TRB

Critical Issues in Transportation

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

The Executive Committee of the Transportation Research Board (TRB) periodically identifies a set of critical issues in transportation to focus attention on their likely impact on the nation's economy and quality of life. The discussion of the critical issues identified in this document is intended to facilitate debate and to encourage research leading to their resolution.

Images of the massive traffic jams during the evacuation from Hurricane Rita in 2005 illustrate both the importance of transportation and the problems caused when the system does not perform as expected. Previous editions of *Critical Issues in Transportation* have highlighted many of the issues that threaten the performance of the nation's transportation system. In recent years, we have added the need to respond to terrorism and natural disasters, highlighting how transportation has become ever more linked to broader issues in society and in the economy.

The urgency of addressing the critical issues has never been greater. The Executive Committee hopes that readers of this list will become aware of and concerned about these issues, and will join us in addressing the problems in transportation so that society and the economy can reap the many benefits.

Genevieve Giuliano, University of Southern California, led the effort to prepare this list, which was developed by the Committee in 2005 and issued in January 2006. Stephen Godwin, TRB Director of Studies and Information Services, provided the staff support.

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Critical Issues in Transportation

America's economy and quality of life depend on a transportation system that functions well. Transportation connects people to jobs, family, medical care, entertainment, education, and the goods needed for everyday life. Networks of trade that deliver breakthroughs in technology, consumer goods that are ever less expensive, and a growing economy—all are possible because of transportation. As with other major infrastructure systems that support society—for example, water or electricity—the importance of the nation's transportation system becomes apparent only when problems arise.

The destruction caused by Hurricane Katrina in August 2005 demonstrated the vital importance of transportation in the response to natural disasters and in recovery, as well as in connecting regional economies to the nation's. The loss of terminals, pipelines, railroad lines, and bridges along the Gulf Coast, for example, had an immediate impact on the energy supply nationwide. Although citizens recognize the importance of transportation at the state and local level, they don't include it when asked about the "Most Important Problems of the Nation."[1] Yet transportation plays a central role in linking regions and the world and in creating the prosperity that citizens rank highest.

Perhaps transportation's successes over the past century explain why it does not make the national list. The nation has made massive investments in building and operating transportation systems, which have connected cities to suburbs, metropolitan areas to one another, factories to markets, and consumers to goods produced all over the world. Americans are the most mobile people on earth, and freight moves efficiently across the United States. But the system is being pushed to its limits, and demands on the system will increase because of trends in population growth, technological change, and the increased globalization of the economy.

Although the rate of population growth—and therefore of travel demand—is projected to slow in the coming years, the increase in population will amount to approximately 100 million by 2040.[2] This could double the demand for passenger travel.[3] Moreover, the added population will concentrate in selected states and regions, which will intensify the demand for transportation in these areas. Meanwhile, the U.S. population will become older and more diverse.

The revolution in information technology (IT)—which most observers believe is only beginning—is expected to bring major societal and economic changes, but the impacts on transportation demand are uncertain.[4] Perhaps most important, the continued expansion of trade, stimulated by the IT revolution, will increase the stresses on a freight system already facing severe congestion. With the emergence of China, India, and Mexico as major trading partners, international trade as a proportion of the gross domestic product (GDP) has almost doubled to more than 22 percent in little more than a decade. Truck and containerized shipments may double by 2025 as the globalization of the economy unfolds.[5] Trade will become an increasingly important component of the U.S. economy, intensifying the demand for transportation (Figure 1).[6]

FIGURE 1: Trade as a proportion of U.S. gross domestic product: projection to 2030.

With these considerations in mind, the Executive Committee of the Transportation Research Board of the National Academies has outlined the most critical transportation issues facing the nation in this first decade of the new century:

- CONGESTION: increasingly congested facilities across all modes;
- EMERGENCIES: vulnerability to terrorist strikes and natural disasters;
- ENERGY AND ENVIRONMENT: extraordinary challenges;
- EQUITY: burdens on the disadvantaged;
- FINANCE: inadequate revenues;
- HUMAN AND INTELLECTUAL CAPITAL: inadequate investment in innovation;
- INFRASTRUCTURE: enormous, aging capital stock to maintain;
- INSTITUTIONS: 20th century institutions mismatched to 21st century missions; and
- SAFETY: lost leadership in road safety.

The Executive Committee has outlined these issues to focus attention on the most significant policy decisions facing the country and on the areas most in need of innovation.

CONGESTION

Congestion

Increasingly congested facilities across all modes.

If the 20th century can be the called the era of building, the 21st may be called the era of congestion. According to the annual Texas Transportation Institute report on urban mobility, "Congestion has grown everywhere in areas of all sizes. Congestion occurs during longer portions of the day and delays more travelers and goods than ever before."[7] Airports, ports, and railroads are straining to meet demand, but highway congestion is most familiar, because 87 percent of all passenger trips are made in private vehicles.[8]

Although estimates are imprecise, highway congestion costs Americans roughly $65 billion per year in today's dollars and wastes 2.3 billion gallons of gasoline.[9] Improved transportation system operations, high-occupancy vehicle lanes, expanded public transit, and many other transportation demand management strategies have hardly slowed the rate of increase.

New road capacity will be needed in the rapidly growing metropolitan areas that are expected to absorb tens of millions of new inhabitants in the next three to four decades. As the population continues to grow, however, metropolitan areas can choose between continued sprawl or more concentrated patterns of development that would support transit options. Transit becomes more cost-effective as population densities increase. Yet a metropolitan area often may comprise many different jurisdictions, and the land use plans of the jurisdictions that control development are rarely coordinated with investment decisions about transportation facilities.

Improved coordination and collaborative decision making about investments are a necessity, but building new highways and transit systems cannot solve the problem of congestion. Improved system operation, more sophisticated user fees, and improved information for users about the system's performance also may be necessary.

Businesses suffer because of congestion. Longer travel times increase transport costs, and the lack of reliable delivery compels firms to hold more inventory or to add extra time for shipments. For example, during the 2004 holiday season, backups at the nation's busiest port complex, Los Angeles–Long Beach, California, required more than 100 container vessels to be diverted to other ports.[10] Rerouting the vessels, which carried tens of thousands of containers filled with consumer goods, imposed higher costs on shippers and ultimately on consumers.

These problems are portents. Accommodating forecasted growth in freight volumes will not be possible with the negligible planned expansions of the networks that support each mode. West Coast ports may be unable to handle the staggering projected growth in Asian trade over the next 20 years—even with significant increases in port productivity—because of landside constraints on rail and highway systems.[11] Although some businesses may relocate away from congestion, scale and network economies concentrate shipping patterns.

Booming trade after the North American Free Trade Agreement (NAFTA), combined with new security procedures, has caused significant congestion and

cost increases at border crossings with Mexico and Canada and on corridors serving NAFTA markets.

The overriding issue for freight policy is to maximize efficiency—and to develop incentives for doing so. The cost of moving goods affects the bottom line of American companies competing in world markets. Greater public investment to relieve bottlenecks may improve efficiency—perhaps even in facilities that formerly were exclusively private—but careful analysis should precede the investments. Improved understanding of the benefits and costs of such investments is vital to making the best choices in a globally competitive world.[12]

Emergencies

Vulnerability to terrorist strikes and natural disasters.

Throughout the world, transportation is the most common target of terrorists, because people congregate in vehicles, terminals, and airports.[13] The recent terrorist bombings of passenger trains in Madrid and of transit lines in London attest to the difficulty of protecting against such attacks.

The federal government responded to the tragic events of September 11, 2001, by creating the Department of Homeland Security (DHS), which combined 22 federal agencies and entities. The amalgamation still faces significant challenges[14]—as indicated when one of the incorporated agencies, the Federal Emergency Management Agency, struggled to respond to the devastation caused by Hurricane Katrina along the Gulf Coast.

Many initiatives have been deployed for transportation security, including increased passenger and baggage screening at airports, requirements that shippers give 24-hour notice of goods entering the country, and security checks for drivers of hazardous cargo trucks. Many more initiatives are unfolding, including the use of public and private data sources for more exhaustive prescreening of air passengers; more extensive physical screening of high-risk cargos; requirements that shippers ensure the security of materials from foreign sources; and biometric identity cards for transportation workers. Yet DHS faces daunting obstacles in making transportation more secure without sacrificing important benefits, such as privacy and efficiency, and in determining who should have to pay for the added costs of security.

Shippers and carriers, for example, are low-margin businesses and are reluctant to bear the financial burden of increased security in freight operations. Shippers balk at paying for security in the supply chain all the way back to the foreign source.[15] The federal government has directed tens of billions of public dollars more in annual funding for aviation security than for the security of other modes, which are equally vulnerable.[16]

Despite the risks and the significant increases in governmental spending, progress has been slow. The risks and the resulting costs are real. For example, a credible threat of a security violation in the supply chain could shut down container movements worldwide. The negative impact on the economy would be enormous if tens of thousands of in-transit containers were stalled for days or weeks in a search for the suspected item.[17]

Although security strategies that are excessively costly or inconvenient are not sustainable, irrevocable changes are being made in the planning, design, and operation of transportation facilities to meet emerging security risks. The challenge is to develop strategies that are cost-effective, efficient, and integrated into the operations of the transportation system.

The slow and ineffective evacuations from Hurricanes Katrina and Rita in 2005 pointed to the importance of having plans that can be executed and of ensuring that intergovernmental collaborations are effective. In addition, the evacuations highlighted the need to plan and provide for transportation facilities that are adequate for response to, and recovery from, terrorist attacks and natural disasters.

ENERGY

Energy and Environment

Extraordinary challenges.

America relies heavily on the most energy-intensive means of transportation—highway travel and aviation. Transportation's voracious appetite for—and almost exclusive reliance on—petroleum-derived fuels makes the United States highly dependent on foreign sources of energy.

Transportation consumes about 5 million more barrels of petroleum daily than are produced domestically (Figure 2).[18] Until the rapid increases in gas prices during 2005, U.S. consumer demand for sport utility vehicles and light trucks, which have poor fuel economy, was propelling record levels of fuel consumption and imports. In addition to requiring U.S. military commitments in unstable parts of the world, the imports drive up the balance-of-trade deficit, which reached historic high levels in 2005.

The dependence of the U.S. economy and lifestyles on foreign sources of fuel has renewed interest in alternative fuels, as well as in increased domestic production. Many different alternatives have been introduced—such as electric power, hydrogen, and biodiesel—but much additional research and development is required before a clear alternative emerges.[19] The transition to any alternative will take decades, adding urgency to the search for suitable substitutes.

Forecasts of conventional petroleum resources indicate a peak of production between 2020 and 2050, which will create a gap between supply and demand that alternative fuels must meet.[20] Efforts to reduce reliance on imported fuels are undermined by national policy, which has resisted such measures as mandating that manufacturers produce more fuel-efficient vehicles, or increasing the fuel tax, or taking other initiatives to reduce consumer demand. Taxes on fuels in the United States are the lowest among industrialized nations, and travel per capita is the highest.

Most energy issues are inextricably intertwined with environmental consequences. Transportation contributes to a variety of environmental problems—for example, by affecting land consumption and water quality—but air emissions are the most urgent. Petroleum-based fuels have significant impacts on the environment, including greenhouse gas emissions and local air pollution.

About 57 percent of the U.S. population lives in areas that fail to meet federal clean air standards (Figure 3).[21] The Environmental Protection Agency has focused recent concern on fine particulate mat-

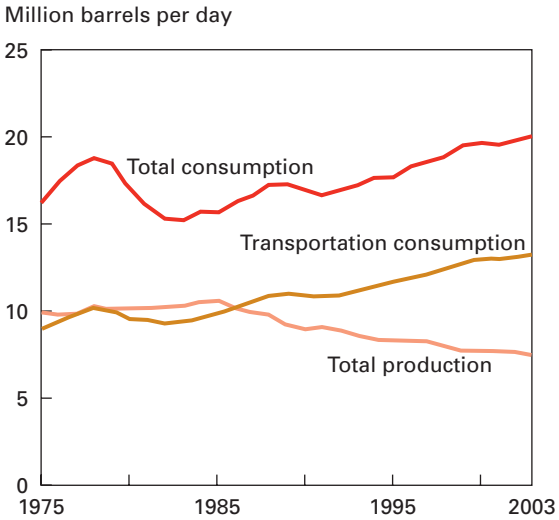

FIGURE 2: Total consumption, transportation consumption, and total domestic production of petroleum.

ter—up to 2.5 microns in size—which more and more studies have linked to adverse effects on human health.[22] The diesel engines of trucks, trains, buses, and ships are major sources of fine particulates. Despite substantial reductions in vehicle emissions in recent decades, many areas have yet to attain the federal clean air standards, and the new standards for particulates will place many more counties and metropolitan areas out of attainment and therefore subject to federal sanctions.

A growing consensus associates global warming with fossil fuel consumption; the transportation sector accounts for roughly 30 percent of all fossil fuel consumption, and the share is rising. Any measure to reduce carbon-based fuel consumption significantly will have to involve the transportation sector. The federal government has yet to address the challenge with policy proposals, but various initiatives are emerging among states and local governments. California passed the first U.S. regulation to limit automotive CO^2 emissions. Despite the controversy and litigation, other jurisdictions may follow California's lead, as citizens become more concerned about the risks of climate change.

Equity

Burdens on the disadvantaged.

A passenger transportation system dominated by the automobile generates challenges for those with limited incomes or physical disabilities or for those who do not drive. The cost of transportation is growing: in the past decade, the percentage of income devoted to transportation increased by almost 9 percent, which has placed a burden on those with the lowest incomes.[23] Low-income households often depend on the car instead of on transit because no other mode is sufficient for getting to work, childcare, shopping, or for other essential trips—except in a few large center cities with extensive transit. The sharp rise in fuel prices in 2005 increased the burdens on the disadvantaged.

The most disadvantaged—those without access to a car—usually are women and often are racial or ethnic minorities. They rely on transit, taxis, and walk-

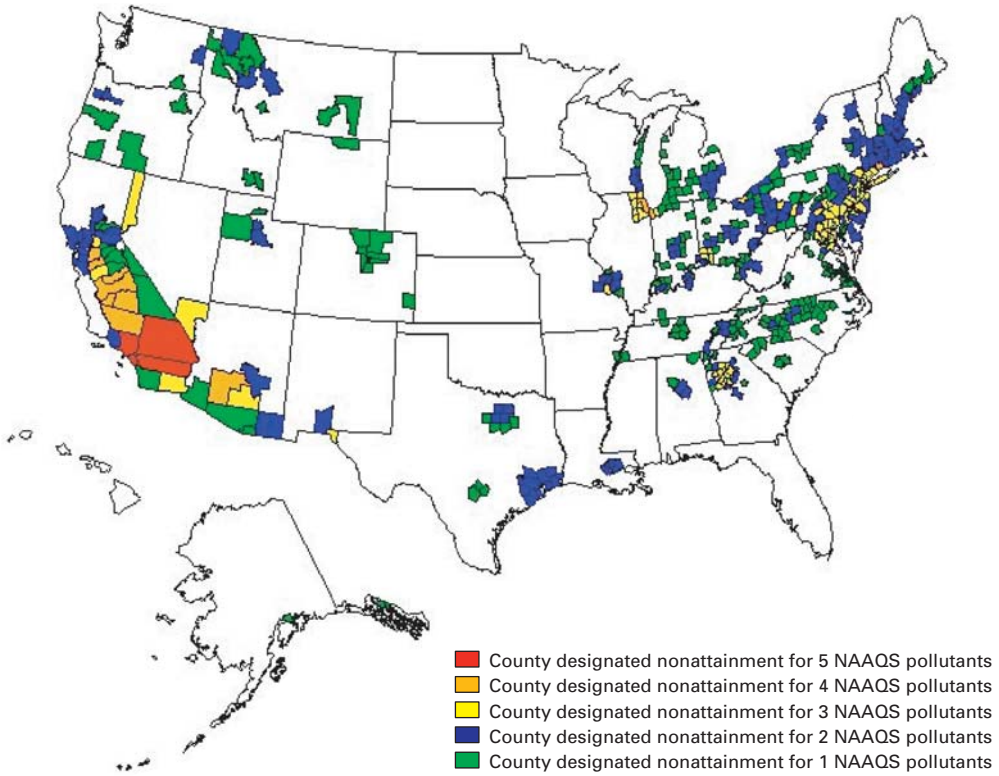

FIGURE 3: Counties not attaining the National Ambient Air Quality Standards NAAQS of the Clean Air Act, April 2005.

ing, and therefore have the most limited mobility and accessibility.[24] The scale of the problem was revealed by the tens of thousands of New Orleans residents who lacked the private means to evacuate or places to go for safety before Hurricane Katrina struck.

As the population ages, more people will have to give up driving and with it the mobility that defined their adult life. Most older people are aging in place—that is, staying on where they have resided as adults—so that the majority of older Americans are remaining in automobile-dependent areas. Losing the ability to drive poses a hardship, particularly when adult children live far away. Reduced mobility results in greater loneliness and depression, increased incidence of certain negative health outcomes, and lower life satisfaction.[25] Seniors without automobiles are more isolated than peers who are able to drive.[26] Disadvantaged persons without automobile access in rural areas are particularly isolated.

By 2025, almost 25 percent of the population—a total of 65 million people—will be more than 65 years old[27] (Figure 4). American society is not prepared to meet the mobility needs of the tens of millions of older citizens who will be unable to drive in coming years.

Disadvantaged populations also bear the brunt of negative side effects from transportation facilities. In urban areas, the adverse health effects of vehicle emissions disproportionately affect members of ethnic, low-income households, who are more likely to reside near freeways, ports, intermodal facilities, or airports.[28] When siting or expanding facilities to address congestion, policy makers will be challenged to find equitable solutions for travelers and nearby communities.

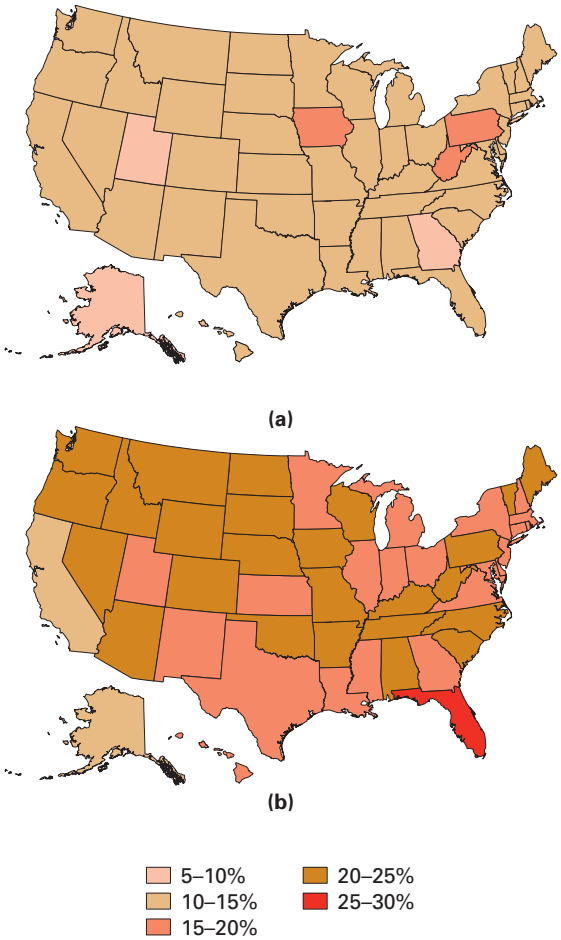

FIGURE 4: Share of population 65 years old and older, (a) 2000 and (b) 2025.

FINANCE

Finance

Inadequate revenues.

The difference between transportation demand and supply has become so great that the increase in congestion experienced by travelers should come as no surprise. All modes must contend with aging infrastructure and capacity problems, without adequate revenues to respond. In part, the mismatch results from the methods of financing publicly owned facilities:

- For highways, the financing system based on gas taxes established more than 50 years ago has served the nation well but in recent years has not kept up with demand and the effects of inflation on revenues (Figure 5).
- A variety of taxes on air passengers and airport users supports the nation's airports and air traffic control system. Revenues from users are not keeping pace with the increased demands on the air traffic control system, causing a gap in funding.[29] Federal support to airports is shrinking, and uncertainties about carrier lease payments are reducing airport capital funding, even as passenger demand grows.
- Waterways face different problems: 80 percent of the funding for the Marine Transportation System comes from the budgets of several federal agencies, which are constrained by federal spending limits in response to the large deficit.
- Many ports require regular dredging to maintain operations and foster growth. Trust funds for this purpose have surpluses that are not being drawn down because the balances are being used to offset the federal budget deficit.
- Amtrak is in the midst of a major financial crisis as Congress and the administration engage in a protracted debate about reform options and appropriate levels of public funding.

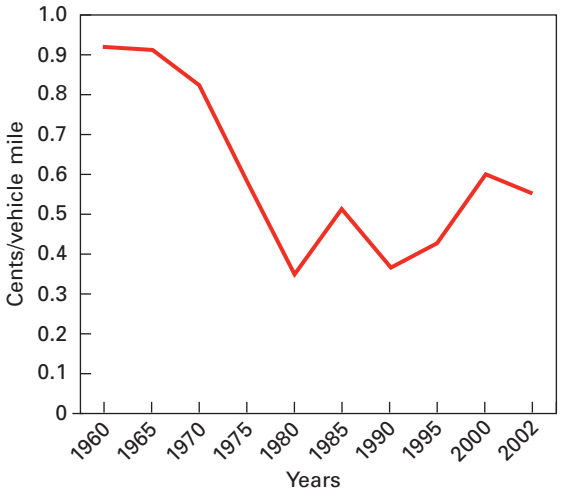

FIGURE 5: Real gas tax receipts per passenger ehicle mile traveled, 1960–2002 (in 1984 dollars).

- After several decades of increased funding, and despite sharp increases in ridership in recent years, the nation's public transit systems face considerable financial problems. The expansion of transit systems expands the requirements for operating funds, which largely come from fares and from state and local government sources. Such sources are not increasing as fast as necessary.

Until the recent sharp run-up in gasoline prices, public opinion polls showed that voters favored fuel tax increases if the revenues would be devoted to improvements in roads and transit systems.[30] In response to capital needs in surface transportation, states and localities are opening up other sources of revenue, such as sales taxes, road tolls, and other user fees. In the November 2004 general election, voters approved 72 percent of state and local referenda to raise or extend taxes dedicated to transportation.[31] Although new revenue streams are needed, some tax sources—such as sales taxes—move away from a user-pays principle and place a disproportionate burden on those who have low incomes. Moreover, these fundamental shifts in financing have significant implications for a national, systems-level approach to transportation policy.

The private sector also faces problems. With large increases in the interstate movement of goods, the nation needs steady growth in railroad capacity. Most of the major railroads, however, are not earning adequate returns to justify expansion.[32] The air transport system is also experiencing difficult times, with the failure of more than one of the legacy air carriers likely. Despite a rebounding economy, major air carriers lost $10 billion in 2004 because of intense competition and sharply higher fuel costs; losses of similar magnitude are projected for 2005.

The past finance strategies for public investment in highways and aviation have much to recommend them: they are funded by users, are inexpensive to administer, and have provided steady revenues for building new capacity and operating systems. But exclusive reliance on these approaches cannot continue. Supplements include more direct charging at the time of highway use and debt financing or revenue bonds repaid by user fees.[33] Perhaps more importantly, wiser investment of scarce resources, along with revenue-raising mechanisms that give

users the incentives to choose the most cost-effective means of travel, will become a larger component of transportation finance.

Human and Intellectual Capital

Inadequate investment in innovation.

As illustrated by the critical issues so far, the nation faces many significant transportation challenges. Public investment to stimulate innovation in transportation services and products, however, has been declining for years, in real terms and as a share of agency budgets.[34] Even with a 36 percent increase in research funding in the recent federal surface transportation authorization, the investment in transportation research and development is small by any measure.

In 2005, public-sector investment in transportation research and development was only 0.015 percent of the GDP. This tiny share is sharply lower than the nearly 0.07 percent of the early 1970s (Figure 6). Coupled with the declining support is the growth in earmarking of research budgets—the designation of funds to specific institutions to carry out research. Earmarking bypasses the role of merit review and competition in ensuring scientific quality and reduces the ability of funding agencies to carry out a coherent research investment strategy.[35]

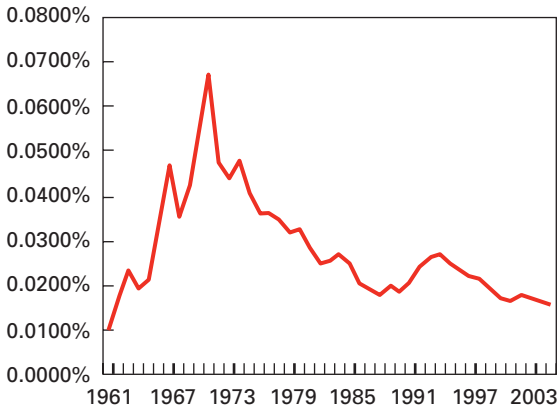

FIGURE 6: Public-sector transportation research and development as a percentage of gross domestic product.

Transportation and health care account for similar proportions of the GDP, but the federal investment in health care research is more than 10 times greater than its investment in transportation research. Transportation has not kept up with other sectors—such as manufacturing and medicine—in taking advantage of new technology to improve efficiency or to develop better products. The cost structure of the private portions of the transportation sector and the substantial public ownership of most transportation infrastructure make it unlikely that private funding will fill the research and development gap.

An active research and development program in laboratories and universities attracts the brightest students. Research and development funding supports university graduate programs, which are the source of the next-generation professional workforce and leaders. The best students have little incentive for a career in transportation if the sector is not viewed as part of the leading edge of research. Research and development is needed in more areas than science and engineering. Many of the critical issues involve complex policy choices that require insights from several disciplines.

With the current problems in hiring capable workers, and with the projections for retirements in the public and private sectors, attracting more and better students into transportation careers is critical. Given the complexity of the issues to be addressed, workers will need a wider range of skills and training than the current workforce possesses.[36] The future workforce will need to address an ever-

increasing reliance on technology; alternative means of finance; increased contracting for services; more public–private partnerships; operating transportation as a system; and new approaches to balance transportation objectives with goals for energy, environment, equity, security, and safety.

Infrastructure

Enormous, aging capital stock to maintain.

The United States built an enormous transportation infrastructure in the 20th century; replacement would cost trillions of dollars. Roads, bridges, locks, channels, runways, terminals, and rail lines are made of durable materials that appear capable of lasting for many more decades—but will not. On the inland waterways, for example, approximately half of the locks maintained by the U.S. Army Corps of Engineers are more than 50 years old, in use beyond their designed service lives.[37]

Maintaining and upgrading the infrastructure is costly. For example, the cost of maintaining highways, bridges, and transit is $91 billion annually—$17 billion more than has been invested.[38] Upgrading the facilities to keep up with demand would require a total of $128 billion. Research can yield cost-saving innovations that can extend the life of these assets—for example, with advanced technologies to identify problematic components that can be replaced or repaired before failing.[39] Even considering such innovations and taking account of the tens of billions invested annually by all levels of government on surface transportation, the federal government estimates that the investment is far from enough.

Lack of system preservation and rehabilitation produces a downward spiral. Deteriorating infrastructure is largely invisible to the public; generating public support for funding rehabilitation and reconstruction, therefore, is difficult. This problem is not unique to transportation—America's sewers, water systems, and public school facilities also are suffering from deferred maintenance. The price of short-term savings from deferred maintenance, however, is proportionately greater rehabilitation cost later. They also raise user costs in the interim, because of delays and the wear and tear on vehicles. Raising the visibility and developing support for system preservation is critical to the 21st century transportation system.

Institutions

20th century institutions mismatched to 21st century missions.

The large-scale changes described earlier distinguish the mission of transportation system providers in the 21st century from that of system providers in the early 20th century. The required institutional responses are not new but have greater urgency with the new demands and the other critical issues already highlighted. Meeting 21st century requirements will include

- Adopting a systems perspective instead of a modal perspective;
- Integrating priorities across levels of government more effectively;
- Emphasizing operations instead of expansion;
- Improving the balance between national and local interests; and
- Expediting a decision-making process that has become slow and cumbersome.

Fragmented authorities and structures for decision making and regulation inhibit the ability to address problems in highways, waterways, public transit, railroads, air transportation, and pipelines from a systems perspective. At the federal level, the separate modal administrations within U.S. DOT are illustrative; responsibilities for waterways are vested in several other federal departments. Most state DOT organizational structures have a similar modal orientation.

With so much infrastructure in place, managing the loosely connected system of modes has become as important as expanding and maintaining it. Better management might reduce the need for some expansion, but the institutional barriers are considerable. More movement of freight by water along coastlines

may relieve some highway and rail congestion, for example, but the endeavor would face many challenges, requiring the collective dedicated efforts of different federal departments, state governments, and disparate industry interests to succeed.

At the local level, state DOTs, counties, and cities own and operate road systems, and special authorities or city or county departments own and operate public transit. These institutional structures inhibit coordinated planning and investment. Progress is being made, for example, as metropolitan areas engage in multimodal planning, but more changes are required before travelers perceive the system to be seamless. Within metropolitan areas, road and transit organizations often act independently, and cities, counties, and states often have different priorities for the facilities they own.

For the past half century, highway agencies primarily have been builders. The state DOTs, in particular, had the fundamental purpose of building and maintaining the Interstate system and other intercity highways. Although expansion will continue in high-growth areas, state DOTs increasingly are expected to serve as system operators. A management mission for the future may include more direct charging for the use of facilities, to supplement or replace other user fees. State and metropolitan transportation organizations, however, were not designed or prepared to manage the political and technical challenges of this transition.

For decades, a general trend in the public sphere has been to decentralize decision making; the results are not always consistent with the development or pursuit of a national transportation policy. Increasingly, cities or even neighborhoods make decisions about public services, new development projects, or highways. Communities that gain this power find few projects acceptable, which bodes poorly for efficient movement of people and goods in the future. Decisions about ports, for example, are made locally, and port communities can reject the burden of the financial and social costs of expanding freight movements, disregarding the regional or national economic benefits that accrue beyond their borders.

Moreover, a decline in federal funding has led to more funding from local sources, which justifies more local control. The large share of state and local referenda that passed in 2004 is explained in part by strategy—many of the successful measures fund priority projects identified by the local public and include local oversight of the special funds. The shift in authority and funding responsibility to the local and state levels raises fundamental questions about what the federal role should be.

The decision-making process for transportation investments has become slow and cumbersome. Although environmental review, for example, has greatly decreased the negative impacts of transportation projects, the review process can extend more than a decade. Lack of consensus on what should be built—and where—can delay or abort socially worthy projects indefinitely, compounding congestion. Moreover, consensus often comes at a vastly higher cost than early estimates, as illustrated by Boston's Central Artery–Tunnel project, the "Big Dig."

Safety

Lost leadership in road safety.

The United States has been the world safety leader in all transportation modes but has fallen behind in the mode that accounts for 95 percent of transportation fatalities and serious injuries. The United Kingdom, the Netherlands, and Sweden have surpassed the United States in road safety for the first time (Table 1).[40] The successes of these nations are partly the result of strategies such as stricter laws on safety belt use, extensive crackdowns on alcohol- and drug-impaired driving, increased restrictions on teenage driving, and automated enforcement of traffic signals and speed limits.

The United States continues to be a world leader in introducing safer vehicle and road technologies. Most past gains stem from the improved crashworthiness of vehicles. Additional safety gains are possible from side air bags, electronic stability control, and other crash-avoidance technologies.

These kinds of improvements enhance occupant protection and reduce vehicle collisions, but do not directly address pedestrian and bicyclist deaths, which account for about 13 percent of the total. The

TABLE 1: Comparative Fatality Rates per 100 Million Vehicle-Kilometers Traveled

Country	1995	2001
Australia	1.2	0.9
Netherlands	1.2	0.76
Sweden	0.9	0.75[a]
United Kingdom	0.8	0.72
United States	1.1	0.9
OECD Median	1.4	1.0

[a] 2002 data.
OECD = Organization for Economic Cooperation and Development.

strategic highway safety plans of many states are introducing improvements to roads, traffic operations, driver licensing, and emergency medical services. These comprehensive improvements will increase safety for motorists, cyclists, and pedestrians, but will do so incrementally over time.

Sharply reducing annual road deaths requires more than improved vehicle and road technology. Driver behavior—speeding, reckless driving, and alcohol or drug impairment—must be addressed. Citizens expect continual improvements in safety, and the rate of improvement from vehicle and road standards has been considerable. But the next major improvements in safety from technology are not expected for many more years.

Behavioral interventions have proved successful in other nations. The United States has lessons to learn from these nations in building public support and developing the political will to introduce measures that now have limited implementation, such as stricter crackdowns on impaired driving, additional restrictions on high-risk drivers, and automated enforcement.

The Challenges Ahead

Every citizen experiences the frustrations of increased congestion, but improving mobility without worsening other problems requires addressing simultaneously the problems of inadequate finance, institutional reform, environmental protection, energy conservation, safety, equity, and security. Policies such as the deregulation of transportation industries have been successes for passengers and shippers, but private carriers may not be able to reinvest adequate capital to help address passenger and freight capacity constraints while also meeting federal and state environmental, energy, and security goals.

The critical transportation issues facing the nation cannot be addressed separately—the issues are interwoven so tightly that remarkable ingenuity and creativity are required to untangle them and make progress. Transportation is so vital to American prosperity and lifestyles that these challenges must be met. Greater investment in innovation can provide the breakthroughs, the new ideas, and the creativity that are so urgently needed.

End Notes

1. The Gallup Organization, January 2005. http://www.gallup.com/poll/content/.

2. U.S. Census Bureau, *Statistical Abstract of the United States*, 2004–2005, Table 3.

3. S. Polzin, X. Chu, and L. Toole-Holt. *The Case for Moderate Growth in Vehicle Miles of Travel: A Critical Juncture in U.S. Travel Behavior Trends*,2003.http://nhts.ornl.gov/2001/articles/moderateGrowth/moderateGrowth.pdf.

4. One transportation example of the IT revolution is the home delivery of goods ordered via the Internet, a fast-growing service. The results include more package delivery truck trips within neighborhoods, but the effect on total shopping trips generated from the neighborhood is uncertain.

5. Bureau of Transportation Statistics. *U.S. International Trade and Freight Transportation Trends*. U.S. Department of Transportation, 2003, p. 1. For a review of forecasts for container shipments, see Special Report 279, *The Marine Transportation System and the Federal Role: Measuring Performance, Targeting Improvement*. Transportation Research Board of the National Academies, 2004.

6. Projections by Global Insight, Inc.

7. D. Shrank and T. Lomax. *The 2004 Urban Mobility Report*. Texas Transportation Institute, September 2004. http://mobility.tamu.edu

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