

Renewing the
NATIONAL COMMITMENT
to the
INTERSTATE HIGHWAY SYSTEM

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Renewing the National Commitment to the Interstate Highway System

THE INTERSTATE HIGHWAY SYSTEM is not only a testament to America's engineering prowess but also an embodiment of what the country can accomplish when its leaders are united behind a common vision. It is perhaps not surprising that the generation that waged World War II would conceive of, plan, and build the Interstates. The president who was key to the country's war effort—Franklin D. Roosevelt—sketched the trunk Interstate routes on a map of the continental United States. One of his top generals during the war—Dwight D. Eisenhower—would later sign into law the Federal-Aid Highway Act of 1956, which raised the federal fuel tax and other highway user fees and dedicated the revenue to pay for the system's construction. By the 10th anniversary of the system's authorization, the states had opened more than 23,000 miles to traffic and had an additional 6,400 miles under construction—representing more than half of the planned system. By that time, the Interstate highways were already handling more than 17 percent of the country's motor vehicle travel.

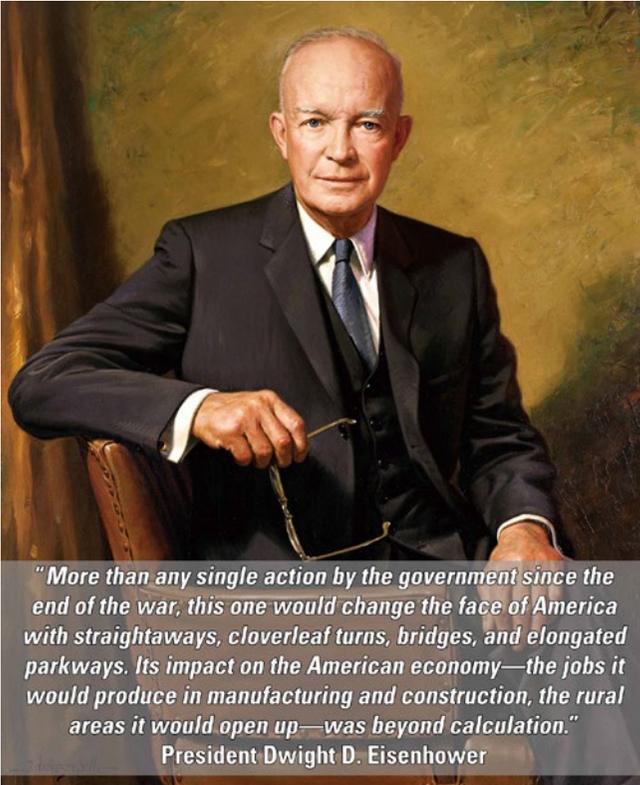
THE VISION TAKES ROOT

Before President Eisenhower signed the Federal-Aid Highway Act of 1956, the country's interstate and interregional highway network consisted of a loosely integrated collection of state and U.S. routes. While it included some modern freeways with divided lanes and access control, often on tolled turnpikes, the network lacked the interconnectivity and standardized design that would set the new Interstate Highway System apart. At the dawn of the Interstate System, long-distance travel often meant driving on routes interrupted by traffic lights; driving through town centers; and traversing roads of widely varying quality, signage, and configuration. Even shorter trips

between neighboring cities could be slow and meandering. Today, the ability to drive hundreds of miles on the same route through multiple states without crossing a single intersection is taken for granted.

The 1956 act required that the Interstate System be built using common geometric and construction standards, as well as other features such as consistent signage. The legislation also required that the system connect the principal metropolitan areas, cities, and industrial centers; serve the national defense; and connect all suitable border points with routes of continental importance. The revenues obtained from higher fuel taxes and other highway user fees were to be placed in a Highway Trust Fund (HTF), with a guarantee

that the funds would be dedicated to the development of the Interstate System. As the construction phase of the system passed its peak in the 1970s and some early segments were deteriorating from heavy use, Congress modified key aspects of the original Interstate program by providing federal funding for not only construction but also resurfacing, restoration, rehabilitation, and reconstruction. Congress would later make HTF funds available for spending on other highways and public transit. By the 1990s,



"More than any single action by the government since the end of the war, this one would change the face of America with straightaways, cloverleaf turns, bridges, and elongated parkways. Its impact on the American economy—the jobs it would produce in manufacturing and construction, the rural areas it would open up—was beyond calculation."
President Dwight D. Eisenhower



The Interstate Highway System has become vital to the nation's economy and central to the daily lives of many millions of Americans.

the construction phase of the Interstate Highway System was viewed as being largely complete. Today, less than one-third of total federal highway aid from the HTF is allocated to the system.

THE VISION PAYS OFF

In the transportation domain, the United States has arguably never accomplished more than it did during the Interstate era. The Interstate Highway System has become vital to the nation's economy and central to the daily lives of many millions of Americans. It has grown to more than 49,000 miles, including multiple transcontinental routes, segments in all 50 states, and connections to all major urban areas of the continental United States. About one-quarter of the country's vehicle-miles traveled (VMT) is on Interstates—even though the system accounts for just

slightly more than 1 percent of public road mileage. The more than 800 billion VMT annually on the system exceeds all the miles traveled on the entire U.S. road network in 1956 when the Interstate System launched.



A Boon to Passenger and Freight Transportation

In addition to accounting for more than 20 percent of VMT by passenger cars, the Interstate System accounts for about 40 percent of all VMT by trucks. The system



has yielded significant travel savings for interstate and long-distance travel for both passenger vehicles and freight, in some cases reducing travel times by half. The Interstates not only make up the backbone of the country's highway system but also serve its marine ports and commercial airports, while also having connections with major freight rail hubs.

Broader Economic and Social Consequences

Regions previously not well connected to the national economy have become more closely linked by the Interstate System for both the movement of goods and personal travel. The system has shaped the economics of residential, commercial,

and industrial locations throughout the nation. It has expanded businesses' access to labor markets and allowed people to commute farther to their workplaces, which in turn has opened up more land around cities for housing and commercial development. Improved access has enabled businesses to restructure their operations and locations to increase efficiency. For instance, the faster trucking service made possible by the Interstate System has allowed firms to rely on fewer and larger production and distribution centers to reach markets and reduce inventories.

These impacts can be difficult to quantify. However, analyses of the economic returns to highway investment in the



Today, some metropolitan areas are undertaking efforts to cover urban Interstates or build tunnels to reunite divided and isolated communities.

United States have in general found a high social rate of return, although it must also be acknowledged that urban Interstates and other freeways contributed to the depopulation of many major U.S. cities. When the Interstates were being planned, many officials believed the urban expressways would reduce congestion and help save central business districts, which did not happen in many cases. Today, some metropolitan areas are undertaking efforts to cover urban Interstates or build tunnels to reunite divided and isolated communities.

Role in the National Defense

The U.S. Department of Defense (DoD) uses freight railroads to move much of the military's heavy equipment long distances. However, DoD's Strategic Highway Network

is also critical to military logistics. The network, developed in collaboration with the Federal Highway Administration and state departments of transportation, defines the minimum public highway network necessary to support the military's deployment needs. The 64,000-mile network comprises the entire 49,000 miles of the Interstate Highway System and 15,000 miles of other selected major highways.

Safety Benefits

Per VMT, the Interstate System is the safest highway network in the United States. Compared with other road types, Interstate fatality rates are the lowest on both rural and urban segments. In 2016, the United States experienced 37,740 traffic fatalities, 5,054 (about 13 percent) of which occurred

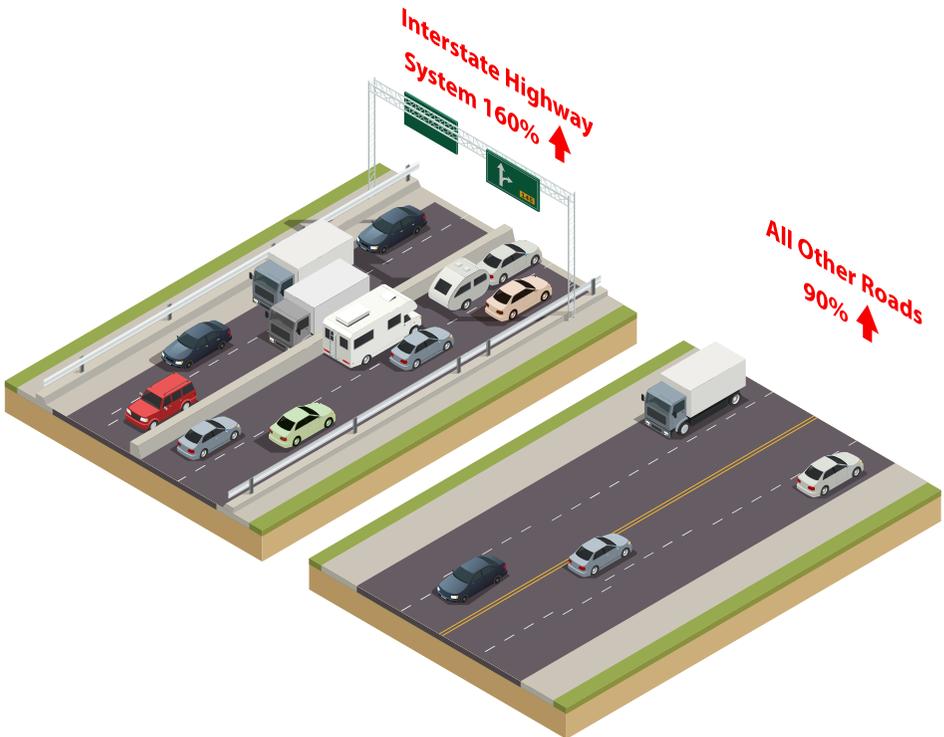
on the Interstates—despite the Interstates' relatively high travel speeds and 25 percent share of VMT.

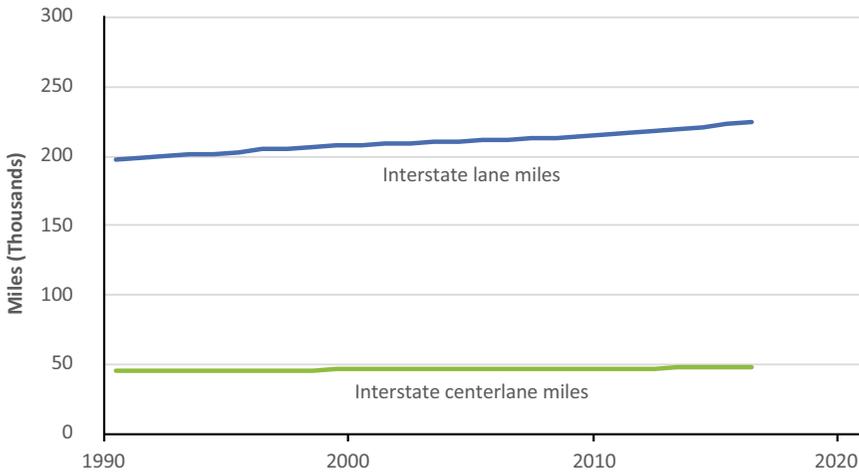
LOOMING CHALLENGES

Because its impacts reverberate across the transportation sector, society, and the economy, it is imperative that the Interstate Highway System not only be preserved and rehabilitated but also renewed and modernized to adapt to the country's changing demographic, economic, climate, and technological landscape. Much of the system is now more than 50 years old and is showing

its age from the stress of heavy and largely unanticipated levels of use. While the system's scope of coverage, or route footprint, has largely remained the same throughout this period, the U.S. population and economy have undergone major shifts, including marked growth in parts of the country that were lightly populated in 1956. Such locales retain a density of Interstate routes today that is modest relative to their current and forecast populations. Originally designed to serve urban areas by connecting them to one another, the system has transformed metropolitan regions by becoming primary corridors for commuting and other local travel, accommodating traffic volumes not

INTERSTATE HIGHWAY SYSTEM TRAFFIC GROWTH (1980-2015)





While the system's scope of coverage, or route footprint, has largely remained the same throughout this period, the U.S. population and economy have undergone major shifts.

imagined when the urban routes were initially planned.

As the owners and operators of the Interstate Highway System, states have regularly undertaken its maintenance and repair and periodically reconstructed portions of the system. Nonetheless, they have been severely challenged to keep the system's assets in satisfactory condition and its operations and capacity aligned with the growth and changes in traffic demand. Original traffic projections by many states and metropolitan regions grossly underestimated the popularity of the Interstate System not only for local commuting, but also for the transport of freight. Increasingly heavier trucks using the system in higher volumes have added to the system's punishment and have led to a mismatch between the conditions for which the highways were designed and the conditions they have faced.

On many segments of the Interstate Highway System in use today, pavement bases and subbases date back to the original Interstate construction phase or before, necessitating more frequent—and often complex and costly—maintenance and repair work on heavily trafficked, high-demand routes. Moreover, while many bridges in southern and western states have thus far remained serviceable beyond their 50-year design lives without major repair work, many bridges in northern and midwestern states that have sustained severe weather and high traffic loadings have required frequent redecking. Aging bridges across the system, including a growing share that have exceeded their design lives, will require major repair, rehabilitation, and replacement, an inevitability that cannot be forestalled much longer.

Fortunately, as it enters its seventh decade of service, the Interstate System is reaping, or set to reap, the benefits of dramatic, unforeseen technological changes. Advances in materials, construction methods, electronics, communications, and other areas are providing new capabilities and opportunities to increase and manage traffic capacity; reduce system congestion and environmental impacts; increase system safety; and reduce the cost of highway maintenance, repair, and reconstruction. However, owners of the system are also facing other unforeseen developments, notably the need to reduce the system's vulnerability and increase its resilience to the effects of climate change. And as highly instrumented highways and vehicles become commonplace, new challenges will be confronted in highway safety and operations, as well as in the field of cybersecurity.

As the nation moves further into the 21st century and as transformation in the vehicle fleet and vulnerabilities due to climate change place new demands on the country's transportation infrastructure, the prospect of an aging and worn Interstate System that operates unreliably



is concerning. Unless a commitment is made soon to remedying the system's deficiencies and to preparing it for the challenges that lie ahead, there is a real risk that the system will become increasingly congested; far more costly to operate, maintain, and repair; less safe; incompatible with evolving technology; and vulnerable to the effects of a changing climate and extreme weather. Thus, the Interstate Highway System today faces an array of challenges that threaten its ability to continue playing the vital roles that have made it one of the nation's greatest and most important assets.

Commencing the enormous task of rebuilding the system's pavements, bridges, and other assets before they become unserviceable and less safe.

Many of the Interstate pavements built in the 1950s and 1960s were designed for 20-year service lives, but have now been in use more than 50 years without reconstruction of their foundations—this despite much higher traffic loadings than initially projected. Even assuming that a pavement structure can last 50 years before requiring full reconstruction, the system's oldest segments are long overdue for this work, and even the majority of the newest Interstate segments, constructed in the 1980s and 1990s, will need to be rebuilt over the next 20 years. As this work is being accomplished, states will also require the increased resources needed to maintain the integrity of their aging Interstate bridges and other assets.

Meeting the growing demand for investment in physical capacity on the urban system and for more



More effective system management, including pricing strategies and investments in other modes, will be needed.

active and innovative management of this capacity in large metropolitan areas that continue to experience most of the country's population and economic growth.

Large portions of the Interstate System, especially in metropolitan areas, are already congested and have difficulty accommodating the demands of local, interregional, and longer-distance travelers. Urban freeway congestion is a complex issue. Alleviating the problem through physical means, such as lane additions, is an expensive and sometimes impracticable option when system right-of-way is constrained by limited land availability. Even if land can be acquired or existing right-of-way can be used more intensively, urban areas are expensive construction environments, and proposals for capacity expansion are often met with opposition because of environmental and community impacts. In short, physical

expansion opportunities are limited and increasingly unpopular as a means of solving the problem of urban congestion. More effective system management, including pricing strategies and investments in other modes, will be needed.

Ensuring that the system remains responsive to, and aligned with, continued changes in the geography and composition of the country's population and economy, and that its connections with the other modes of local, interregional, and long-distance transportation are maintained and strengthened.

Although thousands of miles of high-quality highways other than Interstates connect many of the country's population centers, lack of access to the Interstate System may be viewed by some smaller communities and emerging cities as detrimental to their



growth and development, particularly given that the Interstate System includes the country's main trucking corridors. The Interstate System was planned in the 1950s and considered complete in the 1990s despite a changing pattern of demand that is increasingly urban, western, and southern.

Continually improving system safety as traffic volumes increase, new highway and vehicle technologies are introduced, and the system is modified to increase capacity and throughput.

Although the Interstates are the nation's safest highways, they account for more than 5,000 traffic deaths annually. It will be important for the Interstates of the future to continue to adopt state-of-the-art safety practices that mitigate the additional risks arising from growth in traffic volume, and to ensure that efforts to increase traffic flow are accompanied by measures that counter adverse safety effects.

Ensuring that the system is robust and adaptable to changing vehicle technologies, which entails avoiding premature investments in assets and the introduction of standards that hinder or foreclose future development pathways.

Many new technologies being developed, and in some cases introduced, have the potential to alter the operation and safety performance of the highway system, including the Interstates. Many of these technologies, such as driving-assist features and automated vehicles, are vehicle centered, while others, such as real-time traffic analysis systems that

inform traffic control devices, have a strong infrastructure orientation. Other technologies will involve the connectivity of vehicles and infrastructure. The potential implications of the development and deployment of connected and automated vehicle technology for the future of the Interstate Highway System is a complex topic, involving many potential technologies, systems, and capabilities.

Adopting funding mechanisms that are equitable and efficient, do not unduly impose the burden of payment on future generations or on less financially equipped groups, and do not disadvantage or divert resources from other highways and modes of passenger and freight transportation.

The Interstate Highway program has long been funded by user fees that have both efficiency and equity merits. However, user fee receipts have been stagnant, failing to keep pace with inflation and growth in motor vehicle travel in recent years. Part of the reason for this circumstance is that the federal fuel tax has not been increased in a quarter of a century. The increasing vehicle fuel efficiency and the growing use of electric vehicles risk further revenue declines. Without new funding mechanisms, the longstanding federal contribution to the Interstate System may wane.

Developing and implementing strategies for incorporating future climate conditions into infrastructure planning and design, starting with the development of robust design and construction standards that accommodate greater frequency and severity of extreme weather events.

When much of the Interstate System was being planned, designed, and built during the 1950s, 1960s, and 1970s, there was no recognition of the threat of the buildup greenhouse gases or of how a changing climate could adversely affect the transportation system and other critical infrastructure through such consequences as rising sea levels and extreme weather events. It is now certain, however, that transportation agencies across the country will need to make changes in the planning, design, construction, operation, and maintenance of their highways to account for these impacts.

AN INVESTMENT IMPERATIVE

Congress called for the study summarized here to inform pending and future federal investment and policy decisions concerning the Interstate Highway System. Specifically, Congress asked for recommendations on the actions necessary to upgrade and restore the system to meet the growing and shifting demands of the 21st century. The study's findings point to the need for major reinvestments in the system.

Most of the Interstate Highway System has far exceeded its design life or will do

so over the next 20 years. Only limited planning and budgetary preparations have been undertaken to fix the deterioration that has already been incurred and to prevent the physical and operational deficiencies that will ensue. Recent combined state and federal capital spending on the Interstates has been \$20–\$25 billion annually. The information gathering, modeling, and case studies that informed this study indicate that this level of spending is too low—by at least 50 percent—just to proceed with the long-deferred rebuilding of the system's aging and deteriorating pavements and bridges. The study committee estimates that investments averaging more than \$30 billion per year will be needed over the next 20 years to repair and reconstruct these assets in response to the damage already done and that which is forthcoming from the effects of age and further use (see the figure on the opposite page).

Along with these substantial investments in pavement and bridge repair and reconstruction, additional investments will be required to expand and manage the Interstate Highway System's capacity to handle future traffic. While the need for pavement and bridge upgrades can be estimated with a fair amount of confidence because of the predictable physical effects of age and wear, the investments that will be required to accommodate traffic demand are much more difficult to project. Capacity investments will likely be required, but their size, location, and timing will depend on a host of factors related to changes in the population and economy, how travelers respond to congestion and the supply of new capacity, and the availability of options other than Interstate



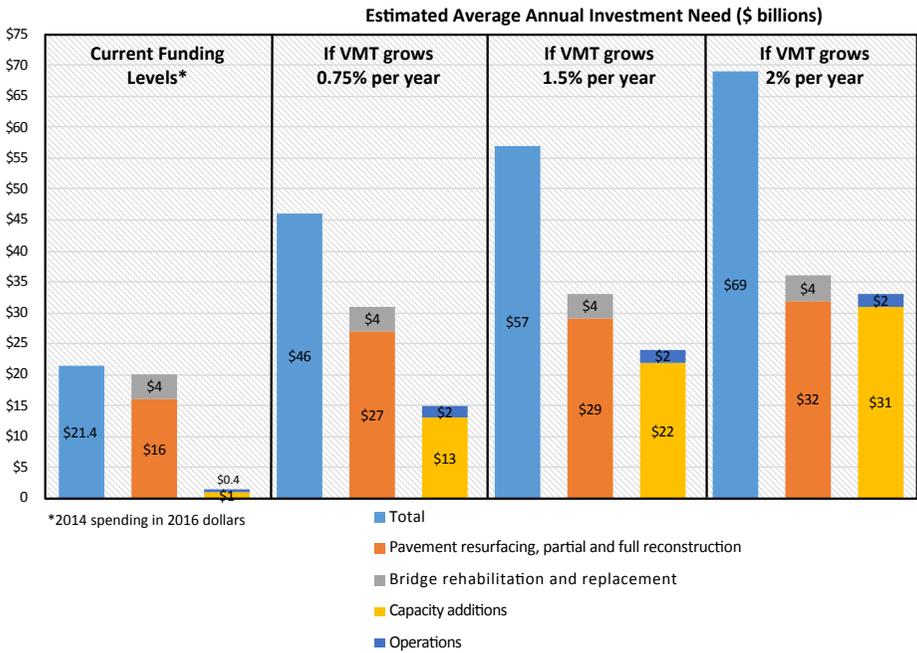


Figure. Estimated spending needs for Interstate highway renewal and modernization over the next 20 years.

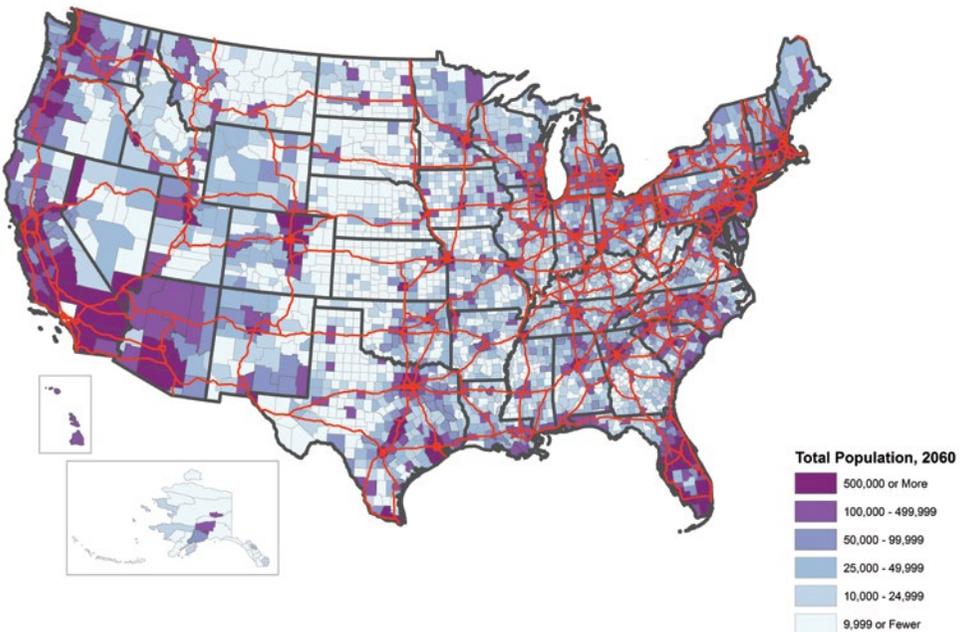
travel. Transportation agencies, especially in urban areas, may substitute more active operations and demand management measures, such as congestion tolling, for spending on lane widening and other physical additions to Interstate highways. Although connected and automated vehicles are likely to have limited effects on travel demand in the nearer term, expectations about their longer-term impact may influence transportation agency decisions about whether and where to invest in Interstate capacity, especially in 10 to 15 years.

The results of modeling and other analytic tools offer little insight into Interstate highway capacity needs 50 years out, but are also questionable for a 20-year period because of the many uncertainties and interdependencies noted above. Thus, even by stretching the limited modeling capabilities that do exist and using a range of historically informed rates of growth in future Interstate travel, the committee could at best develop rough approximations of the magnitude of the investments that will be needed for physical and operational capacity improvements to the Interstate System over the next 20 years. The models

calculate that if travel on the system is assumed to grow at a modest pace, comparable to the forecast growth in the U.S. population of 0.75 percent annually, transportation agencies will need to invest an average of \$15 billion per year for such improvements. These investments will need to be considerably larger—by about 50 to 100 percent—if travel on the system is assumed to grow at a pace closer to recent historical averages.

Thus, an approximation of the total state and federal spending needed to renew and modernize the Interstates over the next 20 years averages \$45–\$70 billion per year. The figures in this range are two to three times higher than current spending levels, and even 50 percent higher if one considers only the outlays required for the pavement and bridge upgrades that can be projected with higher confidence.

However, even these estimated investment levels may be inadequate. Because of the lack of analytic tools and adequate databases, they do not include the funding required to reconfigure and reconstruct many of the Interstate System's roughly 15,000 interchanges, nor do they include the resources needed to make the system more resilient to the effects of climate change; add special-purpose and managed lanes that can allocate system capacity more efficiently in and around metropolitan areas; and “rightsize” the system's scope of coverage through network extensions and, in some cases, replacement and modification of controversial urban segments (see the box on the next page). While these investment needs could not be estimated with an adequate degree of fidelity for this study, they are certain to require billions, and perhaps tens of billions, in additional annual spending.





ADDITIONAL INVESTMENTS IN THE INTERSTATE HIGHWAY SYSTEM THAT CURRENTLY CANNOT BE ESTIMATED

The needed annual investment in the Interstate Highway System of \$55 billion with a range of \$45–\$70 billion estimated by the study committee excludes investments in the following areas because of limitations in inventory data and analytic models that preclude their estimation at this time. Their omission from the committee’s estimated annual investment reflects only these limitations, and not a lower priority.

- **Reconfiguring and reconstructing many of the system’s roughly 15,000 interchanges.** The current condition of Interstate interchanges is not recorded in the national database on Interstate assets, and their improvement needs cannot be assessed using existing modeling tools.
- **Making the system more resilient to the effects of climate change.** These costs are likely to be highly dependent on local context and have not yet been adequately investigated.
- **Expanding and allocating system capacity more efficiently in and around metropolitan areas.** While the committee was able to derive estimates of the spending that would be required to pursue some congestion mitigation options, such as adding new general-purpose and managed lanes, many urban Interstate segments will require the use of a wider array of technological, operational, and other demand management approaches—such as intermodal connectivity strategies, area-wide congestion pricing, and the building of new transportation facilities—to accommodate future growth in travel demand. The investment required to pursue all of these congestion management approaches could not be estimated.
- **“Rightsizing” the length or scope of the system through extensions and replacements of some controversial urban segments that do not serve through-traffic.** Estimation of the cost of such investments is plagued by uncertainty regarding how future demographic, economic, and technological developments will affect specific locations of growth in population and commerce, the lack of compelling criteria for justifying federal investment in such segments, and variation in the choices communities will make regarding the intrusiveness and environmental consequences of potential system modifications.



The original Interstate Highway System Construction Program was underpinned by a long-term, collaborative commitment among the states and the federal government.

INVESTMENT OPTIONS

The study committee conducted an intensive analysis of the various options for funding the needed investments in the Interstate Highway System (see the box on the next page). Central to this analysis was recognition that the scale and scope of the Interstate reinvestment imperative are daunting, but even more so in an environment in which the revenues needed to pay for the investments are flat or falling, as is the case for funds derived from system users. The study committee

believes that situation must change. Having motorists pay for the highway system they use is not only intrinsically fair but also provides opportunities to manage demand and allocate capacity through pricing, while also offering greater assurance that the revenues generated for reinvestment will not be outpaced by the demands placed by users of the system. It is with these expectations and opportunities in mind, together with recognition of the large and inevitable investment requirements lying ahead, that the committee formulated its recommendations.





FUNDING OPTIONS CONSIDERED

The study committee carried out an intensive analysis of a wide range of options for funding the needed investment in the Interstate Highway System. This analysis considered the options listed below, both individually and in combination, including the advantages, disadvantages, and institutional and policy considerations associated with each. The results of this analysis are reflected in the committee's recommendations.

USER FEE-BASED OPTIONS

- **Option 1:** Increasing motor fuel taxes and other existing federal user fees
- **Option 2:** Allowing states and metro areas to toll existing general-purpose Interstate highways
- **Option 3:** Instituting mileage-based user fees for Interstate use to replace other user fees

OTHER FUNDING OPTIONS

- **Option 4:** Dedicating more of existing federal aid to the Interstates
- **Option 5:** Continuing the status quo (with General Fund transfers)
- **Option 6:** Applying a carbon tax or cap-and-trade fees in part to highway funding (as a potential future strategy)



A BLUEPRINT FOR ACTION

The original Interstate Highway System Construction Program was underpinned by a long-term, collaborative commitment among the states and the federal government. A comparable partnership is needed to renew and modernize the system and to ensure that it is resilient and responsive to the changing demands of users. Central to that partnership is federal leadership and a resolve to restore the Interstate Highway System's premier status and ensure that this status is no longer allowed to obsolesce. The recommendations that follow provide a blueprint for Congress to act on that resolve.

Congress should legislate an Interstate Highway System Renewal and Modernization Program (RAMP).

This program, presumed to be pursued without sacrificing normal ongoing system maintenance and repair, should focus on reconstructing deteriorated pavements, including their foundations, and bridge infrastructure; adding physical capacity and operations and demand management capabilities (e.g., tolling) where needed; and increasing the system's resilience. RAMP should be modeled after the original Interstate Highway System Construction Program by

- Reinforcing the traditional program partnership in which the federal government provides leadership in establishing the national vision for the overall system, the bulk of the needed funding, and overall standards, while

states prioritize and execute projects in their continued role as owners, builders, operators, and maintainers of the system;

- Ensuring that the federal share of project spending is comparable to the 90 percent share of the original Interstate Highway System Construction Program;
- Committing the federal government to supporting projects from start to finish, but with a cap on total federal funding (i.e., a cost-to-complete approach); and
- Developing transition plans for updating and incorporating standards for system uniformity and safety to accommodate changing vehicle and highway technologies, environmental and climate conditions, and usage patterns.



Congress should, as a near-term step, (1) increase the federal fuel tax to a level commensurate with the federal share of the required RAMP investment, and (2) adjust the tax as needed to account for inflation and changes in vehicle fuel economy.

To ensure that the federal government's long-term commitment to RAMP is not



As a condition for imposing those tolls, states should be required to assess their impact on current users and offer alternative mobility options for those users significantly and disproportionately harmed by the tolls.

threatened by declining fuel tax revenues as the vehicle fleet and its energy sources evolve, **Congress should prepare for the need to employ new federal and state funding mechanisms, such as the imposition of tolls or per-mile charges on users of the Interstate Highway System.**

To provide states and metropolitan areas with more options for raising revenue



for their share of RAMP investments and for managing the traffic demand on and operations of Interstate segments that offer limited opportunity for physical expansion, **Congress should lift the ban on the tolling of existing general-purpose Interstate highways.** As a condition for imposing those tolls, states should be required to assess their impact on current users and offer alternative mobility options for those users significantly and disproportionately harmed by the tolls.

A “rightsizing” component of RAMP should address current and emerging demands to extend the Interstate System’s length and scope of coverage, and to remediate economic, social, and environmental disruptions

caused by highway segments that communities find overly intrusive and are not deemed vital to network and intermodal traffic. Congress should direct the U.S. Department of Transportation and the Federal Highway Administration to develop criteria for such system rightsizing using a consultative process that involves states, local jurisdictions, highway users, and the general public.

The criteria and their development should take into account the interest in ensuring



- Adequate system connectivity to accommodate network flows of Interstate travel and commerce, including traffic from other important passenger and freight transportation nodes;
- System access to growing centers of population and economic activity;
- System resilience through redundancy or other means as appropriate; and
- Responsiveness to national defense needs.

CONCLUDING COMMENTS

Implementation of the above recommendations, together with several recommended complementary actions (see the box on pp. 27–29), would represent a fundamental shift away from a federal policy that has lost focus on the Interstate Highway System and the commitment to funding it adequately. These actions would restore the system’s premier status within the nation’s highway program in a manner that is aggressive and ambitious, although by no means novel. Taking these actions would rekindle a tried-and-true federal–state partnership; reinforce the system’s long-standing reliance on user fees to provide a fair, adequate, and reliable source of funding; and reassert the forward-looking vision that was

instrumental to the genesis of this crucial national asset more than a half-century ago. At that time, the nation’s leaders endorsed a modern highway system that would confer large and lasting societal and economic benefits, a vision whose realization required a strong and continuing national commitment. Today, the nation is experiencing, and can anticipate, new expectations for the system’s condition, performance, and use. Meeting those expectations will require the same forward-looking outlook and commitment that informed the system’s creation—a rededication to that original vision that reshapes and reequips the system to serve generations to come.



**ROAD
WORK
AHEAD**



Congress should legislate an Interstate Highway System Renewal and Modernization Program (RAMP).

A BLUEPRINT FOR ACTION

RECOMMENDATION 1.

Congress should legislate an Interstate Highway System Renewal and Modernization Program (RAMP). This program, presumed to be pursued without sacrificing normal ongoing system maintenance and repair, should focus on reconstructing deteriorated pavements, including their foundations, and bridge infrastructure; adding physical capacity and traffic demand and operations management capabilities where needed; and increasing the system's resilience.

RECOMMENDATION 2.

A "rightsizing" component of RAMP should address current and emerging demands to extend the Interstate System's length and scope of coverage, and to remediate economic, social, and environmental

disruptions caused by highway segments that communities find overly intrusive and are not deemed vital to network and intermodal traffic. Congress should direct the U.S. Department of Transportation (U.S. DOT) and the Federal Highway Administration (FHWA) to develop criteria for such system rightsizing using a consultative process that involves states, local jurisdictions, highway users, and the general public.

RECOMMENDATION 3.

To better ascertain the spending levels required for RAMP investments, Congress should direct U.S. DOT and FHWA to join with the states to assess the foundational integrity of the system's pavements and bridges, and to identify where full reconstruction is needed based on accepted life-cycle cost principles.



RECOMMENDATION 4.

To pay for RAMP investments, Congress should, as a near-term step, (1) increase the federal fuel tax as needed to a level commensurate with the federal share of the required RAMP investment, and (2) adjust the tax as needed to account for inflation and changes in vehicle fuel economy.

RECOMMENDATION 5.

To provide states and metropolitan areas with more options for raising revenue for their share of RAMP investments and for managing the traffic demand on and operations of Interstate segments that offer limited opportunity for physical expansion, Congress should lift the ban on the tolling of existing general-purpose Interstate highways. As a condition for imposing those tolls, states should be required to assess their impact on current users and offer alternative mobility options for those users significantly and disproportionately harmed by the tolls.

RECOMMENDATION 6.

To ensure that the federal government's long-term commitment to RAMP is not threatened by declining fuel tax revenues

as the vehicle fleet and its energy sources evolve, Congress should prepare for the need to employ new federal and state funding mechanisms, such as the imposition of tolls or per-mile charges on users of the Interstate Highway System.

RECOMMENDATION 7.

To support renewal and modernization investment decisions, Congress should direct, and provide sufficient funding for, U.S. DOT and FHWA to develop modeling tools and databases that track the full condition of Interstate assets, including interchanges, and their reconstruction history; can be used to assess transportation options that can supplement or substitute for additions to Interstate highway capacity; allow for the monitoring and modeling of network-level traffic flows on the Interstate Highway System; and further federal and state understanding of the demand for long-distance and interregional passenger and freight travel by highway and other modes. Because these recommended activities are important for guiding reinvestment in the Interstate System, careful consideration should be given to carrying them out in an effective and efficient manner.

RECOMMENDATION 8.

Congress should direct U.S. DOT and FHWA, working with states, industry, and independent technical experts, to start planning the transition to more automated and connected vehicle operations. This effort should entail performing the needed research and updates to Interstate Highway System requirements and standards to ensure that basic intelligent transportation system instrumentation

is adopted on a consistent and system-wide basis, and that the uniformity and other attributes of pavement markings, interchange design, and the like are capable of facilitating eventual Interstate use by connected and automated vehicles. An emphasis should be placed on ensuring that renewal and modernization projects give full consideration to safety impacts, including the deployment of advanced design and operational features with demonstrated effectiveness in improving safety, and that cybersecurity protections are incorporated into the designs and upgrades of the Interstate highways and the vehicles that use them.

RECOMMENDATION 9.

Expanding on earlier legislative directives (e.g., the Moving Ahead for Progress in the 21st Century [MAP-21] Act and the Fixing America's Surface Transportation [FAST] Act) for transportation agencies to consider resilience in long-term planning, Congress should direct U.S. DOT and FHWA to substantiate that state Interstate highway renewal and modernization projects have fully taken into account the need for resilience. To support these efforts, U.S. DOT and FHWA should be

directed to assess the vulnerability of the Interstate Highway System to the effects of climate change and extreme weather; develop standards, in conjunction with states, for incorporating cost-effective resilience enhancements into projects; and develop and maintain a database of cost-effective practices and resilience strategies employed by state highway and other transportation agencies, including any funding mechanisms dedicated to support for resilience planning and implementation.

RECOMMENDATION 10.

Congress should direct U.S. DOT and FHWA to ascertain the Interstate Highway System's contribution to the country's emission of greenhouse gases and recommend options for reducing this contribution in conjunction with reductions in emissions of other pollutants. The effort should build on past initiatives, such as legislation requiring states to consider the emissions impacts of capacity expansion and demand management options, and legislation mandating a federal program to examine the siting of facilities that support alternative-fueled vehicles, such as electric vehicle charging stations located on Interstate highway corridors.



