transport the preferred choice by making it competitive and attractive, and to encourage people to use cars thoughtfully and sparingly.



Edinburgh's "greenways" provide for fast bus movement through the city at relatively low cost.

Scottish examples of sustainable development and sustainable transport reflect these concepts. Edinburgh, for example, has developed the Travel Wise program, which aims to educate the public to think before traveling, to walk or bike when possible, to use transit effectively, and to plan auto travel to chain trips, avoid congestion, and so on. To encourage the use of alternate modes, an extensive system of "greenways" (exclusive bus lanes painted green) has been established, giving buses priority and making boarding and alighting easier. Bike streets — streets on which bikes have priority — also have been established, and bikeways are frequent and well connected. Wide sidewalks also have been installed through much of central Edinburgh, often by using lanes formerly available to motor vehicles. These sidewalks are reported to be good for business because they create attractive, comfortable venues for shoppers and tourists.

At the same time, a plan for a new town on a former greenfields site was well under development at the time of the study team's visit. While efforts were being made to make the new town a mixed-use development with a balance of jobs, housing, and shopping opportunities, the plan was controversial, with critics believing it could detract from revitalization efforts in older communities.

Auto ownership and use has been growing with greater Scottish prosperity, and government policies have aimed to moderate the auto's impacts. A car club experiment is being implemented to offer city dwellers part-time access to a car without the burdens of full-time ownership, in hopes that it can reduce the number of vehicles parked and used in the city. For similar reasons, parking is priced to reflect costs. Safety is also a concern when it comes to autos; speed limits have been lowered in some zones, and speed

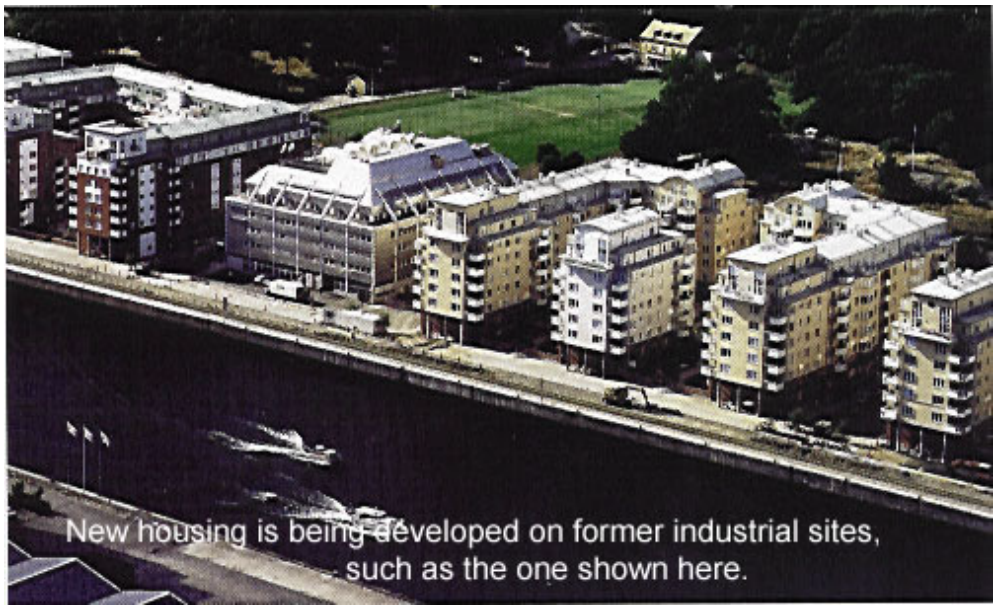
enforcement by camera is permitted. Traffic calming is widely used in residential districts.

Sweden – Stockholm

Swedish officials call their approach to sustainable development "lots of small things" done in collaboration and put together into an overall strategy. Access, quality service, safety, a good environment, and sound economic development are all objectives for Swedish transportation plans, consistent with the EU view of sustainable development as entailing social, economic, and environmental betterment. Furthermore, Swedish transportation providers must meet social and environmental objectives and are evaluated on the social and environmental performance of their projects, which has led to the integration of social and environmental goals into transportation planning. Collaborative efforts to identify and remove conflicts in policy are well under way, and the government's focus is shifting to the identification of opportunities for different agencies and different levels of government to jointly pursue projects. Strategic planning has been done and the development of performance measures is well under way; implementation, monitoring, evaluation, and feedback are now the main foci of the planning process, and the objective now is to accelerate attainment of goals rather than change direction.

A strong belief permeating the Swedes' discussions was that government should lead by example, should be first to innovate, and should build upon local understandings and then expand vision through education. Accordingly, considerable emphasis is given to government-led experiments and demonstration projects to test out new ideas in transportation and land development.

This multimodal transportation corridor provides convenient bicycle pedestrian, auto, and transit access.



New housing is being developed on former industrial sites, such as the one shown here.

Swedish examples of sustainable development and sustainable transport include the following:

- Emphasizing making transit work through the use of performance goals aimed at obtaining more efficient service at reduced subsidy.
- Providing a customer orientation in transit by using surveys to identify traveler preferences, removing barriers to transit use, providing better information and greater comfort and convenience, and offering quality architecture and landscape design in transit stations and at bus stops.
- Coordinating land use and transportation in redeveloping and preserving town centers, recognizing their cultural and social importance, and building new towns at walkable densities near transit.
- Designing, building, and reconstructing transport facilities to reduce negative impacts, e.g., putting highways underground in the city and implementing traffic calming.
- Protecting the environment through good planning, design, and maintenance, such as promoting biodiversity by avoiding damage to habitat, removing barriers for animals, designing to avoid water pollution, and using recycled materials to reduce solid waste.
- Experimenting with and implementing new automotive technologies, including alternate fuels, hybrid and alt-fuel buses and government fleet vehicles, etc.
- Developing a sustainable freight transport strategy, including reductions in truck emissions and incentives for cleanup; regulating the use of trucks in sensitive areas;

improving rail freight; and applying advanced logistics to make freight operations more efficient.

- Emphasizing health and safety in transportation, including a zero deaths safety plan involving the implementation of grade separation, traffic calming, in-vehicle protection, and public education.

The Netherlands – The Hague, Rotterdam

In the Netherlands, the overall strategy for sustainable transportation begins with getting the prices right, for both passenger and freight transportation. It builds upon a widely supported national goal of environmental preservation and enhancement (protecting the "Green Heart" of the nation), and aims to decouple economic growth and environmental degradation. Within that general framework, the strategy for sustainable transportation involves land-use strategies and traffic management. Land-use strategies aim to support existing centers and coordinate the amount of new development permitted with the level of transport service available. Transport strategies emphasize quality services and design for transit, bikes, and pedestrians; management of the auto through pricing and new technologies; active freight planning; and an emphasis on safety.

A prime example of the Dutch integration of sustainable development and sustainable transport includes the country's "ABC" policies that rank locations according to the amount and type of transit service available and focus the most intense development where access is greatest. Mixed-use and contiguous development also is the rule, with limits on stand-alone malls and offices. Policies on the provision of other public infrastructure, including water and sewer services, are aligned with these transportation

and land-use policies. Incentives for using transit, biking, and walking are bolstered by high-quality infrastructure for these modes, along with widespread traffic calming.

Traffic-calmed streets provide safe passage for bicycles and pedestrians.

Nevertheless, urban land for new development is scarce and expensive, and suburban office parks are being developed in some areas, although they are linked to transit systems (sometimes directly, sometimes by shuttles) and are accessible by foot and by bike.

Transport planning aims to account for the whole trip chain, door to door, rather than mode by mode, and investments are made accordingly. For example, bike and pedestrian linkages to transit stations are planned as part of the transit trip. Separate bike lanes are often found along sidewalks, providing for fast and relatively safe movements through the city. Bike parking areas also are provided as a matter of course.

Red bricks and yellow curbs mark separate bike and pedestrian paths in The Hague.

Sophisticated designs are being implemented to provide greenways and green bridges in transport rights of way for animal crossings and habitat. In addition, the Dutch sometimes put highways, railroads, and parking underground, using air rights development as the financing tool, to reduce their impacts on the urban environment. Designs to capture and treat runoff and protect water quality are being implemented.

Outside the city, the emphasis is on traffic information and advanced traffic control systems, including advanced truck logistics. Safety is an important objective; as one example, cell phone use has been prohibited while driving unless it is hands-free. New technologies for vehicles and fuels are being vigorously tested, as are fuel policies that encourage the use of less environmentally damaging options.

Findings

Many of the strategies and measures being implemented in the four European countries visited have been tried before, both in Europe and in the United States, so it is worthwhile to ask: What is different from past practice? The answer seems to be that at least three things are different and have important consequences.

- First, methods of planning have been redesigned so that social, economic, and environmental objectives are an integral part of sustainable transportation planning — rather than constraints or the focus of mitigation efforts. This changes both the process and the content of transportation planning and decision making.
- Second, transport agencies are directly responsible for the social, economic, and environmental performance of their systems. This changes the incentive structure and further alters project design and selection.

As a result,

- Priorities are shifting toward less environmentally damaging modes and improved vehicle technology; optimizing the use of existing capacity; and location and design decisions that support sustainability objectives.

Why are these changes being made?

- Policy commitments are in place.
- Collaborative planning and incentives support action.
- Funding is provided for quality projects and systematic implementation.
- There is a sense of real value being added through this new approach.

Still, as the government officials we visited themselves noted, the results are not yet in. Significant advances in sustainability will require ongoing efforts, with monitoring, evaluation, experimentation, and adjustment — learning through planning and action.

Possible Implementation in the United States

Members of the U.S. study team identified a number of items that might be considered for implementation in the United States. These included policy approaches and planning procedures as well as specific transportation measures or actions.

In the area of policy, team members were especially interested in the European emphasis on policy consistency and cooperative problem solving among agencies with somewhat different objectives.

Team members took special note of the policy harmonization efforts being undertaken at the EU, national, state/province, and local levels. These efforts identify policy conflicts and then turn to negotiations to remove them, following up with new policies and practices as necessary. Team members saw this approach as potentially useful as a way to resolve transportation-environmental conflicts and speed attainment of environmental goals.

Team members also noted that European practice frequently matches operating responsibility for transit and highway systems with control over funding for those systems, and often assigns such responsibility and control to local or regional agencies. Team members saw this as a logical extension of TEA-21 policies.

Planning approaches that might be adopted in the United States include visioning processes to develop shared goals, strategic planning for both the long term and mid term, and backcasting to test to see what strategies would be needed to meet goals. Another policy item with high potential for the United States is the use of performance standards

along with monitoring and reporting on progress. This policy could be coupled, as it is in the countries visited, with fiscal incentives for actions supportive of adopted goals.

All of the specific measures being used in the countries visited were thought to have potential applicability to the United States, recognizing the wide range of conditions among the states and metropolitan areas. Of particular interest to team members were car-sharing and projects aiming to educate the public about the costs of driving, as well as the possibilities for joint development to help pay for expensive but socially and environmentally attractive project designs.

Finally, there was considerable interest in the strategic use of new technologies for the advancement of sustainable development goals, and for creative designs using biotechnologies, recycled materials, and other context-sensitive approaches to build and rebuild transportation infrastructure that better fits its environment.

Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official policy of the Department of Transportation.

The metric units reported are those used in common practice by the persons interviewed. They have not been converted to pure SI units because, in some cases, the level of precision implied would have been changed.

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Appendix A: Amplifying Questions

Background Context

1. Socioeconomics and Patterns of Growth and Change:

a. Please describe your socioeconomic circumstances and the rates and patterns of growth

and change over the past decade or two.

[We are interested in understanding the trends in population, demographics, household income, and workforce participation, as well as changes in employment and growth in the economy, and the effects of these trends on location patterns and transport use.]

2. Urban Development Patterns:

a. What trends are you experiencing in urban and suburban development?

[We are interested in understanding the extent and relative importance of suburban growth in housing and jobs, as well as new construction, redevelopment, and reuse in central cities and other older centers.]

3. Transportation Systems, Vehicle Ownership, Mode Shares:

a. Please describe your current transportation systems and key changes that have occurred over the past decade or two.

[We are interested in such matters as construction of new highway and rail facilities, changes in bus service, auto ownership trends, passenger and freight mode shares, and taxation, finance, price, and subsidy policies affecting these matters.]

4. Key Social, Economic, and Environmental Concerns:

a. Please tell us about key social, economic, and environmental issues that transportation agencies are facing these days.

b. How important are such issues as social equity in the provision of transport services, community disruption from traffic or transport facilities, transport costs, economic development opportunities, and environmental impacts of transport, safety, easy accessibility, mobility?

c. What policies are you applying or evaluating to address these issues (or other issues that are critical to you)?

5. Institutional Arrangements and Decision-Making Processes for Transportation:

a. Please describe your governance structure for transport, especially the roles and resources of national government and regional and local entities.

b. Do you have a formal national or regional transport policy?

c. To what extent and how does coordination among the key actors occur?

d. What roles do public and private interest groups and members of the general public play in transport decision making?

e. What methods do you use to develop and evaluate transport policies, programs, and projects?

6. Urban Development Politics and Institutions:

a. Please describe your governance structure for land use and urban development, especially the roles and resources of national government and regional and local entities, private developers, and property owners.

b. Do you have a formal national urban policy or formal metropolitan growth policies?

c. What kinds of land-use and development controls do you have and how do they work?

d. To what extent and how does coordination occur among government entities and private actors?

e. What roles do public and private interest groups and the general public play in land development and land-use decisions?

Sustainable Transportation

1. Definitions of Sustainability:

a. How do you define the term "sustainability"?

b. Do you use this term, or other terms instead or in addition?

2. Overall Strategies for Sustainability:

a. What strategies are you pursuing to move toward sustainability?

[We are interested in responses to the Kyoto Protocol as well as other strategies you may have adopted to pursue your own objectives.]

b. Where do transport, urban development, and other policies fit into an overall strategy for sustainability?

3. Examples of Sustainable Development and Sustainable Transport:

a. Please tell us about the cases that you consider your best examples of sustainability. These could be built projects or plans, programs, or practices.

[We are interested in urban, suburban, and rural applications, public and private examples, and interorganizational partnerships.]

4. The Policy Framework for Sustainability:

a. What circumstances led to your emphasis on sustainability?

b. Please tell us how the policies and practices developed, including the roles of different public and private actors.

c. What policies have helped promote sustainability and what policies have hindered it?

d. What policy initiatives have you used to try to overcome barriers?

5. Planning and Evaluation Methods Incorporating Sustainability:

a. Please discuss how you forecast, analyze, or measure the effectiveness of sustainable transportation plans, programs, and projects.

[We are interested in specific measures of effectiveness you use: economic, social, environmental, or other. We also are interested in what modeling and analysis techniques you use (e.g., demand forecasting, GIS mapping).]

b. Has planning and evaluation practice changed as a result of the interest in sustainability?

6. Finance and Implementation:

a. Please describe how you have implemented your sustainability program.

[We are interested in the economics of the projects and how they were financed, as well as politics of implementation, including the support and interest level of elected officials, public and private interest groups, and the general public.]

[We also are interested in learning about any difficulties you may have uncovered during implementation and how you dealt with these.]

7. Public Attitudes, Education, and Leadership:

a. How familiar is the public with sustainability issues and strategies, and how much support is there for actions to improve sustainability?

[We are interested in learning about the public reaction to sustainability issues.]

b. Do particular circumstances — cultural, economic, other — lend themselves to such understanding and support (or to opposition and resistance)?

c. Do government agencies or others promote understanding and support for sustainability through public communications, education, demonstration projects, etc.?

d. What is the role of elected officials in providing leadership in this area?

Appendix B: Biographic Sketches

Susan B. Petty, the Panel Chairperson, is the Team Leader for Community Programs in FHWA's Office of Human Environment in Planning and Environment. Ms. Petty is implementing the Transportation and Community and System Preservation Pilot Program and other highway programs that support community enhancements as well as coordinating Department of Transportation (DOT)-wide sustainability issues. Before coming to Planning and Environment, Ms. Petty worked with the Office of Policy to complete the FHWA Strategic Plan and was the Chief of State Programs in the Office of Motor Carriers and working on highway safety and freight issues. In her 19-year career with the U.S. DOT, Ms. Petty has had diverse experience and has worked on a number of modal programs, including in highway safety, transit, motor carrier safety, hazardous materials, pipelines, airport grants, and rail programs. She received undergraduate degrees in design and urban studies and completed a master's degree in Public Administration from North Carolina State University.

Frances T. Banerjee is the Interim General Manager of the City of Los Angeles DOT. She previously served as the Assistant General Manager of the Office of Transportation Programs. Before joining LA's DOT, Ms. Banerjee was Assistant Chief Analyst of Los Angeles where she was responsible for policy review of transportation and economic development, housing and redevelopment activities, and police programs. She also served for a six-year period as Transportation Manager for the LA Community Redevelopment Agency. Ms. Banerjee is actively involved in numerous professional associations including the Transportation Research Board (TRB), the Urban Land Institute, and the National Association of City Transportation Officials. She has undergraduate and

graduate degrees from Boston College and is pursuing a Ph.D. in Urban Planning at UCLA.

Elizabeth Deakin is Associate Professor of City and Regional Planning and Director of the University of California Transportation Center. She teaches transportation policy and transportation studies along with land-use law and land-use planning courses. Her research interests focus on transportation-land use interactions, policy design and implementation, and the social and environmental impacts of transportation and urban development. She has published several papers on land use and transportation for sustainable development. Ms. Deakin is a graduate of MIT, where she received SB and SM degrees in political science and civil engineering - transportation systems, and Boston College Law School. She is on the editorial boards of several journals, including *Transportation Policy* and *Transportation Planning and Technology*.

Charlie Howard is the Planning Director for the Washington State DOT in Olympia, Washington. Mr. Howard currently directs all aspects of transportation planning, including the development of the statewide transportation plan, regional planning coordination, and the development of specific modal and corridor plans. Mr. Howard has been integrally involved in the development and implementation of the State of Washington's Growth Management Act. His professional interests are in the linkage of land use and transportation, regional transportation planning, and transportation governance. Before joining the Washington State DOT in 1987, Mr. Howard worked as a Community Planner with the FHWA in Boston, Massachusetts; Washington, D.C.; Juneau, Alaska; and Olympia, Washington. Mr. Howard earned his BA from Ohio State

University, and his master's of City and Regional Planning from Harvard University. He serves as a member of the TRB Statewide Multimodal Transportation Planning Committee; the TRB Subcommittee on Performance Measures; and the TRB Task Force on Sustainable Transportation.

Jean M. Jacobson is the County Executive of Racine County, Wisconsin. In addition to overseeing the day-to-day operations of a county on one of the busiest transportation corridors in the United States, Ms. Jacobson is Chair of the National Association of Counties' Transportation and Telecommunications Steering Committee, dealing with transportation issues on a nationwide basis. She recently completed a term as a member of the Research Technology Committee of the National Transportation Research Board. Ms. Jacobson attended Wisconsin's Holy Redeemer College and is working on a Certificate in Public Administration from the University of Wisconsin-Milwaukee. She is on the Board of the Southeastern Wisconsin Regional Planning Commission and on the Executive Committee of Sustainable Racine, and in the past has served as Chair of the Transportation Steering Committee of the Wisconsin Counties Association.

Ysela Llort is the State Transportation Planner for the Florida DOT. Her primary responsibilities include executive-level policy formulation and interpretation, as well as working with the numerous transportation partners, including metropolitan planning organizations, to obtain consensus on needs and priorities for this unique state. Ms. Llort has been with the DOT since August of 1994. Prior to 1994, Ms. Llort served nine years with the Virginia DOT as Assistant District Engineer for Planning and Operations in the Northern Virginia portion of Washington, D.C., metropolitan area. She has worked in

both private and public sectors, including developmental banking. Ms. Llort is a graduate of Duke University where she earned a degree in economics, and holds master's degrees from Clemson University in City and Regional Planning as well as in Transportation Engineering.

Peter C. Markle is the Division Administrator for the Massachusetts Division of the FHWA. He was transferred to Massachusetts in August 1995, initially as the FHWA Project Administrator for the Boston Central Artery/Third Harbor Tunnel. He has been with the FHWA since 1976 with past assignments in Connecticut, Georgia, Texas, New York, Headquarters, Region 4 in Atlanta, and California. Mr. Markle received his BSCE from the University of Connecticut and is a registered professional engineer in the State of New York.

David A. Pampu is Deputy Executive Director of the Denver Regional Council of Governments (DRCOG) in Denver, Colorado. Mr. Pampu is currently responsible for management and direction of DRCOG's regional planning program, including regional growth and development, streets and highways, mass transit, air quality and water quality planning. Previously he held transportation and land-use planning positions with DRCOG, was a Research Associate at the University of Michigan Center for Urban Studies, and was with the Michigan Department of State Highways. Mr. Pampu is a graduate of the University of Michigan and holds a master of Urban Planning degree from Wayne State University. He is a member of the American Institute of Certified Planners (AICP) and an associate member of the International City Management

Association and has served on a number of professional committees involved in transportation and environmental planning issues.

G. Alexander Taft is Executive Director of the Wilmington Area Planning Council (WILMAPCO) in Wilmington, Delaware. He supervises innovative regional transportation and land-use planning, and strives to develop sustainable transportation solutions. He has developed "mobility friendly" design standards for government agencies in the region. Mr. Taft has directed transportation planning and operations as both a city official and a consultant. He is a graduate of Washington & Lee University and holds a master of Urban Affairs degree from Boston University. He is Vice Chairman of the Association of Metropolitan Planning Organizations and is a member of the American Planning Association, the Transportation Research Bureau, the Institute of Transportation Engineers, and the Congress of New Urbanism.

Marianna H. Rizzo is an International Programs Manager with the FHWA Office of International Programs. Ms. Rizzo works with the Technology Transfer program and facilitates information/technology sharing and exchange with other countries. She also manages the Private Sector Initiatives to help U.S. highway firms conduct business abroad. With more than 20 years' experience in the transportation sector, Ms. Rizzo has worked in highway safety, grants management, motor carrier safety, hazardous materials transportation and safety, and Intelligent Transportation Systems (ITS) programs. She is a graduate of the State University of New York at Albany with a BA in Management.

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