FUTURE OF THE UNITED STATES TRANSPORTATION SYSTEM

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ABSTRACT

The United States Interstate Highway System is an important part of our integrated transportation network encompassing roadways, railroads, waterways, pipelines, and transit systems. The future holds many challenges for utilizing all transportation modes to enhance livable communities, ensure safety, maintain existing infrastructure, and spur innovations.

1. TRANSPORTATION IN THE UNITED STATES

The Interstate Highway System (IHS), State Highways, and the arterial road systems are part of a broader U.S. transportation system. The IHS recently celebrated its 50 year anniversary and completion of the network, as it was originally designed. The IHS represented a bold vision of connecting people to opportunities and businesses to markets. It fundamentally changed U.S. manufacturing, employment, and way of life. Current trends in roadway congestion, crash causation, and aging infrastructure threaten mobility. The United States has about 130 million more residents than when the highway system first broke ground, and this country is predicted to maintain a similar trajectory over the next 50 years. The U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), and our State partners are looking to meet the challenges by strengthening infrastructure, spurring innovations, and getting innovative ideas into use more quickly.

The IHS is part of an integrated transportation network encompassing roadways, railroads, waterways, pipelines, and transit systems. Table 1 shows a summary of the rich and diverse U.S. transportation system. The IHS comprises 47,000 miles or approximately one percent of the public roadways and serves as the arteries of our roadway system. Size alone is not a proper measurement since the IHS is utilized for 24 percent of all highway travel and 41 percent of truck travel.[1]

Table 1 - System Mileage within the United States, 2009

Transportation System	
Highway	4,067,396
Class I Rail	93,921
Amtrak	21,178
Transit	10,661
Navigable Channels	25,320
Oil Pipeline	172,048
Gas Pipeline	1,539,911

Source: National Transportation Statistics, Bureau of Transportation Statistics, Department of Transportation and Highway Statistics, Federal Highway Administration

[1] http://www.transportation1.org/tif1report/highway_01.html

Historically, the transportation system was largely planned separate from land use and the environment. This view is changing to one in which transportation infrastructure is viewed as part of the social fabric, which recognizes transportation's role in influencing where and how people work and live.

2. TRANSPORTATION AND LIVABLE COMMUNITIES

A livable community is one that puts priority on the citizens' social, physical, and economic well being. The USDOT focuses on livability to help transform the way transportation serves the American people—and create safer, healthier communities that provide transportation choices and access to economic opportunities. The USDOT is removing barriers that have long existed between transportation, housing, and the environment as part of creating livable communities. The USDOT, U.S. Department of Housing and Urban Development, and the U.S. Environmental Protection Agency have come together in a historic Memorandum of Understanding to support more livable and sustainable communities. As noted by USDOT Secretary Ray LaHood "we have a window of opportunity to think differently about transportation and propose bold, new approaches to improve the livability of our Nation's communities."[2] The Memorandum outlines the Partnership for Sustainable Communities that employs six livability principles to guide the partnership:

- **Provide more transportation choices** to decrease household transportation costs, reduce our dependence on oil, improve air quality, and promote public health.
- **Expand location- and energy-efficient housing choices** for people of all ages, incomes, races, and ethnicities to increase mobility and lower the combined cost of housing and transportation.
- **Improve economic competitiveness of neighborhoods** by giving people reliable access to employment centers, educational opportunities, services, and other basic needs.
- **Target Federal funding toward existing communities** to revitalize neighborhoods, reduce public works costs, and safeguard rural landscapes through transit-oriented and land recycling.
- **Align Federal policies and funding** to remove barriers to collaboration, leverage funding and increase the effectiveness of programs to plan for future growth.
- **Enhance the unique characteristics of all communities** by investing in healthy, safe and walkable neighborhoods, whether rural, urban, or suburban. [3]

The Permanent International Association of Road Congresses (PIARC), through its 117-country membership, provides research at the forefront of helping integrate transportation

[2] http://fastlane.dot.gov/2009/06/livability-principles-will-guide-federal-housing-environmental-and-transportation-policy-.html
[3] http://www.whitehouse.gov/sites/default/files/uploads/SCP-Fact-Sheet.pdf

choices to make communities more livable. For example, one element of improving the livability of communities is addressing issues related to highway noise through the use of quieter pavement. The State of Arizona has been one of the leaders in this area. Using the Arizona experience and outcomes from an international scan, PIARC is helping inform countries of the opportunities to decrease road noise for communities around the world.

As we move forward, we must prepare our infrastructure to serve not only the population and economy in the United States but also maintain its role in international trade in order to meet President Obama's call to double exports between 2010 and 2015.[4]

3. MEETING THE CHALLENGES

These bold visions for livable communities require the U.S. transportation system to meet future challenges, including strengthening our existing infrastructure, spurring innovation, ensuring safety, reforming government, and exercising responsibility. These challenges are particularly daunting as the United States and the world continue to overcome the most difficult economic climate since the Great Depression. In addition to record high unemployment in many sectors, families are feeling the impact of a 33 percent increase in gasoline prices.[5] While it is true that gasoline prices in the United States are generally below those in many other countries, the change in price over the last 12 months is forcing many workers to rethink their transportation options and, at the same time, is constraining the government's ability to increase revenues as a means to fund new initiatives. The Federal and most State governments obtain transportation funding via a per-gallon fuel tax that does not vary with the fuel price. As the price of fuel increases and consumers purchase less, funding for transportation decreases.

3.1. Strengthening American Infrastructure

Strengthening the U.S. transportation infrastructure is required to meet the needs of the growing population. This requires not only investing in rebuilding roads and bridges but also fulfilling the bold vision of a national high-speed rail network and providing accessible, affordable transit options.

3.1.1 Rebuilding Roads and Bridges

The construction of the IHS was, at the time, and remains to this day, the largest public works project undertaken by the United States. The IHS is part of a larger network of highways built and maintained by the States with Federal funding support and following standards set out by the Federal Government in partnership with the American Association of State Highway and

[4] http://www.nytimes.com/2010/01/29/business/29trade.html
[5] http://www.bls.gov/news.release/cpi.nr0.htm

Transportation Officials (AASHTO). This two-level system is somewhat unique to the United States.

While the Federal Government actually owns very few highways, it plays a significant role in helping to fund highway improvements. Federal funds provided to the State governments represent approximately 42 percent of total funding for highway capital improvements. The Federal Government also plays a significant role in helping to set strategic directions for highway improvement programs. While State and local governments are responsible for identifying, designing, and constructing specific improvements to be made with Federal funds, the Federal Government establishes priorities for different types of improvements to be made and works closely with State and local governments to identify alternatives that meet Federal, State, and local transportation and economic development objectives.

The O'Callaghan-Tillman Memorial Bridge near the Hoover Dam is a good example of the type of project that takes close collaboration between the Federal and multiple State governments. US Highway 93 (US 93) originally passed directly on top of the Hoover Dam, but when US 93 was designated part of a North American Free Trade Agreement route, congestion increased as trucks slowed to maneuver the switchbacks leading to the dam crossing. The FHWA partnered with Arizona and Nevada, which border the dam, as well as the U.S. Bureau of Reclamation, Western Area Power Administration, and the National Park Service to bring this project to fruition.

3.1.2 National High-Speed Rail Initiative

One of the boldest steps toward meeting the U.S. transportation challenges is the High-Speed Rail (HSR) Initiative. President Obama's goal is to provide 80 percent of Americans access to high-speed rail within 25 years. The USDOT is working with States to plan and develop high-speed and intercity passenger rail corridors ranging from upgrades of existing services to entirely new rail lines exclusively devoted to 150 to 220 mile-per-hour trains.

3.1.3 Investing in Accessible, Affordable Transit Options

The USDOT is committed to providing livable alternatives to congested roadways through investing in increased transit options. This initiative will prioritize projects that rebuild and rehabilitate existing transit systems, including an important new transit safety program. This initiative will also free local authorities from some of the bureaucratic restrictions, enabling temporary use of Federal funds to cover operating costs in economically distressed areas. Generally, Federal transit funding can only be expended on capital improvements and purchases except in rural areas.

3.2. Spurring Innovation

As noted by USDOT Secretary LaHood, "We can no longer afford to continue operating our systems the same way we did 50 years ago, with outdated processes and financial tools that were made for yesterday's economy." The USDOT is meeting this challenge through a proposed infrastructure bank, leadership awards, and renewed investment in rural transportation.

3.2.1 Establishing an Infrastructure Bank

The FHWA currently oversees a credit program entitled Transportation Infrastructure Finance and Innovation Act (TIFIA) that provides Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance. The TIFIA credit assistance program leverages federal expenditures so that $1 of Federal funds can provide up to $10 in TIFIA credit assistance which can support up to $30 in transportation infrastructure investment. Current legislative proposals would expand this popular program for leveraging private funds to meet the needs of public transportation infrastructure.

3.2.2 Rewarding Innovation through the Transportation Leadership Awards

Recognizing that competition often promotes innovation, the USDOT proposes to encourage leadership in the planning, building, and management of the transportation system. The Transportation Leadership Awards would recognize States and regions that implement proven strategies that further USDOT's strategic goals, strengthen collaboration among different levels of government, focus on performance and outcomes, and encourage the development of a multimodal transportation system connecting the economy. Incentive programs such as the Leadership Awards are useful in the U.S. system, since States and local governments are the owners, operators, and ultimate decision makers for the majority of highway and transit transportation investments.

3.2.3 Reinvesting in Rural Transportation

In the United States, more than 20 percent of the population resides in small and rural areas. These rural areas contain 69 percent of the highways eligible for Federal government funding support and 77 percent of the Nation's bridges. The rural transportation system is a shared resource with benefits beyond the immediate residents, as trade and commerce move within the United States and internationally. The USDOT promotes innovative policy solutions to ensure rural residents can more easily connect with regional and local transit options employing seamless connectivity across transportation modes.

The USDOT proposes further investments in rural safety that would reduce the fatalities on rural roads. Fatality rates on rural roads are almost double the fatalities on urban roadways

per 100 million vehicle-miles-traveled. Rural roads account for approximately 40 percent of the vehicle miles traveled in the United States but almost 57 percent of the fatalities.

3.3. Ensuring Safety

The rural roads safety initiative is just part of the USDOT's broad commitment to safety on the roadways. In May 2011, the United States joined dozens of governments and international organizations to launch the United Nations' *Decade of Action for Road Safety*. The United Nations General Assembly set the goal for 2011 – 2020 "to stabilize and then reduce the forecast level of road traffic fatalities around the world." [6] The World Road Association will express its formal support for this initiative at the 2011 World Road Congress meetings in Mexico.

The USDOT has taken a leadership role to improve the behavior of road users by bringing media and legislative attention to combat distracted driving. In 2009, more than 5,000 people were killed and an estimated additional 448,000 were injured in motor vehicle crashes that were reported to have involved distracted driving on roadways. Distracted driving comes in various forms, such as cell phone use, texting while driving, eating, drinking, talking with passengers, as well as using in-vehicle technologies and portable electronic devices. Following the USDOT initiative, 32 States have implemented laws banning operation of hand-held devices or texting while driving.

In addition, the Federal Highway Administration initiated *Toward Zero Deaths: A National Strategy on Highway Safety*. This is a data-driven effort focusing on identifying and creating opportunities for changing American culture as it relates to highway safety. The effort will focus on developing strong leadership and champions in the organizations that can directly impact highway safety through engineering, enforcement, education, emergency medical service, policy, public health, communications, and other efforts. The national strategy will be utilized as a guide and framework by safety stakeholder organizations to enhance current national, state and local safety planning and implementation efforts. The intent is to develop a mechanism for bringing together a wider range of highway safety stakeholders to work toward institutional and cultural changes.

The USDOT is advancing safety through the 4 "E"s of engineering, enforcement, education, and emergency medical services, along with policy, public health, communications, and other efforts. These efforts are paying-off: from 1999 to 2009, the number of large trucks involved in fatal crashes has declined by 35 percent, and the number of buses involved in fatal crashes declined by 31 percent.[7] New technologies and innovations need implementation to continue moving the statistics in the right direction. One example is Safety Edge, a technology that paves the edge of the road at an angle instead of a vertical drop off, helping

[6] http://www.decadeofaction.org/believe/index.html
[7] http://ai.fmcsa.dot.gov/CarrierResearchResults/HTML/2009Crashfacts/2009LargeTruckandBusCrashFacts.htm

drivers that veer off the road to safely return to the travel lane. This practice is being promoted through the FHWA *Every Day Counts* (EDC) initiative.

3.4. Every Day Counts Initiative

The EDC initiative identifies and deploys innovation aimed at shortening project delivery, accelerating the adoption of technology, enhancing the safety of our roadways, and protecting the environment. This initiative looks to shorten the period of time between the first implementation and the wide-spread adoption of improved transportation systems.

3.4.1 Shortening Project Delivery

The traditional U.S. design-bid-build highway construction method may take up to 13 years to deliver a completed project. The EDC initiative looks to reduce the time it takes to deliver highway projects to the public through accelerated project delivery methods. These practices include design-build[8] and an innovative blending of design-build with standard delivery systems called construction manager/general contractor (CM/GC). In a typical CM/GC scenario, project leaders work with a general contractor to serve as the construction manager, to provide the owner with constructability, pricing, and scheduling information during the design process. As the design nears completion, if the owner and the construction manager are able to agree on a price for construction, they sign a construction contract and the construction manager then becomes the general contractor.

Through the PIARC Road Pavements Committee, the FHWA is working with other world leaders in transportation to reduce construction time and cost. The Committee identified making projects more cost effective as the top priority. The FHWA will identify innovative practices and case histories including: methods related to tendering conditions (i.e., bonus/penalties, lane rental, cost plus time bidding, performance); methods related to the organization of the worksite (i.e., public awareness, night work, working 7 days or 24 hours); and methods related to adequate technical choices (i.e., design optimization, overlay-inlay, recycling at site, fast track paving, modular pavements, dowel bar inserter, warm mix asphalt, compact asphalt pavements).

[8] According to the Design-Build Institute of America, the design-build form of project delivery is a system of contracting whereby one entity performs both architectural/engineering and construction under one single contract. Under this arrangement, the design-builder warrants to the contracting agency that it will produce design documents that are complete and free from error (design-builder takes the risk). The selection process under design-build contracting can be in the form of a negotiated process involving one or more contracts, or a competitive process based on some combination of price, duration, and proposer qualifications. Portions of the overall design or construction work can be performed by the design-build entity or subcontracted out to other companies that may or may not be part of the design-build team. (http://www.fhwa.dot.gov/reports/designbuild/designbuild2.htm#sup2)

3.4.2 Accelerating Technology & Innovation Deployment

The EDC initiative is not about inventing the next "big thing." It's about taking effective, proven, and market-ready technologies and getting them into widespread use. In addition to the Safety Edge practice outlined earlier, the EDC initiative is actively accelerating technology deployment including adaptive signal control, prefabricated bridge elements, warm-mix asphalt, and geosynthetic reinforced soil technologies. The use of warm-mix asphalt provides both cost and environmental savings since the road materials require less heat relative to the traditional hot mix used in the United States.

PIARC members, through the Road Tunnel Operations Technical Committee, have also shared experiences and best practices for using tunneling boring machines to build road tunnels. The States of Florida and Alaska plan to utilize this innovative technology to deliver the Port of Miami Tunnel and the Alaskan Way Tunnel, respectively.

4. CONCLUSION

To solve 21st century transportation challenges, the U.S. Department of Transportation and the Federal Highway Administration are constantly looking to provide fast, safe, efficient, accessible, and convenient transportation systems that meet our vital national interests and enhance livability for the American people. We look forward to PIARC's 2011Congress to provide an international forum for our road transport stakeholders to discuss research, technology advances, and best practices so that we can come home with innovation, progress, and new directions in September.