



# An Infrastructure Plan for America

How Investing in Infrastructure Will Lay the Foundation  
for Prosperity, Advance Environmental Goals,  
and Rebuild the Middle Class

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By Kevin DeGood, Christian Weller, and Andrew Schwartz

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# Introduction and summary

*Rhetoric is a poor substitute for action, and we have trusted only to rhetoric.  
If we are really to be a great nation, we must not merely talk; we must act big.*  
Theodore Roosevelt<sup>1</sup>

*The legitimate object of government is to do for a community of people whatever they need to have done, but cannot do at all, or cannot so well do, for themselves—in their separate, and individual capacities.*  
Abraham Lincoln<sup>2</sup>

Infrastructure is the foundation that makes everything in the U.S. economy possible. Infrastructure is also essential to our national competitiveness. When done right, infrastructure investments produce broad-based prosperity for American businesses and workers, facilitating social mobility and enabling access to opportunities, people, and ideas.

At every stage in our national development, infrastructure has played an essential role. Yet, today, many of our most valuable and productive national assets are coming to the end of their useful life and are in need of major repairs or reconstruction. Moreover, our growing population will require system expansion. For too long we have ignored the rising backlog of maintenance, preferring a reactive, patchwork approach that struggles to respond when critical systems fail—often without warning. That is why it is time to build the next generation of American infrastructure that will power our economy in the 21st century.

The need for investment is overwhelming. According to the American Society of Civil Engineers, American infrastructure across all sectors needs more than \$3 trillion in investment to both bring systems up to a state of good repair and accommodate population growth.<sup>3</sup>

In order to advance effective infrastructure policy that addresses current concerns and meets future needs, Congress should take the following three steps:

1. Increase annual federal expenditures across infrastructure sectors by a total of \$500 billion over 10 years—fiscal year 2017 to FY 2026—through a combination of increased user fees and tax code changes to raise general fund revenues
2. Establish a national infrastructure investment authority, or NIIA, to provide competitive grant funds, low-cost financing, and expedited environmental review and permitting for infrastructure projects of regional or national significance
3. Reform federal infrastructure programs to increase accountability and ensure that each dollar produces the greatest possible social, environmental, and economic return on investment

The concrete and steel that make up infrastructure projects are prosaic elements of our daily lives. However, they reflect the deeply American tradition of always looking to the future and making thoughtful investments that will pay dividends for generations to come. Taken together, the investments detailed in this report will serve as a significant down payment on America's continued economic prosperity. Moreover, investing in infrastructure will provide for more strong, middle-class jobs capable of supporting a family, with money left over to save for the future. Finally, the policy reforms will address many of the shortcomings of existing programs, ensuring that increased federal outlays are well spent.

Now is the time to put rhetoric aside and act big.

# How infrastructure shapes our nation

Throughout U.S. history, major infrastructure investments have shaped our society, fueled economic growth, and raised standards of living. In the early 19th century, the Erie and Ohio canal systems helped to open up the interior of the country, fueling population growth while expanding trade and development. Prior to their completion, the movement of goods and agricultural commodities was largely relegated to trails, underdeveloped roads, and coastal navigation.<sup>4</sup> The efficiency gains from canal construction were significant. For instance, when compared to a horse, a single canal barge could transport 240 times the cargo weight.<sup>5</sup> Freight costs fell by as much as 90 percent compared to ox- or horse-drawn wagon.<sup>6</sup> The canal system was such a powerful force that it also shaped settlement patterns. For example, to this day, nearly 80 percent up upstate New York's population lives within 25 miles of the Erie Canal, which stretches 365 miles from Albany to Buffalo.<sup>7</sup> The Erie Canal also made the port in New York City the busiest in the country, spurring the growth of related sectors such as manufacturing, finance, and insurance.<sup>8</sup>

In the late 19th century, the transcontinental railroad tied a vast continent together. Prior to its completion, a cross-country trip by stagecoach cost \$1,000 and took five to six months.<sup>9</sup> According to the Federal Reserve Bank of Minneapolis, \$1 in 1850 is worth approximately \$28.45 in 2015. In other words, a transcontinental trip by wagon cost the equivalent of roughly \$28,000.<sup>10</sup> In the 1860s, a second-class ticket on the Central Pacific Railroad from Chicago to San Francisco cost only \$45. When adjusting for inflation this translates to \$1,280 in 2015 dollars—roughly 22 times cheaper than an equivalent trip by wagon.<sup>11</sup> In 1956, President Dwight D. Eisenhower signed the Federal-Aid Highway Act into law.<sup>12</sup> This groundbreaking legislation initiated the construction of the largest public works program in U.S. history. President Eisenhower succinctly summarized the national project, saying, “Together, the united forces of our communication and transportation systems are dynamic elements in the very name we bear - United States. Without them, we would be a mere alliance of many separate parts.”<sup>13</sup> The 1956 Highway Act envisioned a seamless network of highways that would efficiently link urban and rural areas, ensuring connectivity and spurring economic growth. Flash forward more than six decades, and the interstate construction program initiated by Eisenhower has been so successful that it is scarcely possible to image the United States without these facilities.

The time has come for a proactive approach to investing that looks to the future, correcting mistakes from the past and directing funds to projects that will power our economy in the 21st century. In the absence of robust investment and a vision for America's future growth and development, existing systems will further deteriorate, leading to more congestion, pollution, and lost productivity, among other challenges.



# Investment strategy by sector

This section lays out how Congress should increase federal expenditures by infrastructure sector. Each subsection includes a discussion of current funding and user fees, as well as targeted policy reforms to improve the efficacy and return on federal investments. Taken together, these sectoral recommendations call for increasing federal outlays above FY 2015 baseline levels by \$500 billion over 10 years. Of this total, \$125 billion would capitalize a national infrastructure investment authority, or NIIA, that would provide a combination of grants and financing to qualified projects of regional or national significance. Each dollar of NIIA capitalization would leverage additional public and private financing, expanding the total impact of the proposed funding.

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## Highways and transit

The United States has one of the most extensive and productive surface transportation systems in the world, including more than 4.1 million miles of public roads<sup>14</sup> and 2,100 public transit operators.<sup>15</sup> Each year, these assets support a staggering 3.1 trillion<sup>16</sup> vehicle miles of travel, or VMT, and 10.6 billion transit trips.<sup>17</sup>

While impressive, these numbers belie the fact that states, metropolitan regions, and transit operators face a daunting array of challenges. According to the Federal Highway Administration, or FHWA, only half of the pavement on the federal-aid highway system is considered in good condition.<sup>18</sup> Moreover, there are 58,791 structurally deficient bridges in the United States.<sup>19</sup> Assuming a 1.8 percent average annual growth in overall driving, FHWA estimates that all levels of government must invest \$146 billion annually to improve the overall condition and performance of the highway network.<sup>20</sup> This figure represents approximately a 50 percent increase over current expenditures.



## I-84 Viaduct Project, Hartford, Connecticut

The Hartford metropolitan area, which includes Hartford, Tolland, and Middlesex counties, has a population of more than 1.2 million.<sup>21</sup> Two major interstate highways serve the region: I-84, which runs east to west; and I-91, which runs north to south. These two major highways intersect on the eastern edge of downtown Hartford.

Like many major highway facilities built in the 1960s during the height of the interstate construction era, large portion of I-84 have reached the end of their useful life and now require major rehabilitation and replacement. Yet, deterioration is not the only challenge that I-84 presents. Initially designed to handle 65,000 vehicles per day, the highway now carries more than 175,000 vehicles on a typical weekday.<sup>22</sup> In fact, the section of I-84 that extends west of downtown accounts for 53 percent of all delays on the region's freeways.<sup>23</sup>

Decades of heavy use have taken their toll. Three major interchanges, including number 46 at Sisson Avenue, 47 at Sigourney Street, and 48 at Asylum/Capitol Avenue are structurally deficient, meaning they are in need of major repairs.

In addition, the highway suffers from a number of design deficiencies that hurt overall performance. Modern highway designs attempt to space interchanges at least one mile apart to provide vehicles entering or leaving the facility sufficient space to merge or exit through traffic. The 2.7 miles of I-84 west of downtown include eight full or partial interchanges.<sup>24</sup> This design deficiency contributes to higher accident rates. Between 2009 and 2012, there were 1,170 accidents within the corridor.<sup>25</sup>

The highway also has inadequate shoulder space. Modern standards call for a 12-foot shoulder. By comparison, I-84 has shoulders that are only 2 feet to 4 feet wide. This means that any breakdown affects main-line traffic. Furthermore, narrow shoulders limit the ability of drivers to swerve to avoid accidents. And maintenance crews have less room to plow snow, among other challenges.



The elevated I-84 viaduct stretches through central Hartford, Connecticut.  
Source: Connecticut Department of Transportation

Beyond the structural deficiencies and congestion, I-84 acts as a major physical barrier within the community, effectively splitting Hartford in two. The 2.5-mile section of I-84 west of downtown Hartford runs on an elevated viaduct—essentially a long bridge that rises above the community below. The elevation allows traffic to flow by avoiding at-grade crossings with local streets. However, many of the streets that used to connect different neighborhoods now terminate at or near the highway, as not every street passes underneath the viaduct. This presents both quality of life and economic development challenges. Major highways frequently produce idle, unproductive land on either side since close proximity to a highway is unsuitable for many residential and commercial projects.

The challenge before the governor and the Connecticut Department of Transportation, or CTDOT, is to design a project that not only addresses the deteriorating infrastructure but also reduces congestion and community impacts. Currently, CTDOT is analyzing several project alternatives, including one that would bury a portion of the highway, facilitating more local roadway connections and reducing noise and visual impacts.

The cost of these various alternatives is substantial. Initial estimates place the cost of reconstructing the corridor and reconfiguring the interchanges at between \$4.3 billion and \$6.2 billion. To put this in context, each year, the federal government provides CTDOT with only \$484 million.<sup>26</sup> Assuming the final cost is at the high end of the range—a fair assumption given the history of cost overruns for megaprojects—the I-84 corridor would consume the state's entire federal allocation for more than twelve years. Cancelling or delaying thousands of smaller projects around the state for years to come in order to fix one critical section of highway in Hartford is po-

litically infeasible and operationally unsound. Even doing nothing will come with a big cost. CTDOT estimates that simply maintaining the existing viaduct and interchange ramps will cost more than \$2.5 billion in the coming decades.

The I-84 viaduct is exactly the kind of core reconstruction and improvement project that states must implement. However, existing federal funding is simply inadequate. States need a strong federal partner that can provide major capital projects along with a mix of grant and financing support sufficient to ensure their completion.

The U.S. Department of Transportation, or USDOT, estimates that transit operators face a repair and replacement backlog of \$86 billion.<sup>27</sup> This figure includes elements such as buses, streetcars, vans, and subway cars—also referred to as rolling stock—as well as stations, power systems, communications equipment, maintenance yards, and tracks, among other facilities. For many transit providers, repair and replacement of rolling stock is a constant challenge. For instance, according to USDOT, the chassis and other major structural components of a city bus are designed to last approximately 12 years with an even shorter lifecycle for the engine and drivetrain.<sup>28</sup> The relatively short life of a bus is due to intense daily use, frequent stops, heavy loads, and wear from poorly maintained city streets. Transit providers, therefore, face a constant, costly battle to maintain their fleets to meet the daily needs of passengers.

While daunting, these asset repair needs for highways and transit pale in comparison to the largest challenge facing surface transportation in the United States: metropolitan area congestion. According to Texas A&M University research, urban congestion added 6.9 billion hours to travel times and burned an additional 3.1 billion gallons of fuel for a total economic cost of \$160 billion.<sup>29</sup> In short, the United States has long since overcome the post-war problem of inadequate connectivity. The issue now is how to move people and freight in an efficient manner in dense metropolitan regions.



Damaged power cables from the Washington Metropolitan Area Transit Authority subway system are displayed. Source: AP/Cliff Owen

Federal surface transportation policy has three major problems that limit its effectiveness at combating metropolitan congestion: too much emphasis on highway expansion; insufficient funding and decision-making authority for metropolitan regions; and not enough accountability for how states and regions spend federal funds.

In the past 35 years, the population of the United States grew from 226 million to 319 million people—an increase of 41 percent.<sup>30</sup> At the same time, the total number of registered vehicles grew at an even faster rate, increasing by 90 million, or 57 percent.<sup>31</sup> The biggest growth of all came in total driving, which increased by 100 percent, from 1.5 trillion miles to 3.1 trillion miles.<sup>32</sup> The U.S. Bureau of the Census estimates that, over the next 50 years, the U.S. population will grow by more than 100 million people.<sup>33</sup> If the current per-capita rate of vehicle registration holds over this time, 85 million more vehicles will be vying for space on our roadway network.<sup>34</sup>

At first, these statistics seem to suggest that the solution to urban congestion is substantial highway expansion. However, the truth is that, in many urban areas, dense commercial and residential development along highway corridors makes expansion extremely expensive and politically fraught since it would involve large-scale use of the power of eminent domain. In effect, general public support for more pavement quickly evaporates when state departments of transportation begin identifying land for condemnation.



In 2005, Congress created a national commission to study transportation needs and financing options. The final report stated its conclusions bluntly:

*Contributing to the scale of the problem is a deeply entrenched over-reliance on the personal automobile for travel in urban corridors. Strategies to shift more trips to public transit will play a large role in any forward-thinking efforts to reduce congestion.*<sup>35</sup>

Even though congestion is the defining surface transportation challenge of our time, federal policies have not kept pace with rapid urbanization and the need for greater mobility options. As the commission notes, the current federal program provides substantially more funding for highways than other modes. In fact, 80 percent of federal transportation spending goes to highway projects.<sup>36</sup> This can be thought of as a modal imbalance that pushes states to focus too much on highway capacity at the expense of other transportation options.

The second problem facing the federal program is that metropolitan regions lack sufficient funding and decision-making authority. Under the current program structure, the super majority of federal funds flow to state departments of transportation even though the most pressing congestion problems occur on a regional scale, as most travel is local.<sup>37</sup> According to USDOT, in 2011—the most recent year for which data are available—74 percent of all trips taken in a vehicle each year are less than nine miles in length.<sup>38</sup> Furthermore, 67 percent of all vehicles miles traveled occurred within urban areas during this same time.<sup>39</sup>

Under current law, metropolitan regions with more than 50,000 residents are required to set up metropolitan planning organizations, or MPOs. These regional agencies are required to develop long-range transportation plans. However, MPOs are not given the resources to carry these plans out. These agencies only play a role in allocating a modest share of the funding from the Surface Transportation Block Grant, or STBG, Program. This process is known as suballocation. And even though regions are supposed to have the latitude to direct these funds according to their priorities, in reality, MPOs must often negotiate with their state department of transportation—often with the implicit threat of losing money from other programs—allowing the state to impose its priorities instead.



Dense development along the I-75/I-85 connector in downtown Atlanta prevents expansion. Source: Flickr/muora

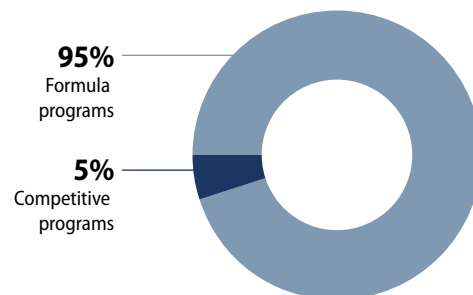
The third problem with the federal program is that it fails to hold states and metropolitan regions accountable for how they spend federal funds. The main issue is that 95 percent of transportation funds flow to transit providers, states, and metropolitan regions through formulas set in law. Allocating funding by formula rewards the geography of political power rather than rational determinations of need or potential return on investment. As the following map demonstrates, there is a significant difference between the share of gross domestic product, or GDP, produced by each state and the share of transportation funding each receives. Because the money from Washington, D.C., shows up each year no matter what, it removes incentives for states and regions to improve performance or try a new approach—even though there are no consequences for failure.

Stated differently, states and regions are not held accountable for achieving specific transportation system performance outcomes tied to clear national policy objectives. Instead, federal rules focus almost exclusively on process. As long as a state or region applies to spend federal money on an eligible use, USDOT approves the project. In this way, the federal program operates like an unrestricted block grant.

The focus on individual projects also highlights a related shortcoming of the federal program. Namely, that transportation policy focuses too much on assets rather than outcomes. Properly understood, transportation policy and planning should focus on what investments accomplish. Congress should reform the program in order to focus states and regions on how investments affect our economy, society, and environment.

The most effective way to accomplish this is to broaden the scope of performance management. In 2012, Congress passed the Moving Ahead for Progress in the 21st Century, or MAP-21, transportation authorization bill.<sup>40</sup> This legislation required USDOT to create the first performance management metrics for states and regions to use. Performance management seeks to maximize the performance of the surface transportation system through detailed analysis of system data.<sup>41</sup> In short, performance management is intended to facilitate a transparent, data-driven, and rational approach to infrastructure investment.

**FIGURE 1**  
**Transportation funding distribution**  
Formula versus discretionary

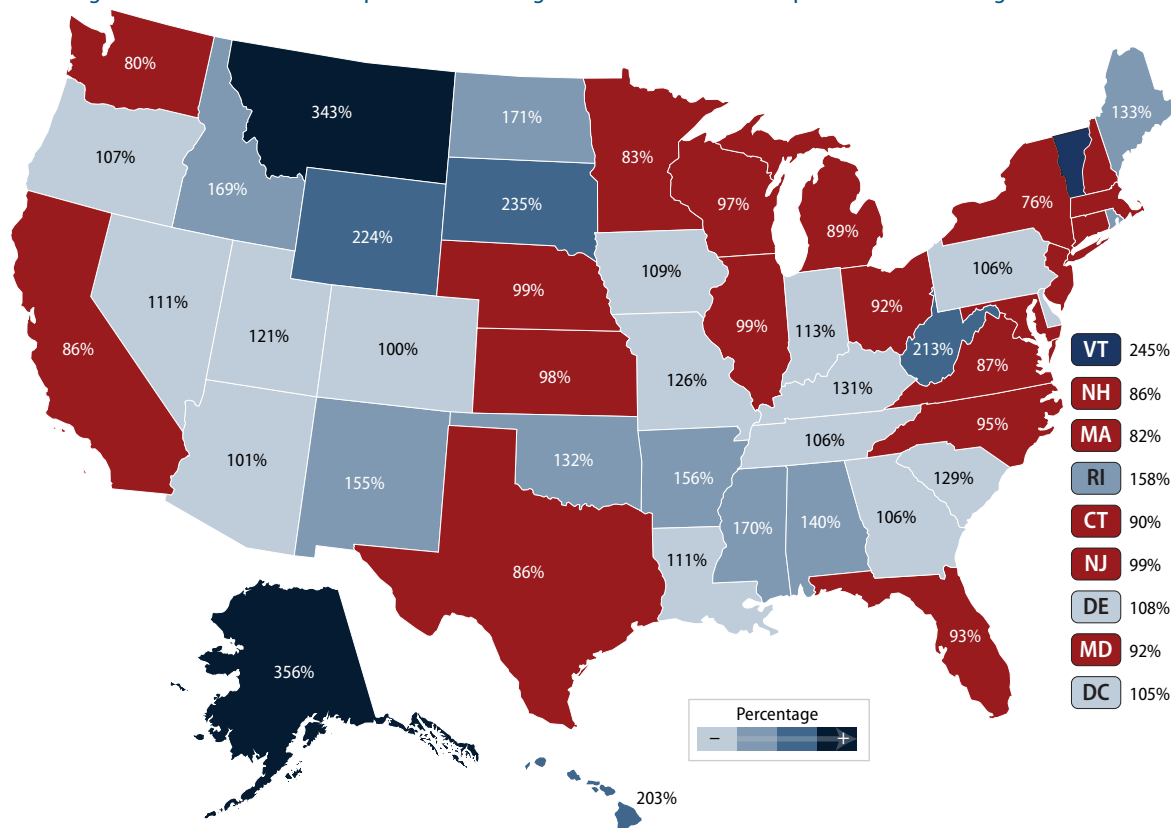


Sources: Author's calculations based on programmatic data from Federal Highway Administration, "Fixing America's Surface Transportation Act or 'FAST Act,'" available at <https://www.fhwa.dot.gov/fastact/funding.cfm> (last accessed April 2016); Federal Transit Administration, "Fiscal 2016 Apportionment Tables – Full Year," available at <https://www.transit.dot.gov/funding/apportionments/fiscal-2016-apportionment-tables-full-year> (last accessed April 2016); U.S. Department of Transportation, "TIGER Discretionary Grants," available at <https://www.transportation.gov/tiger> (last accessed April, 2016); U.S. Department of Transportation, "Annual Report on Funding Recommendations," available at <https://www.transit.dot.gov/funding/grant-programs/capital-investments/annual-report-funding-recommendations> (last accessed April 2016).

FIGURE 2

## Ratio of surface transportation funding to GDP

Percentages reflect how much transportation funding each state receives compared to the GDP it generates



Sources: Author's calculations based on programmatic data from Federal Highway Administration, "Fixing America's Surface Transportation Act or 'FAST Act,'" available at <https://www.fhwa.dot.gov/fastact/funding.cfm> (last accessed April 2016); Federal Transit Administration, "Fiscal 2016 Apportionment Tables – Full Year," available at <https://www.transit.dot.gov/funding/apportionments/fiscal-2016-apportionment-tables-full-year> (last accessed April 2016); and U.S. Department of Commerce, "Table 1. Real GDP by State, 2011–2014," available at [http://www.bea.gov/newsreleases/regional/gdp\\_state/2015/xls/gsp0615.xlsx](http://www.bea.gov/newsreleases/regional/gdp_state/2015/xls/gsp0615.xlsx) (last accessed May 2016).

The measures MAP-21 requires focus overwhelmingly on the state of repair of the transportation system. While important, these measures fail to capture the full set of effects that transportation facilities have on our economy, society, and environment.

A 21st century transportation system should increase economic productivity and competitiveness; improve access to opportunity for all communities; maintain assets; reduce major injuries and fatalities; minimize effects on natural and social environments; reduce energy consumption; and expand affordable transportation choice. In order to achieve this diverse set of goals, Congress should expand the federal performance management framework to include measures for each of these areas.

The following examples highlight some—though certainly not all—of the performance measures that Congress should require states and regions to adopt:

- **Transit productivity.** Transit productivity measures the ratio of ridership to transit service. The goal of this measure is to push transit providers to improve productivity, including service for transit-dependent communities.
- **Average distance to transit stops.** Public transportation riders are pedestrians at the start and end of every journey. The goal of this measure is to the average distance to transit stops by expanding service and zoning for more development around transit stops.
- **Roadway connectivity.** Connectivity measures how directly the roadway network connects destinations, often measured as a ratio of roadway segments to intersections, with a higher number indicating greater connectivity. Less connected roadway systems effectively cause people making local trips to compete with and impede longer-distance drivers and freight carriers because they lack alternative route options, thereby degrading system performance. The goal of this measure is to increase roadway connectivity
- **Carbon dioxide emissions from transportation.** This measure estimates carbon dioxide emissions from the transportation sector. Transportation represents the second-largest source of greenhouse gas emissions, producing 28 percent of U.S. emissions each year.<sup>42</sup> The goal of this measure is to reduce total mobile-source emissions by comparing how different infrastructure investments, land-use patterns, and vehicle fleets change overall emissions.
- **Per capita driving.** Per capita VMT is a measure of how much driving a person does in a year. Measuring per capita driving captures the effects of transportation investments and land-use policies while also allowing total VMT to rise as populations increases over time. The goal of this measure is to reduce per capita driving.
- **Transit mode share.** Transit mode share measures the percentage of all trips that use public transportation. The goal of this measure is to increase the overall share of trips taken by public transportation.



## Funding

Funding for highway and transit programs comes from two sources: appropriations and fuel taxes. Annual appropriations fund the Transportation Investment Generating Economic Recovery, or TIGER, program, as well as the New Starts fixed guideway transit capital program.<sup>43</sup> Federal excise taxes of 18.4 cents a gallon on gasoline and 24.4 cents a gallon on diesel capitalize the Highway Trust Fund, or HTF, which supports highway and transit formula programs.<sup>44</sup>

Congress last raised the federal excise tax on gasoline and diesel in 1995.<sup>45</sup> Over this time, vehicles have become substantially more fuel efficient. In effect, the same level of driving does not produce the same amount of transportation revenue for the HTF. As a result, Congress has had to backfill the Highway Trust Fund since 2008 with money from the General Fund of the Treasury because fuel tax receipts have not been sufficient to cover program outlays.<sup>46</sup>

Congress avoided raising fuel taxes as part of the most recent surface transportation authorization, the Fixing America's Surface Transportation, or FAST, Act, which covers FY 2016 through FY 2020. In order to cover the approximately \$14 billion annual shortfall, Congress backfilled the HTF with \$70 billion in general fund revenues.<sup>47</sup>

Given the enormous need for repair and expansion of highway and transit facilities, Congress should increase overall HTF outlays by \$25.9 billion each year over the next 10 years. In order to offset these outlays, Congress should increase the federal excise tax on gasoline and diesel by 15.25 cents a gallon. Each additional penny in gas and diesel taxes generates approximately \$1.7 billion in revenue for the HTF.<sup>48</sup> The increased fuel taxes would generate approximately \$25.9 billion annually. In order to cover the remaining \$15 billion annual shortfall for FY 2021 through FY 2025—a \$70 billion total over five years—Congress should authorize another general fund transfer. This funding approach balances the need for users to substantially contribute to system maintenance and expansion while recognizing that increased investment provides broad economic benefits that justify general fund support.

In addition to additional funding, Congress should make three key reforms: First, increase funding for competitive grant programs such as TIGER and New Starts. These programs reward project sponsors that submit the most innovative, productive, and cost-effective projects. Second, expand local control over project selection decisions with formula funding by increasing the share of STBG funds suballocated to metropolitan regions. Third, provide greater transparency and accountability to transportation governance through expanded performance management.

The following policy changes and spending priorities will increase competition, accountability, and local control, as well as address the significant maintenance and replacement backlog.

#### *Current tax regime*

- Funding for highway and transit programs comes from general appropriations and a federal excise tax of 18.4 cents a gallon on gasoline and 24.4 cents a gallon on diesel.

#### *Policy reforms*

- Increase the share of funding suballocated to metropolitan regions from the Surface Transportation Block Grant Program from 51 percent to 75 percent, with no more than 15 percent of suballocated funds going to projects that expand the number of general purpose travel lanes on the Interstate or National Highway System
- Expand the performance management program under 23 USC 150 to include new measures for overall system accessibility; transit and nonmotorized mode share; transportation affordability and energy consumption and greenhouse gas emissions from the mobile sector; among others
- Require that not less than 65 percent of National Highway Performance Program, or NHPP, funds support rehabilitation, repair, and replacement projects and allow NHPP funds to support bridge repair projects anywhere on the federal-aid highway system

#### *Tax reform and investments*

- Raise the federal excise tax on gas and diesel by 15.25 cents a gallon to 33.65 cents and 39.65 cents a gallon, respectively
- Transfer an additional \$70 billion to the Highway Trust Fund to cover the anticipated shortfall for FY 2021 through FY 2026
- Increase annual Highway Trust Fund outlays for highway and transit formula programs by \$25.9 billion
- Increase annual funding for the New Starts program from \$2.3 billion to \$4 billion
- Increase annual funding for the Transportation Investment Generating Economic Recovery grant program from \$500 million to \$1 billion

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## Passenger and freight rail

Passenger and freight rail are essential elements of America's surface transportation system. The National Railroad Passenger Corporation, also known as Amtrak, is the main provider of passenger rail service. In 2012, Amtrak served a record 31.2 million passengers across more than 500 destinations in 46 states.<sup>49</sup> During this same time, freight railroads hauled more than 2 billion tons of freight worth \$550 billion.<sup>50</sup>

Taken together, passenger and freight rail provide vital mobility to millions of Americans and serve as an engine of economic growth. Moreover, passenger rail service helps to reduce congestion in large metropolitan areas. Yet, both sectors face substantial infrastructure needs. Failure to invest in repair, modernization, and expansion of passenger and freight facilities will place a drag on our economy in the decades to come. And while these two sectors are often discussed in isolation, passenger and freight providers share facilities across the country, and federal policy and investment will largely determine their collective success.

In the 19th century, Congress granted railroad companies millions of acres of land in addition to the power to condemn private property. The goal was to provide the legal authority and financial subsidies that would allow private railroads to expand their networks and facilitate westward migration. In exchange for these substantial benefits, Congress required railroads to provide intercity passenger rail service. For many decades, rail travel was a private business. The absence of effective competition from other modes of transportation meant this requirement was not a burden.

However, by the late 1960s, regulatory requirements, as well as competition from cars, trucks, and airlines, pushed down demand for both freight and passenger rail service. In a short period of time, multiple major freight rail carriers declared bankruptcy.<sup>51</sup> The succession of bankruptcies threatened to terminate passenger rail service in many areas of the United States. In order to prevent this, Congress agreed to provide some financial relief by removing the requirement that carriers continue to provide unprofitable intercity passenger rail service. In 1970, Congress authorized the creation of Amtrak and, by May 1971, Amtrak began to provide passenger rail service across the nation.<sup>52</sup>

The financial relief of removing passenger service requirements proved insufficient to resuscitate failed freight railroads. In 1973, Congress established a government-owned railroad corporation known as Conrail that appropriated failed rail operations in the Northeast, including the tract that would become the Northeast Corridor, or NEC. Finally, in 1976, Congress passed the Railroad Revitalization and Regulatory Reform Act, which authorized Amtrak to purchase the NEC from Conrail—effectively transferring this valuable asset from one government corporation to another.<sup>53</sup>

Amtrak's takeover of the NEC, which stretches 457 miles from Washington, D.C., to Boston, came with a downside: The neglected facility needed substantial investment.<sup>54</sup> Unfortunately, Congress has provided insufficient capital funding, typically just enough to ensure the corridor continues to operate but not enough to address major capacity and structural challenges. Even with limited capital support, Amtrak manages to provide essential rail service in the most heavily populated and congested region of the United States. Each day, more than 2,200 trains use a portion of the corridor.<sup>55</sup> Ridership along the corridor has increased by 37 percent since 2000.<sup>56</sup> In 2015, Amtrak carried 11.7 million passengers on the NEC mainline.<sup>57</sup>

In 2014, the Northeast Corridor Infrastructure and Operations Advisory Commission estimated that the NEC will require approximately \$13 billion to reach a state of good repair.<sup>58</sup> In order to accommodate travel demand and population growth, the corridor will require an additional \$30 billion for capacity expansion projects.<sup>59</sup>

These investments would not only provide benefits to rail passengers but also highway drivers and flyers. For instance, in 2001, Amtrak accounted for just 37 percent of the total air and rail travel between Washington, D.C., and New York City.<sup>60</sup> By 2011, Amtrak accounted for 75 percent of the combined total, meaning ridership growth dramatically outpaced growth in aviation between these two major cities.<sup>61</sup> Over this same period, Amtrak's share of combined rail and air travel between New York City and Boston increased from 20 percent to 54 percent.<sup>62</sup> This is especially important, as the New York metropolitan region has some of the worst aviation congestion and delays in the nation.<sup>63</sup> By providing travelers with a safe and efficient alternative, Amtrak alleviates demand for short-haul flights that clog the skies over the Northeast.

## Northeast Corridor rail improvements

The Northeast megaregion is home to more than 50 million people, or 1 in every 7 Americans. All told, the region accounts for \$1 out of every \$5 of economic productivity.<sup>65</sup> Amtrak and the NEC play a significant role in facilitating this productivity.

Beyond intercity trips, the NEC supports local commuter rail service as well. In 2015, an average of 720,000 commuters rode on trains each weekday that used some portion of the NEC or associated Amtrak infrastructure.<sup>66</sup> Without this service, rail commuters would be forced to drive, adding to heavily congested roadways. According to Texas A&M University, 3 of the 10 most congested metropolitan regions lie within the NEC: New York City, Washington, D.C., and Philadelphia. Taken together, drivers in these three cities face 880 million hours of annual roadway delay.<sup>67</sup>

Yet, for all the benefits the NEC provides, the corridor faces enormous challenges. Three crucial projects highlight the capital needs facing the corridor—although this is only a portion of what is needed to bring the NEC to a state of good repair and accommodate future travel growth.

The most significant barrier to improving rail service along the NEC is the more than 100-year-old North River Tunnels that connect Weehawken, New Jersey, with Penn Station in midtown Manhattan. Both Amtrak and NJ Transit commuter trains use these tunnels on a daily basis. On average, approximately 450 trains pass through the tunnels each weekday.<sup>68</sup> During the morning and evening peak period, each tunnel reaches its maximum carrying capacity of 24 trains per hour.<sup>69</sup>

The tunnels are rapidly reaching the end of their useful life and Amtrak must close them frequently for inspection and repair. Superstorm Sandy exacerbated the need for replacement by causing the tunnels to flood with millions of gallons of salt water, which left behind sulfide and chloride residue and caused significant damage to the concrete tunnel liner and conduits that house critical electrical and signaling systems.<sup>70</sup> Adding two new tunnels would double the number of Amtrak and NJ Transit trains that could travel through the corridor per hour from 24 trains to 48 trains, reducing

commute times by an average of 23 minutes.<sup>71</sup> In addition, expanding tunnel capacity would eliminate 22,000 auto trips and 590,000 miles of driving every day—a significant benefit to auto commuters who already face heavily congested roadways.<sup>72</sup>

Another critical yet aging link is the Portal Bridge, which crosses the Hackensack River halfway between Manhattan and Newark. On an average day, about 450 trains carrying 150,000 riders travel over Portal Bridge.<sup>73</sup> Constructed in 1906, Portal is a two-track, moveable, swing-span bridge that opens to allow barge and other commercial water traffic to pass.<sup>74</sup> Unfortunately, maintaining the structure is costly and the swing mechanism is prone to failure. When the bridge cannot swing back into place, it causes delays along the entire NEC as trains await bridge repairs.<sup>75</sup> Amtrak's long-term plan is to replace the existing portal bridge with two two-track bridges that would double rail capacity to accommodate existing and future travel demand. Altogether, Amtrak estimates that the bridge, tunnel, and related improvements, including a significant expansion of Penn Station, will cost approximately \$24 billion.<sup>76</sup>

To the south, the Baltimore and Potomac, or B&P, tunnels in Baltimore were constructed in 1873—just eight years after the end of the Civil War.<sup>77</sup> The tunnels serve as a critical link on the NEC, connecting the main line tracks to Baltimore's Penn Station. Each day, 143 passenger trains and two freight trains use the tunnels.<sup>78</sup> The tunnels serve Amtrak intercity and Maryland Area Regional Commuter, or MARC, commuter trains, as well as Norfolk Southern freight trains.<sup>79</sup> B&P tunnel design, including tight curves, limits train speeds to just 30 miles per hour.<sup>80</sup> This significantly reduces the number of trains that can move through the corridor per hour, limiting overall capacity. Amtrak estimates that the cost of replacing the existing tunnels with an expanded four-tunnel system would cost approximately \$4 billion.<sup>81</sup>

The NEC advisory commission expects intercity ridership to more than double by 2040.<sup>82</sup> Improving the NEC is essential to avoiding further congestion of the region's highways and airports.

Amtrak service also helps to reduce the already overburdened I-95 corridor. In fact, using a highway travel demand forecasting model, the Northeast Corridor Infrastructure and Operations Advisory Commission determined that without investment and expansion of the NEC, “the number of highway miles operating at 27 mph or less during peak periods will increase from 165 miles to 474 miles by 2035.”<sup>64</sup>

The Northeast Corridor is not the only corridor in desperate need of investment. In fact, outside of the Northeast, Amtrak’s rail service operates on private freight rail tracks. This overlap in facility use means that freight rail bottlenecks also cause problems for passenger service. Conversely, growing demand for passenger rail service places pressure on already strained freight operations. The Chicago region demonstrates the challenges that both sectors face.

Chicago has served as a freight and passenger rail hub for nearly 150 years. The region includes 78 rail yards and 2,800 route-miles of track, which carry, on average, 500 freight trains and 760 passenger trains each day.<sup>83</sup> Approximately 37,500 rail cars, or one-quarter of all freight rail traffic nationally, flow through the Chicago region each day.<sup>84</sup> Unfortunately, the region suffers from significant rail bottlenecks. The average rail car requires nearly 30 hours to travel through Chicago.<sup>85</sup> Moreover, many of the lines have at-grade crossings with local roadways, causing substantial vehicle delays, which lead to lost productivity and increased vehicle idling and air pollution.

Given the importance of freight, passenger, and commuter rail service to the region, the state of Illinois, the Chicago Metropolitan Agency for Planning, the Chicago Department of Transportation, the U.S. Department of Transportation, and rail operators have formed a unique partnership to tackle the problem of rail congestion and roadway delay. Together, these agencies and operators have developed a long-term plan to reduce at-grade crossings and expand overall capacity known as the Chicago Region Environmental and Transportation Efficiency, or CREATE program.

The CREATE program consists of 70 projects, including six rail-rail grade separations; 25 road-rail grade separations; and 36 other improvements to signal systems, tracks, and switches.<sup>86</sup> Once completed, CREATE will save drivers approximately 3,800 hours in wait times each day. The combination of reduced wait times and improved train operating efficiency will save 3.4 million gallons of diesel fuel each year.<sup>87</sup> Reducing diesel fuel consumption will also remove 36,000 metric tons of carbon dioxide, 155 metric tons of nitrogen oxide, and 5 metric tons of particulate matter each year.<sup>88</sup>

Rail congestion in Chicago also negatively affects Amtrak and Metra commuter rail passengers. Each year, Metra and Amtrak serve 36 million and 2.6 million riders, respectively. The CREATE program will reduce total annual delay for Metra and Amtrak riders by an estimated 817,000 hours.<sup>89</sup>

Eliminating at-grade crossings in urban areas is only one aspect of rail investment needs. Freight bottlenecks produce conflicts between intercity passenger and cargo traffic that result in delays and poor overall service quality. Amtrak's Wolverine Line, which provides service between Detroit and Chicago, is another excellent example of the benefits that result from investment.

Currently, Amtrak operates three round trips each day along the 300-mile route between Chicago and Detroit/Pontiac, Michigan.<sup>90</sup> Unfortunately, this route includes the single most delay-prone corridor in the nation. The 29-mile stretch of track owned by Norfolk Southern between Porter, Indiana, and the Indiana-Illinois state line struggles to handle 14 Amtrak trains and approximately 85 freight trains each day.<sup>91</sup> This congestion produces delays that often result in the Wolverine Line having the worst on-time performance of any Amtrak route in the nation.<sup>92</sup>

Investing in upgrades along the corridor would have a dramatic impact on frequency, travel times, and overall ridership. Moreover, a substantial share of the increased ridership would come from people who would otherwise drive. Initial estimates are that doubling the number of daily round trips and reducing travel times by 1 hour and 44 minutes, or 30 percent, will increase ridership by more than 500 percent, or to 2.8 million, by 2035.<sup>93</sup> Travel demand models estimate that 54 percent of this ridership will come from "car diversion" and 10 percent from "air diversion."<sup>94</sup>

Projects such as CREATE and the Wolverine Line highlight the substantial benefits that rail investments produce in both overall economic productivity and mobility. These projects also highlight an important aspect of rail infrastructure that is different from other sectors: Freight rail assets are mostly privately owned. For this reason, in addition to the NEC, the Federal Railroad Administration, or FRA, should limit future investments in infrastructure controlled by private companies to projects that deliver co-benefits to Amtrak and commuter rail providers.

In addition, FRA should invest in projects that produce clear positive externalities that are not captured by private railroads and, as a result, are not a priority. As the Chicago region demonstrates, freight traffic causes major delays on arterial roadways due to at-grade crossings. These delays not only affect traffic but also result in lost economic productivity. These negative consequences, however, are not a



factor in the capital planning of private railroads because the economic benefits of separating rail and roadway grades do not accrue to the company. For this reason, FRA should prioritize rail investments that offer substantial returns on investment to the public and not merely pecuniary gain for the railroad.

In order to substantially address the major state-of-good-repair backlog along the NEC and to meet the growing demand for passenger rail service, Congress should increase overall funding for rail infrastructure. In addition, Congress should remove the uncertainty surrounding annual funding for Amtrak by establishing a rail account within the HTF. This would provide dedicated annual operations and capital funding. Furthermore, it would allow FRA to sign full funding grant agreements with Amtrak and other rail project sponsors, allowing for much greater certainty around capital project planning and financing.

### Current tax regime

- Passenger and freight rail projects are funded with general fund revenues through annual appropriations legislation.

### Policy reforms

- Establish a rail account within the Highway Trust Fund to provide dedicated annual funding for operating assistance for Amtrak, as well as capital repair and expansion projects for Amtrak and other passenger rail providers
- Require the Federal Railroad Administration to sign full funding grant agreements with rail project sponsors to provide stability and predictability for multi-year capital projects over \$100 million in cost
- Rename the Highway Trust Fund the Transportation Trust Fund to reflect its comprehensive role in surface transportation investment

### Tax reform and investments

- Capitalize the new rail account with \$50 billion raised through tax reform
- Authorize annual outlays of \$5 billion to cover passenger rail service expansion projects, as well as Amtrak operating and capital costs

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## Aviation

In 1903 the Wright brothers made history in Kitty Hawk, North Carolina, with 12 seconds of powered flight.<sup>95</sup> In those few seconds, modern aviation was born. Things have changed dramatically since then. Today, aviation contributes \$1.3 trillion to the U.S. economy, or 5.2 percent of GDP.<sup>96</sup> The industry is also a major source of employment, generating more than 10 million jobs.<sup>97</sup>

Aviation consists of two major public-sector infrastructure components: air traffic control and airports. The Federal Aviation Administration, or FAA, owns and operates the air traffic control systems, which includes airport towers and thousands of other smaller facilities and pieces of equipment that together form an integrated network capable of managing our national airspace system. In fact, the FAA employs more than 14,000 air traffic controllers at 317 facilities across the country.<sup>98</sup> Airports, by comparison, are typically independent public authorities governed by an appointed board with the power to issue debt and collect fees and other taxes to finance capital and operational expenses.

In the coming years, both the federal government and airport authorities must make substantial investments to ensure the system can safely and efficiently handle growing aviation travel demand. In 2014, commercial airlines carried 662 million passengers on 8.1 million domestic flights.<sup>99</sup> This translates to approximately 23,000 scheduled commercial flights a day.<sup>100</sup> As significant as these numbers are, commercial aviation represents only one-third of the daily flights that air traffic controllers have to handle. When military, general aviation, and taxi flights are added, the daily total climbs to more than 87,000.<sup>101</sup> Air traffic controllers must handle approximately 64 million takeoffs and landings per year.<sup>102</sup> At any given moment, roughly 5,000 airplanes are in the sky above the United States.<sup>103</sup>

The FAA estimates that that domestic aviation demand will climb from 889 billion revenue passenger miles, or RPMs, in 2015 to 1.53 trillion RPMs by 2036.<sup>104</sup> This translates to a compound annual growth of approximately 2.5 percent.<sup>105</sup>

In 2003, Congress passed legislation directing the FAA to transition from an antiquated ground-based radar system to a modern satellite-based system of navigation and control known as the Next Generation Air Transportation System, or NextGen, by 2025.<sup>106</sup> While the current system is the safest in the world, ground-based radar has significant limitations that result in flight delays,

inefficient routes, and wasted fuel. Implementing NextGen air traffic control systems and procedures is essential to ensuring the U.S. air transport system remains productive and efficient. Without the NextGen upgrade, aviation congestion will cost the economy \$22 billion in lost economic activity each year by 2022 and \$40 billion annually by 2033.<sup>107</sup>

The benefits of upgrading the air traffic control systems are enormous. The FAA estimates that NextGen improvements will generate \$134 billion in economic benefits by 2030.<sup>108</sup> The cost of NextGen implementation over the next 15 years will total \$39 billion.<sup>109</sup> The federal government and industry will approximately split this cost. The government will cover the cost of improvements to public infrastructure while carriers and private owners and operators are responsible for making significant upgrades to onboard avionics systems. After applying a discount rate to account for the timing of both economic benefits and costs, the overall benefit-to-cost ratio is more than 3-to-1.<sup>110</sup> The business case for investment is clear, but implementation presents significant challenges. Moreover, the FAA does not control the pace of technological adoption by industry.<sup>111</sup>

To better understand the source of inefficiency and delay, it helps to review how the FAA manages aviation traffic today. Controllers rely principally on ground-based radar and a three-stage process for tracking and directing air traffic. The process begins with personnel at airport traffic control towers, or ATCT, who direct both ground movements and the first few thousand feet of ascent. Second, ATCT controllers hand off outbound flights to personnel at facilities known as terminal radar approach control, or TRACON. Controllers at TRACON facilities handle the congested airspace in the vicinity of the airport up to an altitude of 10,000 feet. Third, TRACON facilities hand off outbound flights to controllers at air route traffic control centers, or ARTCC. These controllers handle what is termed “en route airspace,” which includes final ascent and the portion of the flight at cruising altitude.<sup>112</sup> The process repeats itself in reverse as a flight approaches its arrival airport.

Tracking and controlling aircraft using data from ground-based radar limits how efficiently the FAA can use air space. In order to ensure safety, the FAA requires planes to maintain ample separation distances. Once implemented, NextGen will provide highly accurate, near real-time data to pilots without recourse to controllers on the ground. With more accurate information, NextGen will allow planes to fly safely in closer proximity. This is especially important in heavily traveled regions.

## Current air traffic control

### **Airport control tower, or**

**ATCT:** Handles final approach and takeoff up to 3,000 feet

### **Terminal radar control, or**

**TRACON:** Handles aircraft up to 10,000 feet in the vicinity of the arrival or departure airport

### **Air route traffic control center, or ARTCC:**

Handles aircraft at cruising altitude en route to final destination, as national airspace is broken into three-dimensional sectors with one controller responsible for each sector

Ground-based radar also suffers from coverage limitations, meaning that over certain areas or under a certain altitude, air traffic controllers cannot track airplanes. For instance, ground-based radar cannot track planes over much of the Gulf of Mexico since coverage extends only 200 miles off shore.<sup>113</sup> This means that flights to Florida from the West Coast must follow an indirect route to stay within the coverage of the radar system.<sup>114</sup> When severe weather arises, flights must often take circuitous alternative routes that allow them to miss the storm but also stay within the radar coverage area. This adds time, burns more fuel, and can force missed connections, as well as other lost productivity.

Early federal investments in NextGen systems allow airplanes equipped with the GPS-based navigation technology known as automated dependent surveillance-broadcast, or ADS-B, to take a direct route across the Gulf of Mexico. These planes constantly transmit their altitude, air speed, and direction to radio stations installed on offshore oil rigs that in turn transmit the information to air traffic controllers.

Takeoff and landing are other areas where NextGen technology will allow for greater efficiency. Currently, as planes approach for landing, they cannot simply set a glide path and smoothly descend. Instead they must drop and plateau multiple times to slow the process and allow for coordination between air traffic controllers. The graduated approach to landing ensures a safe handoff from ARTCC to TRACON and from TRACON to ATCT. By comparison, airplanes with fully NextGen-compliant avionics and airports with upgraded facilities will be able to direct planes to take off and land smoothly, thus saving significant fuel. The FAA estimates that NextGen upgrades will reduce total delay, in flight and on the ground, by about 35 percent and save about 1.4 billion gallons of aviation fuel by 2018, reducing carbon dioxide emissions by 14 million tons.<sup>115</sup> The environmental, safety, and efficiency benefits of NextGen will only increase with full implementation.

Every two years, the FAA publishes an airport capital-needs assessment known as the National Plan for Integrated Airport Systems, or NPIAS. The FAA develops the NPIAS needs estimate by reviewing all projects listed within the five-year capital plans at the 3,345 public-use airports around the nation. The NPIAS only counts projects that are Airport Improvement Program, or AIP, eligible but that have not yet signed an AIP agreement or secured other funding. The AIP is the program the FAA uses to support the planning and development of public-use airports around the nation. Each year, AIP distributes more than \$3.3 billion in funding.<sup>125</sup>

## NextGen upgrades delivering benefits at Dallas-Fort Worth International Airport

NextGen air traffic control technologies and related air space management practices not only improve overall safety and reliability but also capacity. Dallas-Fort Worth International Airport, or DFW, demonstrates the benefits that NextGen systems and procedures are already beginning to deliver.

DFW is the fourth-busiest airport in the nation, with more than 30.8 million passenger boardings in 2014.<sup>116</sup> Each day, the airport handles an average of 1,300 commercial aircraft takeoffs and landings.<sup>117</sup> American Airlines accounts for approximately 80 percent of the commercial airline traffic at DFW.<sup>118</sup> In the past several years, American Airlines has spent more than \$400 million upgrading a large share of its aircraft fleet to include advanced NextGen-compliant air navigation systems.<sup>119</sup> As a result, many of the planes that American Airlines flies into and out of DFW are able to take advantage of more efficient routes that burn less fuel, as well as reduced spacing between flights. This substantially increases the maximum throughput of the airport, which the FAA defines as “the average number of flights that pass through an airport on a daily basis.”<sup>120</sup> Increasing throughput allows American Airlines and other carriers to move more passengers and cargo on time, which reduces congestion and delay throughout the system.

For airplanes that are not equipped with NextGen-compliant avionics, air traffic controllers are required to space takeoffs at least 3 nautical miles apart.<sup>121</sup> By comparison, controllers are able to reduce spacing to 1 nautical mile for compliant aircraft. The ADS-B system that is a core component of NextGen provides controllers with data on airplane position, altitude, direction, and speed every

second instead of every 5 to 12 seconds with traditional radar.<sup>122</sup> Additionally, unlike traditional radar systems, the accuracy of ADS-B information does not change based on the distance between the plane and control sensors.<sup>123</sup>

The change to tighter spacing for compliant aircraft at DFW highlights the connection between advanced technologies and airspace management procedures. As NextGen facilities owned and operated by the FAA are paired with new avionics systems onboard commercial and private aircraft, controllers are able to fundamentally improve the use of airspace—especially within the most congested metropolitan areas that often have more than one major airport generating traffic.<sup>124</sup>

A critical aspect of the more efficient air navigation procedures in place at DFW is the use of Wide Area Augmentation System, or WAAS. The WAAS infrastructure consists of numerous towers located around the country that have a fixed location. The FAA is able to use these towers to capture traditional GPS signals and correct for any errors in positioning calculations. The WAAS systems is able to relay hyperaccurate locational data to NextGen-compliant aircraft at DFW. Because both air traffic controllers and pilots have such reliable, accurate, and timely location information, they are to reduce aircraft spacing.

As more pieces of NextGen infrastructure come online and as more carriers and private owners update their avionics, efficiencies like those present at DFW will permeate the entire national airspace system. In short, implementing NextGen will result in billions of dollars in savings and increased economic productivity.

Overall, FAA estimates that public-use airports have \$33.5 billion in unfunded needs over the next five years.<sup>126</sup> The NPIAS estimate tends to fluctuate for two reasons. First, as projects secure funding, the FAA removes them from the report. Second, the aviation sector is highly responsive to economic cycles, causing airports to delay projects beyond the five-year report horizon in response to changes in travel demand. Even with these fluctuations, the NPIAS report demonstrates substantial unmet capital needs across the country.

Three broad factors drive overall airport capital project needs: current and future travel demand; the age of existing facilities; and changes in aircraft design and size.<sup>127</sup> Airports, like other sectors, face challenges in keeping their facilities in a state of good repair. Overall, unmet capital project needs are substantially weighted to repair, rehabilitation, and reconstruction. The NPIAS estimates that 79 percent of capital needs are for state of good repair, while 21 percent are for new capacity.<sup>128</sup>

Capital needs are concentrated at the 29 large hub airports around the country. Together, these airports—while a small percentage of overall public-access airports—account for 71 percent of all passenger boardings.<sup>129</sup> Their capital-needs account for \$8 billion, or 25 percent, of the \$33.5 billion identified. At these airports, capacity expansion is the largest development category, outpacing repair, rehabilitation, and reconstruction.

Fully implementing NextGen and expanding airport capacity will require substantial funding and key policy changes. Federal aviation programs, including NextGen and airport capital projects, are supported with a mix of general fund revenues and aviation taxes that capitalize the Airport and Airways Trust Fund, or AATF. The other major source of aviation tax revenue comes from a charge levied by airports on enplaning passengers called the passenger facility charge, or PFC.

Depending on the year, the AATF covers between 80 percent and 93 percent of the overall FAA budget of approximately \$16 billion.<sup>135</sup> Yet, many of the taxes that support federal aviation programs have not kept pace with inflation. For instance, the 4.3 cents per gallon excise tax on commercial jet fuel was set in 1995.<sup>136</sup> Since 1995, the commercial jet fuel tax has lost 50 percent of its purchasing power due to inflation when measured against the Office of Management and Budget GDP deflator. Today, the tax's effective value is only 2.2 cents.<sup>137</sup>

## Philadelphia International Airport's capacity enhancement program

Philadelphia International Airport, or PHL, is the 19th-busiest airport in the nation as measured by passenger boardings, with more than 14.7 million in 2014.<sup>130</sup> The airport suffers from several substantial capacity constraints that hamper its ability to efficiently handle both passenger volumes and aircraft operations—defined as takeoffs or landings. In fact, PHL is frequently in the top five most delayed airports in the nation.<sup>131</sup>

Beginning in 2000, the City of Philadelphia, which owns PHL, began studying a number of different capacity expansion options. According to data collected by the FAA, in 2003—the base year for the capacity study and related environmental review—the average annual delay in aircraft operations was 10 minutes. The FAA considers delay of 10 minutes or more to be severe. The study determined that without additional capacity, the airport would experience operational delays of more than 19 minutes by 2025.<sup>132</sup> Importantly, 20 minutes is the generally accepted threshold that pushes air carriers to halt service expansion plans.

The final capacity enhancement program has eight major elements, including: a 2,000 foot extension of runway 8-26; a 1,500 foot extension

of runway 9R-27L; a new 9,100 foot runway constructed to the south of 9C-27C; construction of a new automated people mover that will link terminal and parking facilities; major terminal reconstruction and expansion; expanded parking and rental car facilities; relocation and upgrades to navigational aids; acquisition of property, demolition of multiple structures, and the reconstruction of certain facilities.<sup>133</sup>

The total estimated cost of the capacity enhancement program is \$5.2 billion in 2006 dollars. The increased capacity and operational efficiency will produce significant delay reductions. By 2025, the average annual delay in aircraft operations is projected to fall from 19.3 minutes under the no build scenario to just 5.2 minutes, which translates to a 73 percent improvement.<sup>134</sup>

Yet, for all the benefits to the region and national airspace from these improvements, the PHL program is anticipated to take 15 years to complete—assuming airport revenues and bond market financing meet plan projections. With additional AIP grant funding and an increase in the passenger facility charge, PHL could deliver this program of projects and associated economic benefits far more quickly.

Similarly, the passenger ticket tax, which Congress set in 1997 at 7.5 percent of the value of the ticket, has also not kept pace.<sup>138</sup> For instance, in constant dollar terms, the average commercial ticket in 1997 was 9 percent more expensive than the same ticket today. As a result, while the passenger ticket tax brings in more revenue in nominal terms than in previous years, it is providing dollars that have less overall purchasing power.

Beyond the issue of lost purchasing power, commercial airlines have also restructured their business model to avoid paying taxes on a large portion of their revenue. When Congress established the first ticket tax in 1941, airlines collected almost all their revenue from tickets sales. However, in recent years, the industry has moved aggressively to charge passengers ancillary fees that are not subject to the ticket tax. Ancillary revenues include baggage charges, a la carte food sales, seat upgrades, and flight changes.<sup>139</sup>



In 1995, airlines collected only \$128 million in ancillary revenues.<sup>140</sup> By 2014, the most recent year for which data is available, airlines collected \$9.6 billion.<sup>141</sup> In constant 2014 dollars, this translates to an increase of more than 5,000 percent.<sup>142</sup> If the 2014 ancillary revenue were subject to the current domestic ticket tax, it would generate more than \$720 million each year.<sup>143</sup>

At the local level, airports are permitted to levy the PFC on every enplaning passenger for the first two flight segments. Currently, participating airports may charge up to \$4.50 per enplaning passenger.<sup>144</sup> Congress last raised the PFC cap in 2000. Since that time, the PFC has lost 38 percent of its purchasing power due to inflation when measured against the Office of Management and Budget GDP deflator. Today, the PFC's effective value is only \$2.81.<sup>145</sup>

In addition to more funding, the FAA needs greater flexibility to prioritize investments at the most congested and capacity-constrained airports around the country. As the NPIAS report demonstrates, major capital project needs are concentrated at large hub commercial airports.

Under current law, 75 percent to 80 percent of AIP funds are distributed based on formulas that account for the number of passenger boardings and air cargo volumes at each airport.<sup>146</sup> Airports that choose to levy a PFC of more than \$3 per boarding passenger forfeit 75 percent of their formula AIP funds.<sup>147</sup> These funds are then redistributed to smaller airports. The FAA distributes the remaining 20 percent to 25 percent of AIP funds on a discretionary basis, with some requirements that they choose certain types of projects such as capacity, safety, security, and noise.<sup>148</sup> The FAA needs to be able to distribute a larger share of AIP funds on a discretionary basis and airport authorities should retain a larger share of the AIP entitlement funds even if they levy a PFC charge more than \$3.

Congress should enact the following tax and policy changes to provide the FAA with the resources and flexibility necessary to support airports and the aviation sector through expanded grant making and the rapid deployment of NextGen technologies. In addition, by raising the cap on PFCs, airports—especially the most congested large hub airports—will have the financial resources needed to undertake major rehabilitation, reconstruction, and expansion projects. At the same time, smaller airports will benefit from increased formula outlays from the AIP program in order to ensure they are able to provide high-quality aviation facilities and services.

## Current tax regime

### Federal aviation taxes

- Ticket and flight segments
  - Domestic passenger tickets: 7.5 percent of ticket price
  - Domestic flight segments: \$4 per segment, adjusted for inflation
  - International arrivals/departures: \$17.50, adjusted for inflation
  - Flights to/from Alaska/Hawaii: \$8.70
  - Frequent flyer benefits: 7.5 percent of benefits value
- Domestic cargo tax
  - 6.25 percent of amount paid to transport cargo by air
- Aviation fuels
  - General aviation gasoline tax: 19.3 cents per gallon
  - General aviation jet fuel tax: 21.8 cents per gallon
  - Fractional ownership surcharge: 14.1 cents per gallon
  - Commercial fuel tax: 4.3 cents per gallon

### Local aviation taxes

- Passenger Facility Charge of up to \$4.50 on each enplaning passenger—limited to the first two flight segments

## Policy reforms

- Require airport authorities that raise their Passenger Facility Charge above \$4.50 to spend not less than 15 percent of revenues on environmental mitigation and sustainability projects
- Reduce the share of Airport Improvement Program entitlement funds that airports must return to the Airport and Airways Trust Fund in exchange for levying a Passenger Facility Charge above \$3 from 75 percent to 65 percent
- Levy the domestic passenger ticket tax against all ancillary commercial airlines revenues, including baggage fees, cancellation fees, food service, and other passenger charges
- Set aside not less than half of increased Airport Improvement Program outlays as discretionary funds in support of letter of intent and other significant airport development projects

## Tax reforms and investments

**Offset increased Airport and Airways Trust Fund outlays by raising approximately \$2.5 billion in additional annual revenue by increasing aviation taxes, including:**

- Ticket and flight segments
  - Domestic flight segment tax: from \$4 to \$4.76 per segment, adjusted for inflation
  - Domestic ticket tax: from 7.5 percent to 9 percent
  - Frequent flyer benefits tax: from 7.5 percent to 9 percent
  - International arrival/departure tax: from \$17.50 to \$20.82, adjusted for inflation
- Domestic cargo tax
  - from 6.25 percent to 7.44 percent
- Aviation Fuel
  - Commercial fuel tax: from 4.3 cents to 5.1 cents a gallon
  - General aviation gasoline tax: from 19.3 to 23 cents a gallon
  - General aviation jet fuel tax: from 21.8 cents to 26 cents a gallon
  - Fractional ownership surcharge: from 14.1 cents to 17 cents a gallon

**Increase annual outlays for NextGen implementation from the current level of approximately \$1 billion to \$2.36 billion annually**

**Increase annual outlays from the Airport Improvement Program from the current level of approximately \$3.3 billion to \$4.5 billion annually**

**Raise the maximum Passenger Facility Charge airports are permitted to levy on enplaning passengers from \$4.50 to \$8, limited to first two flight segments**

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## Ports, inland waterways, and flood control

The civil works program of the U.S. Army Corps of Engineers, or USACE—also known as the Army Corps—traces its origins all the way back to the 1824 Rivers and Harbor Act, which authorized the Army Corps to clear obstacles and deepen portions of the Ohio and Mississippi rivers, as well as certain harbors.<sup>149</sup>

From this modest beginning, inland waterways and ports have become essential elements of our national freight transportation system. Today, the U.S. inland waterway system consists of 12,000 miles of river channels, including 236 lock chambers at 171 lock sites.<sup>150</sup> In addition, the United States has more than 300 commercial sea and river ports with more than 3,700 cargo and passenger terminals.<sup>151</sup> In 2013, the most recent year for which data is available, U.S. ports and waterways carried 808 million tons of cargo with a value of \$284 billion.<sup>152</sup>

## Flood control

Beyond waterborne cargo, the USACE provides critical protection against the threat of flooding. Across the nation, there are more than 100,000 miles of levees, which the Army Corps defines as “an earthen embankment or concrete flood wall designed ... to contain, control, or divert the flow of water so as to provide reasonable assurance of excluding temporary flooding from the leveed area.”<sup>153</sup> Preventing flooding in urban and rural areas saves countless lives and the economy billions of dollars each year. The Army Corps estimates that, in 2011 alone, levee systems prevented \$120 billion in economic losses.<sup>154</sup> Recent hurricanes and major storms demonstrate the potential for flooding to cause catastrophic economic losses, as well as the loss of life. Hurricane Katrina produced an estimated \$200 billion in economic losses.<sup>155</sup> More recently, Hurricane Sandy caused more than \$50 billion in damages and lost productivity in the New York metropolitan region.<sup>156</sup>

Unfortunately, the national system of flood control faces two major challenges. First, policymakers lack adequate information about the state of levees around the country. The lack of comprehensive information on the location, design, and state of repair of these facilities hampers Congress’ ability to design sensible flood control policy. According to a 2009 report by the National Committee on Levee Safety, “The current levee safety reality for the United States is stark—uncertainty in location, performance and condition of levees and a lack of oversight, technical standards, and effective communication of risks.”<sup>157</sup> To repair and improve levees around the country is anticipated to cost government at all levels and private levee owners at least \$100 billion, according to the National Committee on Levee Safety.<sup>158</sup>

The vast majority of levees around the country are state or locally owned and controlled. In fact, the Army Corps monitors only 14,500 miles of levees, or approximately 10 percent of the estimated national total.<sup>159</sup> Of those levees monitored by the Army Corps, the results are sobering. The Army Corps found that only 8 percent are in acceptable condition, 70 percent are minimally acceptable, and 22 percent of levees are unacceptable.<sup>160</sup>

Second, states often lack formal levee safety programs. Moreover, even those states that have a handle on the extent of levee facilities within their borders have inadequate fiscal resources to ensure proper maintenance and rehabilitation. Unlike other infrastructure sectors, such as drinking water, wastewater and highways, the federal government does not provide dedicated annual funding to state and local governments for ongoing levee identification, monitoring, and repair.<sup>161</sup>

Instead, states wishing to advance a major rehabilitation or improvement project have just two options: finance the entire project with state resources or seek partial federal funding. Yet, federal funding is not guaranteed and states must work through a lengthy legislative authorization process. First, the state or local project sponsor must secure an authorization for a project study as part of the Army Corps reauthorization legislation known as the Water Resources Development Act, or WRDA, which happens roughly every two years.<sup>162</sup> Next, the study must receive appropriations funding. Once the study has been completed and the Army Corps has determined that the project meets the standard of having a clear federal interest—that the project will contribute to national economic development by increasing the output of goods and services—it must then receive a second congressional authorization and funding before beginning construction.<sup>163</sup>

This lengthy and uncertain route often limits the pace and extent of work, as states must repeat this process for each project. By comparison, a program that offered states dedicated formula funding each year to monitor, repair, and improve levee facilities would not only provide additional financial resources to states but also allow for more programmatic approaches to levee system improvement. A levee safety formula program would not absolve states of the responsibility to conform to the requirements laid out in 33 USC 408—often simply referred to as section 408—that any levee modifications not adversely harm upstream or downstream communities and habitats.

In 2014, Congress authorized the creation of two levee safety programs as part of the WRDA. The first is called the Levee Safety Initiative. The ultimate goal of the initiative is for states to collect comprehensive data on all levee facilities, including their location, structural characteristics, and hazard potential. The second is called the Levee Rehabilitation Assistance Program. This program is designed to provide project-level funding to states in order to help cover a portion of the cost of rehabilitation and repair of specific state, local, or tribally controlled levee facilities. Congress authorized annual funding for the two programs at \$25 million and \$30 million, respectively. To date, Congress has not provided any appropriations funding.<sup>172</sup>

## West Sacramento project

The Sacramento Valley is one of the most flood-prone areas in the United States. The American and Sacramento Rivers cut through parts of greater Sacramento and converge near the city's downtown. Beginning near Redding, California, the Sacramento River flows southward into the Sacramento-San Joaquin River Delta and continues to the Pacific Ocean via the San Pablo and San Francisco Bays. The water system is essential to California's water supply and the region's agriculture sector.

Most of the region sits just 15 feet to 30 feet above sea level. And a few sections of Sacramento lie below the river level, making recovery from a flood especially challenging. Typically, breaches are the result of heavy rains that eventually overwhelm a levee system. The Sacramento region and other areas in California also face the possibility that an earthquake could cause catastrophic failure—even when heavy rains are not a factor.<sup>164</sup>

For the region's 1.4 million residents, levees are an essential element of flood protection, reducing the risk of major loss of life and property.<sup>165</sup> The risks from flooding are not theoretical. Major floods in 1986 and 1997 prompted an in-depth review of regional levees, including several congressionally authorized Army Corps studies to identify system risks.

The City of West Sacramento, located to southwest of the City of Sacramento, was identified as having levees in need of rehabilitation and improvement. West Sacramento is particularly vulnerable, as it sits on the west side of the Sacramento River and to the east of the Sacramento Deep Water Channel. In effect, the city is nearly surrounded by water, making the community of about 50,000 residents with more than \$4 billion of property particularly vulnerable to flooding.<sup>166</sup>

Working with the Army Corps, the West Sacramento Area Flood Control Agency identified a series of projects to improve overall levee safety. These projects received their first congressional authorization in 1992 and a subsequent authorization in 1999.<sup>167</sup> In December of 2015, the Army Corps completed a comprehensive review of the West Sacramento area and determined that additional project elements would be needed to provide sufficient flood control protection.

Taken together, the expanded project list developed by the Army Corps has an estimated total cost of \$1.19 billion.<sup>168</sup> The new elements include adding cutoff walls to address ongoing seepage, construction of setback levees, and additional elements to combat river bank erosion, among others.<sup>169</sup> When all the work is completed it will improve the flood protection of the area to a 200-year standard. This standard means that there is a 1-in-200 chance of a significant flooding event each year. These projects are estimated to have a benefit-cost ratio above three, meaning every \$1 spent improving flood protection will result in \$3 of economic benefit over the next 50 years.<sup>170</sup>

Under current law, the federal government is responsible for 65 percent of project costs. In the case of West Sacramento, the state of California has agreed to cover 28 percent and local residents and businesses the remaining 7 percent. However, the timeline for completion of this project is far from certain.

In many respects, the projects in West Sacramento are emblematic of the shortcomings of our current approach to flood control. First, the amount of funding available from the federal government is simply inadequate to meet flood control needs of California or the rest of the country. Second, when Congress provides funding on an intermittent and erratic basis, it creates significant construction planning challenges for Army Corps. With no knowledge of how much money Congress will provide from one year to the next, the Army Corps struggles to let contracts and successfully construct functionally useful project segments.

Congress first authorized a more modest set of flood control projects for West Sacramento in 1992 and then followed this up with a subsequent authorization in 1999. Since 1996, Congress has provided a total just \$34.5 million.<sup>171</sup> Yet, in 7 of the past 10 years, Congress provided no funding at all. In other years, funding jumped around from a few hundred thousand to several million dollars. The average annual federal funding for West Sacramento projects is just \$1.7 million. At this rate, it would take 455 years for Congress to appropriate the federal share of the expanded West Sacramento flood control projects identified by the Corps in 2015. This is no way to study, design, and fund major flood control projects that are critical to the safety and economic prosperity of the region and the country.

While these two programs recognize that states need assistance with levee safety, they are inadequate to the task. Congress should make participating in the Levee Safety Initiative program mandatory. Furthermore, Congress should set a deadline by which states must submit information to the National Levee Database on all levees within their boundaries. In addition, Congress should establish a formula program to provide states with \$350 million in dedicated annual funding in order to cover a portion of the cost of documenting every levee and making major repairs and improvements. Importantly, states would still be able to work through the legislative authorization and appropriations process for megaprojects beyond the scope of annual funding.<sup>173</sup>

## Water transport

The U.S. system of water transportation faces three major challenges: aging facilities, insufficient capacity, and inadequate funding. Many critical pieces of infrastructure have reached the end of their useful life and need substantial repair or replacement. At the same time, even facilities that have many years of useful life left face increasing freight volumes that strain capacity, as well as changing industry economics that have pushed container ships to ever larger sizes. To maintain the nation's federal navigable coastal and inland waterways, nearly 230 million cubic yards of material are dredged annually.<sup>174</sup>

The inland waterway system carried 600 million tons of cargo in 2014.<sup>175</sup> This represents approximately 5 percent of total commercial tonnage in the United States on an annual basis.<sup>176</sup> Research from the National Waterways Foundation found the inland waterways system supports close to 550,000 domestic jobs, resulting in \$29 billion income and \$125 billion in economic output annually.<sup>177</sup> The Army Corps' annual expenditures of \$1.13 billion on inland waterways in FY 2015 reduced freight costs by \$12.5 billion, a return of \$11 for every \$1 in expenditures.<sup>178</sup>

A review of the inland waterway systems reveals that many locks and dams were built in first half of the 20th century with a 50-year lifespan.<sup>179</sup> The current average age of the nation's locks and dam complexes is above 50 years, even after factoring in major rehabilitations.<sup>180</sup> Older locks have more frequent maintenance issues, which costs users both time and money. Throughout the system, there were nearly 136,000 combined hours of both scheduled and unscheduled downtime where locks were unavailable for use, creating commercial freight bottlenecks and hurting overall economic activity.<sup>181</sup>



## Construction: Lower Monongahela River

The Monongahela River runs approximately 128 miles north from its origins in West Virginia, where it joins with the Allegheny River in Pittsburgh to form the Ohio River. The Monongahela River is an essential part of the U.S. inland waterways system, carrying large volumes of waterborne freight each year, principally coal, petroleum products, crude petroleum, and aggregates.<sup>182</sup> An average of 12 million tons of cargo passes through the locks of the Lower Monongahela each year.<sup>183</sup>

The river is made navigable for barge traffic by six locks and dams that allow commercial vessels to pass through sections of the river that have significant elevation changes. Several of these facilities are more than a century old.

Locks and Dams 2, 3, and 4 of the Monongahela River need replacement or removal and dredging. Specifically, the projects on the Lower Monongahela involve the construction of a new dam—the Brad-dock—and new locks—the Charleroi—removal of Locks and Dam 3, and significant dredging, according to the Army Corps.<sup>184</sup>

The Army Corps estimates that completion of these projects will result in \$220 million in annual economic benefits. Nearly \$40 million will come from reduced transportation costs and reduced damage and congestion to other modes, principally highways. Nearly all of the remaining \$176 million in savings will come from avoided maintenance on structurally deficient facilities following replacement.<sup>185</sup>

The total estimated cost of these projects is \$1.22 billion. Of this total, Congress has not yet appropriated \$481 million.<sup>186</sup> The Lower Monongahela received \$52 million in equal amounts from the general fund and the Inland Waterways Trust Fund for FY 2016, but based on the executive budget, it is not set to receive any funding in FY 2017.<sup>187</sup>

Funding gaps make planning and constructing these enormous projects difficult. Without annual funding consistency, projects become inefficient and take longer to complete. Initial authorization for Lower Monongahela occurred in 1992, and recent estimations suggest the project could be completed by 2023 if it receives full annual funding.<sup>188</sup> Without full funding, determining a project completion date would be speculative.

### Operations and maintenance: Melvin Price Locks and Dam

Major navigation facilities require significant operations and maintenance. Much of the budget for operations and maintenance funds activities such as inspections, minor equipment replacements, and routine dredging. It also includes specific major projects. Operations and maintenance of inland waterways facilities are funded entirely by the federal government.

Located less than 20 miles north of St. Louis on the Upper Mississippi River, the Melvin Price Locks and Dam opened in 1989.<sup>189</sup> Each year, more than 64 million tons of freight with an estimated value of \$10 billion moves through the locks.

In 2009, the Army Corps discovered underseepage in an adjacent levee. Underseepage is a structural issue with the sand and gravel beneath a levee. Water pressure from the Mississippi River pushes sand and gravel to the other side of the levee. If enough sand and gravel is displaced, it could create a direct pathway for the water, undermining the structural integrity of the levee. Should underseepage continue unabated, it could interrupt commerce and recreation on the Upper Mississippi, hampering economic activity.

The Army Corp estimates rehabilitating this facility to combat the underseepage will cost \$34 million—but only around \$12.4 million had been allocated through fiscal year 2015.

The U.S. seaport system includes more than 1,000 ports and harbors located on the coasts and in the Great Lakes.<sup>190</sup> Congress mandates that the Army Corps of Engineers keep specific harbor channels in coastal and Great Lakes ports navigable through maintenance of jetties and breakwaters—barriers that jut out from land that reduce the intensity of waves from open waters—and dredging activities. Commercial cargo activity is heavily concentrated in a few major port complexes. In fact, approximately 90 percent of waterborne cargo passes through just 59 ports.<sup>191</sup>

Port authorities, working with state and local agencies, are responsible for the development of all landside facilities. The Army Corps is mandated to cover 100 percent of the cost of maintaining high-volume port channels to a depth of 45 feet. If a port authority wishes to deepen its channel beyond 45 feet, they must split any additional costs with the Army Corps.<sup>192</sup>

In 2008, the most recent year for which complete data is available, the Army Corps found that commercial shipping channels at the 59 busiest ports functioned at their full width and depth just 30 percent of the time.<sup>193</sup> The lack of adequately maintained channels often limits the ability of ports to engage in commercial activity, as vessels must wait for tides to change in order to make a port call.

At the same time, many ports—especially along the Gulf and Atlantic coasts—are actively working to deepen their channels to accommodate the substantially larger ships that will begin arriving in significant numbers now that the expanded Panama Canal has officially opened to commercial traffic.<sup>194</sup> The Panama Canal is now able to accommodate vessels with up to 13,000 to 14,000 20-foot equivalent units, or TEUs, which is a standard measurement for shipping containers.<sup>195</sup>

While channel dredging projects generate a great deal of attention, navigation is only one of the challenges facing large commercial ports. These complexes also have significant landside infrastructure, connectivity, and environmental remediation needs. According to the EPA, more than 40 commercial ports around the country are located in communities that are in nonattainment or maintenance status for ozone and particulate matter smaller than 2.5 microns.<sup>204</sup> Ports generate significant pollution from both the ships that continue to run their engines in order to provide power to ship systems, as well as from trucks used for drayage operations—high-frequency, short-haul truck trips that move shipping containers from port complexes to local freight rail yards or storage facilities. These operations increase harmful air pollution in the communities that surround port complexes.<sup>205</sup>

## Port of Charleston

The South Carolina Ports Authority owns and operates the Port of Charleston, with locations in the Charleston Harbor and along the Cooper and Wando rivers. Charleston's harbor channel is currently 45 feet deep. This is important because channel depth is one of the controlling factors limiting the size of vessels that may call on a port. At its current depth, the Charleston Harbor can accommodate vessels with a 50-foot draft but only during high tide. As a result, the harbor is only able to handle 11 post-Panamax ships—vessels that are larger than the previous maximum size able to travel through the Panama Canal—per week.<sup>196</sup>

In 2014, the Port of Charleston handled cargo with a total value of \$71 billion, making it the seventh-highest port in the nation by value.<sup>197</sup> Also, in 2014, the most recent year for which data is available, the port handled 19.8 million tons of cargo, making it the 32nd-largest port by volume in the U.S.<sup>198</sup>

The automobile industry is a top user of the Port of Charleston.<sup>199</sup> The expensive nature of some auto parts contributes to the port's higher ranking by value than by volume. The automaker Volvo has announced plans to build an assembly plant north of Charleston by 2018, which will further boost port activity and the auto industry's impact.<sup>200</sup>

A new dredging project, which is slated to begin in at the end of 2017, will increase the harbor channel depth to 52 feet, making Charleston the deepest East Coast port.<sup>201</sup> The port anticipates completing the first phase of dredging to the Wando terminal by 2020.<sup>202</sup> The deeper channel will allow the harbor to handle more post-Panamax vessels, including during low tide. The estimated total project cost is \$521 million. To date, South Carolina has set aside \$300 million in funding. The remaining \$180 million is anticipated to come from the federal government through the Army Corps.<sup>203</sup> However, the project still must receive an authorization for construction within the next WRDA bill, as well as separate annual appropriations funding. The uncertainty over both the project authorization and funding could push back the start of the dredging.

Charleston is just one of the ports on the East Coast that needs substantial dredging in order to accommodate post-Panamax vessels.

As post-Panamax vessels begin calling on ports along the Gulf and Atlantic coasts in significant numbers, they will place pressure on port authorities to invest in taller cranes, longer docks, larger container storage operations, and better connectivity with the surrounding highway and rail networks, among other improvements. Many port complexes lack the fiscal capacity to make needed improvements. Furthermore, the highly competitive and mobile nature of shipping means that environmental remediation projects are often seen as additional costs that hurt port growth. For these reasons, Congress should establish a nationally competitive port development program to provide \$200 million each year for expansion and environmental remediation projects. At least half of these funds should address environmental effects from port complexes—though remediation work should not be limited to the boundaries of the port. This could take the form of on-dock electrification to allow ships to plug into the electrical grid rather than running their engines to generate electricity or purchasing cleaner trucks for drayage operations, among many other possible options to reduce port environmental impacts.

## Funding

Funding for flood control and navigation projects comes from a combination of general appropriations and two trust funds: the Harbor Maintenance Trust Fund, or HMTF, and the Inland Waterways Trust Fund, or IWTF.

Each year, the Army Corps spends a little more than \$2 billion for nondisaster repair flood control projects.<sup>206</sup> This funding comes through the annual energy and water appropriations bill. In order to address the backlog of maintenance, major repair, and improvement projects, Congress should establish a new formula program supported by general fund appropriations to provide states with a total of \$350 million each year. This funding would be in addition to the money the Army Corps currently spends on flood control. The distribution of levee formula dollars would be based on a combination of factors, including the total miles of levees, populations living in leveed areas, and the potential for economic loss from a major flooding event.

The IWTF was first authorized by the Inland Waterways Revenue Act of 1978.<sup>207</sup> Capitalization of the trust fund comes from a tax of 29 cents a gallon on barge fuel.<sup>208</sup> All funds appropriated out of the trust fund are used to cover the construction, replacement, rehabilitation, and expansion of federal waterways projects, including locks and dams along major navigable waterways, such as the Mississippi River and its tributaries.<sup>209</sup>

The HMTF was established by Congress as part of the WRDA.<sup>210</sup> Capitalization of the trust fund comes from a tax of 0.125 percent on the value of imported and domestic cargo, as well as cruise ship tickets.<sup>211</sup> This translates to a tax of \$1.25 per \$1,000 of assessed value of cargo and tickets. Trust fund proceeds are used to cover a portion of the cost of harbor channel dredging projects. The tax was last increased in 1990.<sup>212</sup>

Unlike other federal trust funds, such as the Highway Trust Fund, expenditures from both the Harbor Maintenance and Inland Waterways trust funds count against annual discretionary budget caps and 302(b) appropriations subcommittee allocations.<sup>213</sup> This means that both trust funds are effectively on budget. For the purposes of determining the annual budget deficit, Congress treats barge fuel and cargo tax receipts as general fund revenues.<sup>214</sup> Any revenue collected by these trust funds that is not spent on navigation projects in a given year is used to offset spending in other areas of the budget. This makes harbor maintenance and inland waterways trust funds in name only.

Under this budgetary treatment, spending down the unobligated balances would require either an offset from some other discretionary account or an increase in the annual budget deficit. This budgetary treatment is one of the reasons that Congress has not spent as much as it should on navigation projects. In order to address this shortcoming, Congress should raise enough revenue through offsets to cover the Congressional Budget Office score over the 10-year scoring window.

In addition, Congress should increase the industry user fees to push up the annual capitalization of both trust funds. Specifically, Congress should increase the barge fuel tax by 10.2 cents a gallon to 39.2 cents a gallon. In addition, Congress should increase the ad valorem tax—one that is based on the assessed value of goods or property—on cargo to 0.169 percent, or the equivalent of \$1.68 per \$1,000 in value. Taken together, these two steps would substantially boost annual outlays on navigation projects. Moving the two trust funds off budget would also ensure that all industry user fees collected by the federal government are spent on navigation projects.

Chronic underinvestment in water infrastructure has resulted in a system of navigation that is often hampered by unscheduled outages at high-traffic locks and harbors that are forced to work around inadequately maintained channels. Furthermore, many ports are unprepared to handle the demand from the larger vessels that will arrive now that the Panama Canal expansion is complete. In each case, U.S. economic activity is substantially restricted, leading to lost time and higher transport costs. The situation is equally as troubling for flood control

facilities. The lack of comprehensive data limits policy options, and the Army Corps simply lacks the resources to support states as they attempt to inventory their levee facilities and make needed improvements.

These challenges call for a significant increase in federal investment in navigation and flood control. The following policy and funding changes would boost spending and ensure that federal funds advance projects that provide a high return on investment.

#### *Current tax regime*

- The Inland Waterways Trust Fund is capitalized by a tax of 29 cents per gallon on barge fuel.
- The Harbor Maintenance Trust Fund is capitalized by a tax of \$1.25 per \$1,000 of assessed cargo or cruise ticket value.
- Flood control projects are funded through annual appropriations legislation using general fund revenues.

#### *Policy reforms*

- Navigation
  - Move the Inland Waterways and Harbor Maintenance trust funds off budget so that they are treated as mandatory budget authority
  - Establish a port development grant program within the U.S. Maritime Administration to provide \$200 million annual for landside projects in order to ensure that ports are prepared to handle post-Panamax vessels, as well as projects to improve port sustainability
- Flood control
  - Require state participation with the Levee Safety Initiative and require that states identify and assess all levees within their borders by 2026
  - Replace the Levee Safety Initiative and Levee Rehabilitation Assistance Program with an \$350 formula program to support levee assessment, rehabilitation, and improvement

#### *Taxes and investments*

- Offset the approximately \$16.2 billion cost of moving the Inland Waterways and Harbor Maintenance trust funds off budget through tax reform
- Raise the excise tax on barge fuel from 29 cents a gallon to 39.2 cents a gallon total
- Raise the ad valorem cargo tax from \$1.25 per \$1,000 of cargo value to \$1.69 per \$1,000 of cargo value
- Increase annual outlays from the Harbor Maintenance Trust Fund from \$1.14 billion to \$2.25 billion\*

Increase annual outlays from the Inland Waterways Trust Fund from \$69 million to \$132 million

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## Drinking water and wastewater

The average person uses 80 gallons to 100 gallons of water each day when they cook, flush the toilet, take a shower, or wash clothes.<sup>215</sup> At first, this may not seem like much, but the numbers scale quickly when looking at the entire nation. According to research by the U.S. Geological Survey, each day, residents use more than 27 billion gallons of water.<sup>216</sup>

Clean drinking water is something most people take for granted—turn on the tap and out it comes. Yet, collecting, treating, and distributing safe drinking water requires massive amounts of infrastructure and ongoing oversight. Water utilities face a daunting mixture of challenges in the coming years, including aging infrastructure and compliance with water quality mandates. The Environmental Protection Agency, or EPA, estimates that over the next 20 years, public drinking water utilities face \$384 billion in capital needs.<sup>217</sup> This estimate includes needs such as the rehabilitation and replacement of pipes, treatment plants, and storage tanks. The EPA estimates that approximately 10 percent of this total is due to compliance with Safe Drinking Water Act mandates. Most of the cost associated with compliance is attributed to the upgrade, replacement, or installation of treatment technologies. The remaining 90 percent is due to the need to replace facilities that have reached the end of their useful life.<sup>218</sup>

Drinking water infrastructure can be grouped into four broad categories: acquisition and source, treatment, distribution, and storage. The largest single need is distribution. The EPA estimates that water utilities will need to spend at least \$247 billion over the next 20 years. Replacing water mains is time-consuming, costly, and often disruptive to local commerce. The federal government estimates that, around the country, there are 1 million miles of water distribution piping.<sup>219</sup> Water utilities are able to replace only about 0.5 percent of this total each year.<sup>220</sup> When distribution pipes suffer a major break, they can cause localized flooding. And while water main breaks tend to receive a lot of attention, a most subtle crack or failure allows valuable treated water to leak out and contaminants to enter.

The primary source of funding for ongoing operations and capital projects comes from the fees that water users pay each month. States and the federal government support capital repair and expansion projects principally with low-cost, flexible



financing. In 1996, Congress established the Drinking Water State Revolving Fund, or DWSRF, program.<sup>221</sup> In response, each state set up a revolving loan fund to make loans to water utilities for infrastructure projects. Each year, Congress provides a capitalization grant to ensure that state revolving funds can always make new loans. As water authorities repay their loans over time, the revolving fund is able to lend these dollars again for new projects. In FY 2015, Congress appropriated \$907 million in capitalization grants.<sup>222</sup>

State revolving funds, or SRFs, tend to focus their lending on small systems or those that serve economically disadvantaged communities. In 2015, states directed 67 percent of all financing to projects in communities with fewer than 100,000 people.<sup>223</sup> This approach to prioritization is partially a reflection of the fact that larger systems have an easier time accessing financing through the municipal bond market. It is also a reflection of the fact the financing needs of larger systems could easily overwhelm the available credit of the SRF. Given the scale of water authority infrastructure needs, federal capitalization grants are simply insufficient.

Treatment of drinking water focusses on two sources of public health threat: microbial pathogens and chemical compounds, such as lead and copper. These contaminants can occur naturally or result from human activity. Lead contamination in drinking water continues to be a substantial public health threat in communities across the country. Research demonstrates that there is no safe level of lead threshold in the blood. Children are especially at risk, with lead exposure leading to significant neurological problems. In adults, high lead levels can lead to renal failure, gout, and hypertension, among other health issues.<sup>224</sup>

Lead service line replacement is an eligible activity for financing under the DWSRF program. However, in addition to focusing on smaller communities, states have tended to direct limited financing to projects that address immediate public health threats.<sup>225</sup> At first this may appear a contradiction: After all, lead exposure can become a severe health crisis. The contamination in Flint, Michigan, shows how quickly lead can develop into a problem with profound and long-lasting health effects. However, in many other communities lead lines represent a long-term challenge with comparatively lower levels of risk. As a result, a state may choose to focus resources on preventing outbreaks of coliform bacteria or cyanotoxins—a type of freshwater bacterial bloom that can produce a powerful toxin.<sup>226</sup> As a result, local water utilities are often unable to make progress on the massive backlog of replacement projects for both main and lead service lines.

The threat of lead from drinking water is also not a uniform problem. Some states and communities have a much higher prevalence of lead lines and a higher risk of lead levels crossing federal limits, which can eventually result in a health hazard. For this reason, Congress should establish within the EPA a nationally competitive lead line replacement program. This program would provide grants to water authorities, with priority for communities facing the greatest risk and those that are economically disadvantaged. Moreover, the EPA should have the flexibility to require that up to 25 percent of a project grant be set aside to assist homeowners with low- or zero-interest loans to finance the cost of replacing the portion of lead service lines that belong to the homeowner.

Survey research by the American Water Works Association, or AWWA, reveals that there are approximately 6.1 million lead service lines in need of replacement.<sup>227</sup> These service lines connect to an estimated 11,200 community water systems. AWWA research estimates that 15 million to 22 million people live in homes served by partial or full lead service lines. This represents about 7 percent of the total population served by community water systems.<sup>228</sup> While the cost of replacing a lead service line varies depending on the size of the lot, where the line enters the house, and the price structure of a given community, research by AWWA shows that the typical cost is around \$5,000. AWWA estimates the total cost to replace all lead service lines at more than \$30 billion.<sup>229</sup>

Typically, the cost for replacing a line is shared by the water utility and the homeowner. In most areas, the utility owns a portion of the service line where it branches off of the main line. The homeowner is responsible for the remaining section into their home.<sup>230</sup> Survey research shows that the homeowner is responsible for 55 to 65 percent of the estimated total cost. Using this proportion, CAP estimates that the total cost to homeowners for lead line replacement at \$16 billion to \$19 billion.<sup>231</sup>

This cost is simply more than many families and water utilities can afford. Given the clear public health threat posed by lead, Congress should authorize the creation of a nationally competitive lead service line replacement grant program to provide \$250 million annually. Under this program, community water systems and other public end users that serve vulnerable populations such as schools, prisons, and hospitals would be eligible to apply for grant funds from EPA. Furthermore, EPA would have the flexibility to require that grant recipients, such as community water systems, use not less than 35 percent of funds to provide low-income homeowners with low- or zero-interest loans. This would allow homeowners to affordably amortize the cost of their replacement through the water authority with flexible repayment terms.

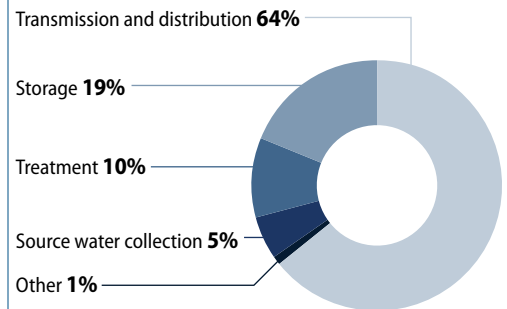
## Drinking water regulatory enforcement

Congress passed the Safe Drinking Water Act, or SDWA, in 1974. This law established a regulatory structure whereby states assume the primary responsibility for ensuring that public water systems deliver clean and safe drinking water.<sup>232</sup> In order to assume primacy of oversight and enforcement, a state must adopt regulations and administrative penalties that are at least as stringent as national requirements. In this way, the Safe Drinking Water Act sets a regulatory floor.

The SDWA established a regulatory framework with specific roles for the federal government, states, and public water systems. Through the EPA, the federal government is responsible for setting national drinking water standards, conducting studies to identify new chemicals and pathogens that pose a threat to public health, and overseeing state implementation, among other activities. The central office in Washington, D.C., leads regulatory development and scientific research efforts. The EPA regional offices concentrate on oversight of state implementation of the SDWA. State governments are responsible for administering and enforcing federal regulations through monitoring and reporting, as well as specific enforcement actions to correct SDWA violations. Finally, community water systems are responsible for the day-to-day management of collecting, treating, and distributing water that meets federal standards, as well as reporting data to the state regarding water quality. With this data, states are able to determine if a water system has violated federal standards and subsequently hold the system accountable for taking specific actions to return to compliance.<sup>233</sup>

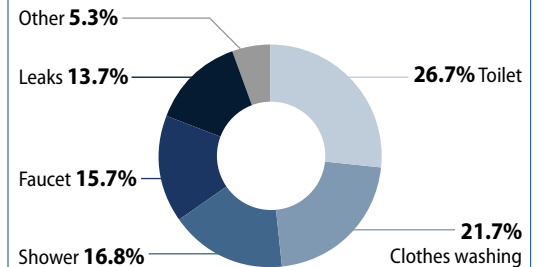
In order for a state to take over primary responsibility for the SDWA, it must have adopted and be implementing “adequate procedures for the enforcement” of safe drinking water standards.<sup>234</sup> When states fail to implement the SDWA, the federal government has the authority take enforcement actions. If the EPA determines that a state has systematically failed, it may revoke state primacy. Short of this extreme step, federal regulations often focus more on public hearings and technical assistance as opposed to punitive actions. For instance, 40 CFR Part 142.33 within the Code of Federal Regulations details the process for petitioning the EPA to hold a hearing to gather more information about SDWA violations

**FIGURE 3**  
**Drinking water infrastructure needs, by category**



Source: Environmental Protection Agency, *Drinking Water Infrastructure Needs Survey and Assessment* (2013), available at <https://www.epa.gov/sites/production/files/2015-07/documents/epa816r13006.pdf>.

**FIGURE 4**  
**Residential water use, by activity**



Source: Environmental Protection Agency, "Water Use Today," available at [https://www3.epa.gov/watersense/our\\_water/water\\_use\\_today.html](https://www3.epa.gov/watersense/our_water/water_use_today.html) (last accessed April 2016).

committed by a particular community water system.<sup>235</sup> These hearings are intended to identify the “ways in which the system can within the earliest feasible time be brought into compliance.”<sup>236</sup>

The recent public health crisis in Flint, Michigan, demonstrates that this approach to state oversight is insufficient to address immediate threats to the public in three ways.

First, Congress should strengthen oversight with a dual approach: When the EPA receives information about a violation that presents an immediate and substantial risk to public health, it should have an affirmative obligation to report this information to residents if the community water system or state fails to act within 15 days. In addition, Congress should amend section 1341 of the SDWA to require the EPA administrator to take all necessary actions to protect public health when there is credible information regarding an imminent and substantial threat. Under current law, the EPA administrator has the discretion but not the obligation to act. The Flint crisis has demonstrated that the EPA is too passive in the exercise of its regulatory authority and must be compelled to act. To put this in perspective, the SDWA allows the EPA administrator to exercise emergency powers when there is merely a credible threat to public health, let alone active contamination producing serious health problems. Section 1341 reads as follows:

*[T]he Administrator, upon receipt of information that a contaminant which is present in or is likely to enter a public water system or an underground source of drinking water... which may present an imminent and substantial endangerment to the health of persons, and that appropriate State and local authorities have not acted to protect the health of such persons, may take such actions as he may deem necessary in order to protect the health of such persons. (Emphasis added)*

Second, Congress should replace the phrase “may take such actions” with “shall take such actions” as are necessary to protect public health. Furthermore, this section should state clearly that all costs associated with any actions and orders of the administrator undertaken as part of this emergency authority shall be the financial responsibility of the state.

Third, Congress should double the maximum civil penalties that the EPA administrator may levy against state oversight agencies and water utilities for SDWA violations. In addition, these penalties should be trebled if there is a finding that public officials acted with malice or attempted to obstruct justice. Taken together, these

steps would address the gaps in existing SDWA oversight and enforcement without upending a regulatory framework that has demonstrated its overall efficacy.

Beyond SDWA oversight, the federal government provides funding assistance to states to help them carry out their oversight and enforcement of the SDWA through the Public Water System Supervision, or PWSS, program.<sup>237</sup> Essentially, these funds help states to implement national primary drinking water regulations and build technical capacity within the state administration. Federal regulations specify requirements for everything from monitoring and reporting violations to sanitary surveys—an on-site review of a public water system’s water source, facilities, equipment, and operations—and enforcement actions. States often use PWSS funds for the following purposes, among others:<sup>238</sup>

- Provide technical assistance to public water systems
- Manage public water system data and reporting to the Safe Drinking Water Information System
- Respond to violations
- Certify laboratories
- Conduct laboratory analyses
- Conduct sanitary surveys
- Train and certify public water system operators
- Provide training and technical assistance to small-system staff and management to build water system technical, managerial, and financial capacity

In FY 2017, Congress appropriated only \$101 million for the PWSS program. This funding is not enough to ensure states have the resources they need to ensure residents have safe drinking water. In particular, small water systems face significant technical, managerial, and financial challenges that require direct support from the state. The vast majority of public water systems with repeat violations of primary drinking water regulations—including the total coliform bacteria rule and disinfectant byproduct rule—are small systems.<sup>239</sup>

## Clean water

The term clean water is a polite euphemism for all the pollution that results from residential and industrial water use, as well as the pollution that rainwater picks up as it flows over agricultural and urban land, accumulating sediment, microbial pathogens, and chemicals. If untreated, these pollutants become part of our surface waters, threatening human health and aquatic habitats.

Data collected by the EPA reveals that more than 246,000 miles of rivers and streams within the United States are polluted to a point that they cannot support their intended use, such as fishing and swimming.<sup>240</sup> The most frequent reason cited for impairment was the presence of pathogens, such as bacteria, viruses, or other microorganisms, that often cause disease.<sup>241</sup> The principal source of pathogenic pollution is from untreated animal waste—typically from grazing and large-scale animal feed lots.

Each year, raising livestock produces 500 million tons of manure.<sup>242</sup> This is approximately three times the amount of waste produced by people. More than 10.4 million acres of lake and reservoir water are polluted with mercury and polychlorinated biphenyls, or PCBs—which can cause cancer and other immune system disorders—or they are fouled by nitrogen and phosphorus from farm runoff.<sup>243</sup> In 2011, the most recent year for which data is available, farmers used 21.7 million tons nitrogen, phosphate, and potash in support of crop production.<sup>244</sup> Unfortunately, the same fertilizers that help crops grow also provide nutrients to algae. Farm runoff can spur large-scale large blooms that drive down dissolved oxygen levels in water, killing fish and other aquatic life.

In urban areas, combined sewer systems, which collect both residential effluent and storm water, are often the source of untreated pollution. During heavy rains, these systems cannot handle the sudden rush of stormwater. As a result, raw sewage overflows into local waters and backs up into streets and basements. Combined sewer systems serve approximately 46 million people in the United States.<sup>245</sup> The EPA estimates that, each year, combined systems overflow as many as 75,000 times, releasing approximately 850 billion gallons of untreated sewage into the environment.<sup>246</sup> Research by the Centers for Disease Control, or CDC, shows the real-world impacts of these statistics. Each year, thousands of people are infected by waterborne illness at an economic cost of more than \$500 million in medical bills and lost productivity.<sup>247</sup>

In 1972, Congress passed the Clean Water Act, or CWA, to regulate pollution of surface waters and to provide financial assistance for the construction and repair of municipal sewage treatment plants.<sup>248</sup> The CWA set out to restore and maintain the “chemical, physical, and biological integrity of the nation’s waters.”<sup>249</sup> Under the law, all discharges into surface waters are considered unlawful, unless specifically authorized by a permit from the EPA.<sup>250</sup>



Every day, businesses and households use water for industrial production and personal use, respectively. These water users are referred to as point sources, meaning they are discrete locations where water use produces pollution. Both businesses and municipal sewage plants must apply to the EPA for permits to treat and discharge water into the environment. By comparison, stormwater runoff over agricultural or urban land is referred to as nonpoint source pollution.

The CWA sets treatment protocols and maximum discharge levels. Over time, the discharge permitting process has evolved from focusing almost exclusively on reducing chemical and microbial agents that deplete the dissolved oxygen concentration in water to a focus on toxic chemicals.<sup>251</sup>

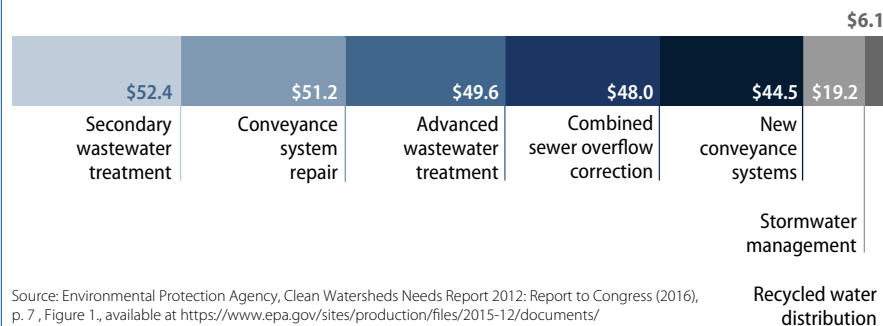
As with drinking water, the regulatory framework for the CWA sets up a federal-state partnership. Under the act, the federal government has broad authority to set pollution discharge limits. Moreover, the EPA determines what constitutes the best practicable and available control technologies. In this way, the CWA empowers the EPA to set regulations around both contamination limits and the technologies and processes necessary to meet those limits. For their part, states may assume the primary responsibility for issuing discharge permits; monitoring compliance and reporting; and taking enforcement actions when permit holders exceed their permitted limits. Nonpoint sources of pollution are not subject to permitting. Instead, the EPA provides states with guidance on best management practices.

Beyond regulatory frameworks, clean water and drinking water infrastructure share a direct connection: The greater the level of surface water contamination, the greater the complexity and cost of drinking water treatment. Investments that reduce surface water pollution also help to lessen the cost burden on drinking water utilities. The challenges facing municipal sewage treatment works are immense. According to a national needs survey conducted by the EPA, municipal treatment works will require \$271 billion in capital investments to meet or continue to meet CWA standards.<sup>252</sup>

While the EPA capital-needs estimate is very large, it represents only part of the story since it addresses only point source pollution from public water treatment facilities. This estimate does not capture the funding needed to meaningfully address nonpoint source pollution. According to the EPA, more than half of surface water pollution comes from nonpoint sources.<sup>253</sup>

**FIGURE 5**  
**Clean water infrastructure needs, by category**

Amount, in billions



Source: Environmental Protection Agency, Clean Watersheds Needs Report 2012: Report to Congress (2016), p. 7, Figure 1., available at [https://www.epa.gov/sites/production/files/2015-12/documents/cwns\\_2012\\_report\\_to\\_congress-508-opt.pdf](https://www.epa.gov/sites/production/files/2015-12/documents/cwns_2012_report_to_congress-508-opt.pdf).

In addition to increasing funding for traditional capital projects at public treatment works, Congress should also increase funding for nonpoint source programs. Within the umbrella of programs known as categorical grants, section 319 grants provides states with funding to implement their EPA-approved nonpoint source management programs.<sup>254</sup> The goal of this program is to remediate past contamination and to prevent or minimize future nonpoint pollution. Given the immense burden that nonpoint source pollution places on surface waters, Congress should increase funding for the section 319 grants program.

Furthermore, Congress should establish a 15 percent set-aside within the Clean Water State Revolving Fund, or CWSRF, for financing assistance for nonpoint source projects. Unlike SRF loans to municipal treatment works that have a rate-payer base, nonpoint source project sponsors are less likely to have a dedicated revenue source. Instead, project sponsors are likely to be local governments or other political subdivisions of the state that pledge their full faith and credit. For this reason, state SRF administrators should have the discretion to forgive as much as 30 percent of nonpoint source repayment obligations. Allowing loan forgiveness is recommended because, while the cost of implementing a nonpoint source project is carried by the local government, the benefits are highly diffuse. By comparison, a project that upgrades a treatment works facility directly benefits households that pay a sewage fee and rely on the public infrastructure to handle their daily effluent.

Finally, Congress should establish a 15 percent set-aside within the CWSRF for advanced treatment capital projects. Advanced treatment involves processes such as flocculation; membranes for advanced filtration; ion exchange; and reverse osmosis, among others.<sup>255</sup> Historically, the CWSRF has focused on bringing

all public treatment works up to the secondary treatment standard, which are additional treatment steps to ensure water quality before being discharged back into a body of water. Today, the vast majority of systems meet this standard. In 1972, approximately 60 million people were served by less-than-secondary treatment systems. By 2012, the number of people served by systems that did not meet secondary standards had fallen to just 4.1 million.<sup>256</sup> At the same time, the share of wastewater treatment plant needs associated with advanced treatment projects has risen substantially from 35 percent in 2004 to 49 percent in 2012.<sup>257</sup> Establishing a set-aside will ensure that advanced treatment projects receive an appropriate level of prioritization by SRF administrators.

## Funding

All federal drinking and clean water programs are supported through general fund appropriations.<sup>258</sup> The majority of the money for infrastructure flows out to states in the form of capitalization grants for the Drinking Water State Revolving Fund and the Clean Water State Revolving Fund. In FY 2017, Congress appropriated \$863 million and \$1.3 billion, respectively.<sup>259</sup> The annual grants from Congress provide capitalization so that states may make new loans each year. Similarly, the funding for nonpoint source pollution control and state regulatory enforcement activities also comes from the general fund. Congress should increase funding for these programs through changes to the tax code that offset an equivalent amount of spending over the next decade.

### *Current tax regime*

- The Drinking Water State Revolving Fund and Clean Water State Revolving Fund are capitalized through annual appropriations legislation using general fund revenues.

### *Policy reforms*

- Drinking water reforms
  - Require that the EPA administrator take all necessary actions under emergency powers granted by section 1341
  - Increase the civil penalties that EPA may levy against state oversight agencies and water systems for Safe Drinking Water Act violations
  - Require the EPA to notify water users within 15 days of receiving information on an immediate health hazard if the local water authority or state agency charged with enforcing the Safe Drinking Water Act fails to notify users

- Establish a national lead service line replacement program to provide grants to community water systems and nontransient noncommunity water systems on a competitive basis, with priority for economically disadvantaged communities and a set-aside for financing assistance to low-income homeowners
- Increase the state matching requirement for the Drinking Water State Revolving Fund capitalization grant from 20 percent to 25 percent
- Clean water reforms
  - Require that not less than 15 percent of Clean Water State Revolving Fund financing supports advanced treatment and stormwater mitigation projects
  - Require that not less than 15 percent of Clean Water State Revolving Fund financing supports nonpoint source pollution control projects
  - Allow states to forgive as much as 30 percent of Clean Water State Revolving Fund loan obligations for nonpoint source pollution control projects that have a municipal or other public agency or instrumentality as the project sponsor when these entities have pledged their full faith and credit for the balance of repayment
  - Increase the state matching requirement for Clean Water State Revolving Fund capitalization grant from 20 percent to 25 percent.

#### *Taxes and investments*

- Increase annual federal capitalization grant to the Drinking Water State Revolving Fund from \$863 million to \$1.863 billion
- Increase annual capitalization grant to the Clean Water State Revolving Fund from \$1.3 billion to \$2.3 billion
- Increase annual funding for the Public Water System Supervision program from \$100 million to \$250 million
- Increase annual funding for the EPA’s nonpoint source pollution control program, or section 319, from \$165 million to \$265 million
- Provide \$250 million in annual funding for a nationally competitive lead service line replacement program

# National infrastructure investment authority

Developing infrastructure projects of regional and national significance typically involves securing financing. For these projects, the total cost is simply too large for state, local, and public authority project sponsors to use pay-as-you-go funding. By accessing credit markets, project sponsors are able to spread the cost out over time.

The most common source of project financing is the municipal bond market. All nonfederal, tax-exempt public bond financing is called municipal, or muni. Currently, there is more than \$3.7 trillion in outstanding municipal debt.<sup>260</sup> While not all this debt was issued to build infrastructure, the size of outstanding issuances indicates that the muni bond market is active and robust.

In order for federal credit assistance to have value, it must offer project sponsors benefits that are not available through the municipal bond market. A national infrastructure investment authority, NIIA, would offer three important benefits: cost, flexibility, and full subordination.

Borrowing money comes with a cost that is reflected in the interest rate that the issuer must offer to attract bond buyers. The interest rate reflects a combination of inflation and risk. Investors must be compensated for the opportunity cost of foregoing the use of their money for a set period of years, as well as the risk that the issuer may default on their repayment obligations. This is sometimes referred to as the risk premium. Before a municipal security is issued, it must receive a rating from a national rating agency such as Moody's Investors Service, Standard and Poor's Financial Services, and Fitch Ratings, among others.

Ratings agencies look at each individual bond issuance to determine the likelihood that the issuer will be able to make their payment obligations. For general obligation bonds, which pledge the full faith and credit of the issuing government, ratings agencies look at the overall indebtedness of the government and their overall ability to raise revenues. For revenue bonds, which pledge a specific source of funding,

such as tolls or parking fees, ratings agencies assess the likely demand for the facility—for example, a road, bridge, or parking deck—in question. These assessments translate into an overall rating, such as AAA, AA or BB-. The higher the overall rating, the lower the anticipated risk to investors and the lower the interest rate.

Even modest changes in the level of assessed risk—and, by extension, the interest rate—can increase overall financing charges. For instance, a \$100 million municipal bond issuance with a 30-year repayment and an interest rate of 2.75 percent results in \$82.5 million in total interest payments. The same \$100 million dollar issuance with an interest rate of 3.75 percent results in \$112.5 million in total interest payments. In this example, a 1 percentage-point change in the interest rate increased the total cost of borrowing by \$30 million. As the size of the underlying issuance increases, the difference in total financing charges grows as well. On a \$500 million issuance, the difference in total finance charges is \$150 million over 30 years.

The federal government is able to issue debt in the form of U.S. Treasury securities at very favorable rates because this debt is assumed to be effectively risk free. Absent the risk premium associated with other bonds, Treasury rates reflect broad market assumptions about long-term interest rates. And while the rate changes on a daily basis, currently, the federal government can issue 20-year debt for around 2.2 percent.<sup>261</sup>

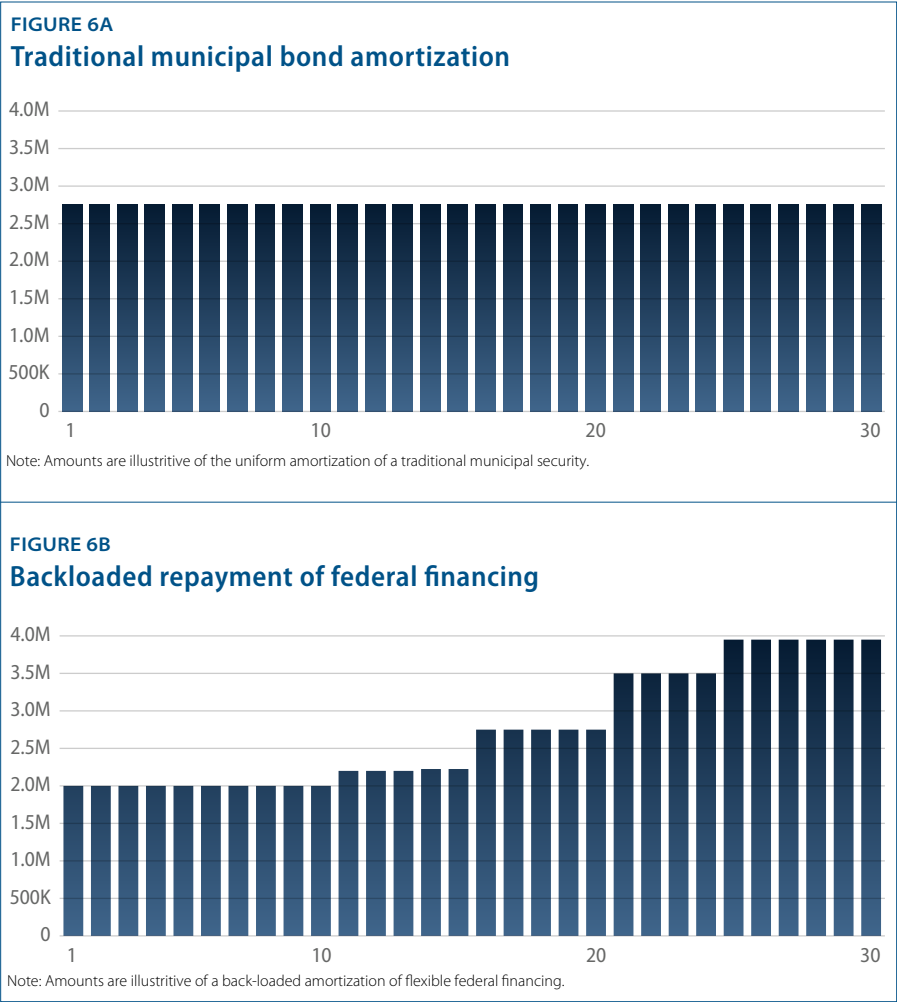
Existing federal infrastructure loan programs, such as the Transportation Infrastructure Finance and Innovation Act, or TIFIA, offer project sponsors a pass-through rate. This means that project sponsors are able to borrow from the federal government at the same rate that the federal government is able to borrow on the open market. In effect, project sponsors are able to obtain loans at risk-free rates even if their actual credit profile would not allow borrowing at such a low cost. For project sponsors issuing general obligation bonds with a AAA rating, the spread in interest rates between the municipal market and what the federal government offers are often not that large. The interest rate spread increases as the credit rating of the municipal security falls. In this way, when the federal government makes a loan for an infrastructure project that would otherwise receive a lower credit rating, it is assuming that risk but not passing along any additional cost.

As envisioned, the NIIA could provide project sponsors access to even cheaper credit by offering loans at below-market rates. For instance, if the federal government is currently able to borrow at 2.6 percent over a 30-year period, the NIIA could offer a project sponsor financing at only 1 percent.<sup>262</sup> On a \$100 million loan, this would save the project sponsor \$48 million in financing charges over 30 years.



The NIIA could also issue loans with zero or negative interest rates. The NIIA would simply take a charge against its capitalization from Congress to cover the difference in the cost of accessing capital through the Treasury market.

The second major benefit of the NIIA would be its ability to offer flexible repayment terms. A traditional municipal security requires the issuer to make a fixed annual or semi-annual interest payment. At the end of the life of the bond, the issuer repays the entire principal. For instance, a 30-year \$100 million municipal bond issuance at 2.5 percent would require the issuer to make an annual interest payment of \$2.5 million for a total of \$75 million in total interest payments.

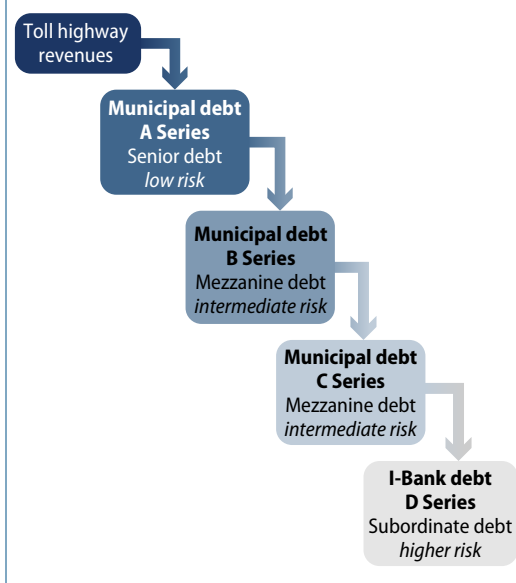


The third major benefit the NIIA would provide is fully subordinate debt. Large projects typically involve multiple tranches—meaning a piece or slice of the total—of financing.<sup>263</sup> The tranche designates the order of payment or cash flow broadly broken out into senior, mezzanine, and subordinate. For instance, if a toll highway project has three tranches of financing, the most senior debt holders are paid first, with the mezzanine holders second, and the subordinate holders last. This means that if toll revenues fall short, the senior and mezzanine holders will likely be paid while the subordinated debt holder—in this case, the federal government—would not. The lower down the debt stack, the higher the risk of nonpayment. In exchange for accepting a higher risk of nonpayment, subordinated debt holders receive a higher interest rate. The market prices the risk premium into the security.

Historically, the federal government has taken a modified subordinate position in large project deals that involve multiple tranches of debt.<sup>264</sup> According to the U.S. Department of Transportation, “TIFIA can be structured as junior-lien financing in order to enhance the creditworthiness of senior-lien capital markets financing through greater debt service coverage.”<sup>265</sup> Fitch Ratings states the government’s position in a debt structure as allowing “the federal government to take a subordinate cash flow position, but retain a parity lien.”<sup>266</sup> However, unlike traditional subordinate debt holders, the federal government springs to parity with senior debt holders when insolvency arises.<sup>267</sup> According to Fitch Ratings, “The springing lien nature of the pledge gives TIFIA considerably more influence in a distressed situation than a typical subordinate lender.”<sup>268</sup> The springing lien nature of federal credit may complicate the ability of project sponsors to secure municipal debt on favorable terms because potential senior and mezzanine level investors understand that their risk exposure is higher than it would otherwise appear. For large projects with hundreds of millions or even billions of dollars in debt, the issue of subordination become more pressing.

The NIIA would have the flexibility to issue truly subordinated debt. This would increase the risk taken on by the federal government. In the case of insolvency, the federal government would only have a claim to whatever project revenues remained after senior and mezzanine investors received their full payment. This would allow the NIIA, on a project-by-project basis, to provide this added benefit if it would make the difference between a project being built or not.

**FIGURE 7**  
**Revenue flow chart for toll highway project**



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## Project review streamlining and coordination

As proposed, the NIIA would offer project sponsors several additional procedural benefits. First, since the NIIA would also offer grant funding, the authority would serve as a one-stop shop for sponsors to receive a bundle of loan and grant assistance. This would substantially simplify what can sometimes be a complex and disjointed system of federal programs housed in multiple agencies or, in the case of transportation, modal administrations within the same department.

The mixture of grants and financing also allows state and local governments to apply for project support and then negotiate the most appropriate combination of support without having to specify the exact outcome on the front end.

Under the current program structure, state and local governments seeking assistance for a transportation project often apply for a Transportation Investment Generating Economic Recovery grant, as well as TIFIA financing. These separate applications must work their way through separate review and administrative processes. Furthermore, the applications must contain a hard ask with respect to grant funding and financing. By comparison, the NIIA would be able to take a more comprehensive and flexible approach. The key lies in the use of capitalization funds from Congress.

Congress would provide an annual capitalization grant of \$12.5 billion to the NIIA—totally, \$125 billion over 10 years. The authority would have the discretion in any given year to determine the ratio of grants to financing. The NIIA could choose to spend a dollar of its capitalization in one of three ways. First, the authority could provide straight grant funding. In this case, a state or local government or public authority would apply for grant funding and compete against other projects within the same sector.

Second, the authority could use its capitalization to cover the cost of the risk premium payment necessary to provide financing at the Treasury pass-through rate. Currently, federal infrastructure loans involve two sources of money. The bulk of the loan—typically 90 percent—comes from the U.S. Treasury Department. The remaining 10 percent comes from the agency making the loan.<sup>269</sup> Existing loan programs require the full value of the principal and interest to be repaid to the Treasury Department. In this way, existing federal infrastructure financing programs such as TIFIA are not revolving. Once a dollar leaves the TIFIA program, it never comes back. The 10 percent contribution is often referred to as the credit

risk premium—an amount set aside to cover the possibility of default on the part of the project sponsor borrowing the funds. For instance, on a \$250 million loan, the TIFIA program would provide \$25 million and the Treasury Department would provide the remaining \$225 million.

Importantly, unlike existing federal infrastructure financing programs, the NIIA would be a revolving fund. This means that the Treasury Department would return the credit risk premium to the NIIA once the project sponsor completed repayment of the loan. The authority would have the ability to use the money again on a future loan.

Third, the NIIA could use its capitalization to offer low, zero, or negative interest rate financing. In effect, the authority would buy-down the cost of the loan using its capitalization. For instance, if the interest rate on a 30-year Treasury security is 2.6 percent, the authority could offer 1 percent financing.<sup>270</sup> At 2.6 percent, a loan of \$250 million dollars would result in \$195 million in interest charges. At 1 percent, a loan of \$250 million would result in \$75 million in interest charges—a difference of \$120 million, or 62 percent. The NIIA would put up the credit risk premium of \$25 million—which would revolve back to the authority upon repayment of the loan—and take a charge of \$120 million to buy-down the interest rate.

This flexibility would allow the NIIA to provide each project sponsor with the unique mix of support necessary to ensure completion while lowering the risk of nonperformance of the loan. For some projects, lower interest charges over a 30-year period would have more value than an upfront grant award during the construction phase. For instance, a lower interest loan may prove especially attractive to a major bridge construction project that pledges toll revenues in order to repay project financing. A lower interest rate would push up the coverage ratio—the anticipated amount of project revenue over and above financing costs—and lower the risk of nonperformance of the loan.

The NIIA would also play an important role in coordinating major investments for large projects and groups of interrelated projects that span state lines. The NIIA would be able to sequence and coordinate investments along multistate assets, such as the Northeast Corridor, the Mississippi River, and water storage and reclamation projects, among others.

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## Phasing out existing loan programs

Once the NIIA is established and has promulgated all necessary regulations concerning its grant-making and financing assistance, Congress should allow existing federal infrastructure loan programs to expire. Federal employees that work on existing loan programs would transition to the NIIA as their programs are phased out over time. Moving staff to the NIIA would ensure continuity and competence in the management of outstanding loans and in offering new grant and financing assistance moving forward.

### Lending and grant-making:

- Provide the authority with the flexibility to make loans with interest rates that match project needs, including:
  - A rate equal to U.S. Treasury securities of equivalent maturity
  - A rate below the Treasury pass-through rate
  - A zero- or negative-interest loan
- Provide the authority with the ability to structure loan repayments to meet anticipated project revenues, including back-loading repayment
- Provide the authority the ability to make grants and loans to individual projects or programs of functionally related projects
- Restrict grant and loan assistance to projects with at least the following total cost:
  - Rural: \$15 million
  - Urban: \$50 million

### Capitalization:

- Capitalize the national infrastructure investment authority with \$125 billion to support grant and loan financing assistance

# Paying for infrastructure investments

The CAP plan for infrastructure investment calls for a total \$500 billion in increased outlays above baseline over the next 10 years. In order to cover the cost of these expenditures without adding to annual budget deficits and the national debt, the plan includes a combination of increased user fees and changes to the tax code to generate additional revenues.

Table 1 shows the increase in outlays over baseline by infrastructure category over the next 10 years, as well as the amount of additional revenue that will be generated by user fees. Table 2 shows the increase in user fees across infrastructure sectors and the approximate amount of additional revenue that these increases will generate over the 10-year period.

**TABLE 1**  
**Ten-year outlays and user fee revenues over baseline**

In billions of dollars

Infrastructure sector	Outlays over baseline	User fee revenues over baseline
Highways/transit	\$259.17	\$259.17
Aviation	\$25.60	\$25.60
Inland waterways	\$0.63	\$0.35
Harbors	\$11.10	\$5.34
Flood control	\$3.50	\$0.00
Drinking/clean water	\$25.00	\$0.00
Passenger/freight rail	\$50.00	\$0.00
National investment authority	\$125.00	\$0.00
Total	\$500.00	\$290.5

Source: Results based on authors' calculation from Federal Aviation Administration, Current Aviation Excise Tax Structure (U.S. Department of Transportation, 2014), available at [https://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/aatf/media/14.1.17excisetaxstructurecalendar2014.pdf](https://www.faa.gov/about/office_org/headquarters_offices/apl/aatf/media/14.1.17excisetaxstructurecalendar2014.pdf); U.S. Department of Transportation, "Highway Trust Fund and Taxes," available at <http://www.fhwa.dot.gov/map21/factsheets/htf.cfm> (last accessed April 2016); John Frittelli, "Federal Freight Policy: In Brief" (Washington: Congressional Research Service, 2016), available at <https://www.fas.org/sgp/crs/misc/R44367.pdf>; John Frittelli, "Harbor Maintenance Finance and Funding" (Washington: Congressional Research Service, 2013), available at <https://fas.org/sgp/crs/misc/R43222.pdf>.



**TABLE 2**  
**User fee increases and revenue, FY 2017–FY 2026**

Sector	Tax mechanism	Increase	Ten-year revenue above baseline, in billions of dollars
Highways and transit	Gas and diesel fuel	15.25 cents	\$259.2
	Commercial fuel	\$0.008	
	Aviation gasoline	\$0.036	
	General aviation jet fuel	\$0.041	
	Fractional ownership fuel	\$0.027	
	Flight segment	\$0.760	
	Ad valorem ticket/frequent flier	1.5 percent	
	International arrival/departure	\$3.32	
	Ad valorem cargo tax	1.19 percent	
			\$25.6
Inland waterways	Barge fuel	\$0.102	\$0.35
Harbors	Ad valorem cargo/ticket tax	0.044 percent	\$5.34

Source: Results based on authors' calculation from Federal Aviation Administration, Current Aviation Excise Tax Structure (U.S. Department of Transportation, 2014), available at [https://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/aatf/media/14.1.17excisetaxstructurecalendar2014.pdf](https://www.faa.gov/about/office_org/headquarters_offices/apl/aatf/media/14.1.17excisetaxstructurecalendar2014.pdf); U.S. Department of Transportation, "Highway Trust Fund and Taxes," available at <http://www.fhwa.dot.gov/map21/factsheets/htf.cfm> (last accessed April 2016); John Frittelli, "Federal Freight Policy: In Brief" (Washington: Congressional Research Service, 2016), available at <https://www.fas.org/sgp/crs/misc/R44367.pdf>; John Frittelli, "Harbor Maintenance Finance and Funding" (Washington: Congressional Research Service, 2013), available at <https://fas.org/sgp/crs/misc/R43222.pdf>.

Table 3 lists a series of changes to the tax code that will generate more than \$400 billion in revenue for the federal government over the next 10 years. The revenue estimates come from the Joint Committee on Taxation. Importantly, these offsets cover spending on programs described in the plan that rely on appropriations funding, including: The NIIA, the TIGER grant program, drinking and clean water programs, lead service line replacement, flood control, port development, and passenger and freight rail projects.

In addition, these revenues will offset the cost of moving the Harbor Maintenance and Inland Waterways trust funds off budget. The cost of moving these off budget is \$15.2 billion and \$980 million, respectively.<sup>271</sup> By taking these two trust funds off budget, Congress will be able to expend the full amount of revenue the trust funds generate each year without increasing the budget deficit.

Finally, revenue generated by these tax code changes will cover the shortfall in the Highway Trust Fund. Currently, the HTF runs an annual shortfall of approximately \$15 billion. This amount is needed to cover all outlays at current levels and to keep enough in reserve as to avoid triggering a slowdown in

reimbursements from the highway and transit accounts. The most recent general fund transfer from the Fixing America's Surface Transportation, or FAST, Act covers the shortfall through FY 2020. The tax offsets will cover the period from FY 2021 through FY 2026, or \$90 billion. By covering the shortfall with offsets, Congress will be able to spend the entire \$259 billion in additional revenue over 10 years—a sum generated by increasing the tax on gasoline and diesel fuels.

**TABLE 3**  
**Tax offset provisions and 10-year revenue estimate**

<b>Tax provision</b>	<b>Ten-year revenue estimate, in billions of dollars</b>
<b>Repeal the percentage depletion rule for oil and natural gas wells:</b> This change would eliminate an accounting method that allows independent producers and royalty owners of oil and natural gas wells to deduct more expenses from the acquisition and development of a well than were actually incurred.	\$12.10
<b>Repeal the intangible drilling cost provision:</b> This change would ensure that oil and natural gas well operators deduct their expenses as income is earned over the life of a project. In addition, this change would place the oil and gas industry on an equal tax footing with other businesses.	\$13
<b>Repeal last-in-first-out, or LIFO, method of accounting for inventories:</b> This change would prevent businesses from artificially lowering their tax liability by assuming that the cost of items sold is the same as the cost of the most recently purchased inventory items.	\$106.70
<b>Repeal lower-of-cost-or-market inventory accounting method:</b> This change would eliminate a method of accounting that enables businesses to understate taxable income by overvaluing ending inventory that has lost value from its price at the time of purchase.	\$4.60
<b>Modify like-kind exchange rules:</b> This change would repeal a provision that allows taxpayers to defer capital gains taxes by directly exchanging certain capital assets such as real estate and art. When assets are exchanged repeatedly, this can result in the permanent deferral of capital gains taxes.	\$10.40
<b>Increase certainty with respect to worker classification:</b> This change would permit the IRS to require prospective reclassification of workers who have been misclassified as independent contractors and whose reclassification has been prohibited by law, enabling avoidance of federal employment taxes.	\$10.70
<b>Increase tobacco taxes and index for inflation:</b> This change would establish a uniform tax on all types of tobacco, based on weight. The new rates would be higher and would be indexed for inflation, addressing the current-law disparity in the tax burden across similar types of tobacco products.	\$80.50
<b>Modify transfer tax rules for various grantor trusts:</b> This change would close loopholes through which wealthy taxpayers use trusts to avoid gift and/or income tax when transferring appreciated assets to their family members.	\$14.20
<b>Restore the estate, gift, and generation-skipping transfer, or GST, tax parameters in effect in 2009 with portability of exemption amount between spouses:</b> This proposal would increase the estate and GST taxes each to 45 percent above \$3.5 million and above \$1 million for gifts made during the decedent's lifetime in excess of \$14,000 per person per year. Spouses could take advantage of any unused exemption amount from a predeceased spouse, referred to as exemption portability.	\$161.00
<b>Total</b>	<b>\$413.20</b>

Source: Office of Management and Budget, "General Explanations of the Administration's Fiscal Year 2017 Revenue Proposals," available at <https://www.treasury.gov/resource-center/tax-policy/Documents/General-Explanations-FY2017.pdf>; Joint Committee on Taxation, "Estimated Budget Effects of the Revenue Provisions Contained in the President's Fiscal Year 2017 Budget Proposal," available at [https://www.jct.gov/publications.html?func=download&id=4902&chk=4902&no\\_html=1](https://www.jct.gov/publications.html?func=download&id=4902&chk=4902&no_html=1) (last accessed April 2016).

# Fiscal stimulus and the limits of monetary policy

In response to the Great Recession, the central bank of the United States, known as the Federal Reserve System—or simply the Fed—undertook the largest interest rate cuts and increase in monetary supply in modern history.<sup>272</sup>

In early 2007, several major U.S. financial institutions began reporting substantial losses tied to subprime mortgage lending and related financial products.<sup>273</sup> By August, the Fed cut its overnight lending rate to 5.75 percent in response to growing losses and fears of an economic slowdown.<sup>274</sup> However, the financial and broader economic situation continued to deteriorate rapidly. In September, the Fed cut its rate to 4.75 percent and again in January of 2008 to 3.5 percent—rapid and relatively large cuts by historic standards. The rate would continue to fall, and by the middle of December, the rate reached 0.25 percent.<sup>275</sup>

Combined with lowering key interest rates, the Fed began pumping money into the economy through a massive asset purchasing program known as quantitative easing. During the first round of quantitative easing, the Fed purchased a total of \$1.25 trillion in mortgage-backed securities and another \$175 billion in government agency and corporation debt principally from the Treasury Department, as well as Fannie Mae and Freddie Mac.<sup>276</sup> The purchases did not stop there, as the Fed sought to inject even more liquidity into the economy with two additional extended rounds of purchasing. By the end of 2014, the Fed's balance sheet had increased by approximately \$3.5 trillion—a truly unprecedented monetary stimulus.<sup>277</sup>

Combined with the monetary interventions of the Fed, Congress and President Barack Obama worked to enact the American Recovery and Reinvestment Act, or ARRA—otherwise known as the stimulus act—in February of 2009. The legislation had a total cost of \$840 billion, with \$540 billion in direct outlays and another \$300 billion in tax cuts.<sup>278</sup> The bill's principal aim was to arrest the economic freefall arising from the financial crisis and to stem further job losses through fiscal stimulus. Research by the Congressional Budget Office, which focused solely on direct employment effects, demonstrates that ARRA did increase both employment and

overall economic output.<sup>279</sup> While the stimulus act largely accomplished its goal of providing a counterweight to falling aggregate demand and rising unemployment, it was a one-time fiscal intervention.

Unlike previous post-WWII economic downturns, the Great Recession lasted longer, and overall employment levels rebounded much more slowly.<sup>280</sup> In addition, real interest rates have remained well below long-term historical averages. In fact, a number of central banks, including the Bank of Japan and the European Central Bank, have started charging negative rates for overnight lending and issuing debt with negative interest rates in an attempt to spur lending and economic activity.<sup>281</sup>

Several prominent economists have argued that the United States and other Western industrial nations have entered a period of secular stagnation. The concept of secular stagnation dates back to the 1930s with the writing of economist Alvin Hansen. While the theory has a number of elements, its overarching point is that when aggregate demand falls, both corporate and individual savings accumulate due to a lack of productive and attractive investment opportunities.<sup>282</sup> The excess savings often produce asset bubbles and drive down interest rates as companies and other large investors look for a safe outlet to earn even modest returns. For example, the yield on 10-year Treasury notes has fallen to just 1.8 percent.<sup>283</sup>

In a well-functioning market, the price of a good helps to balance out supply and demand. When it comes to money, interest rates represent the price of accessing capital. Historically, real or neutral interest rates have tended to settle at a level that balance savings and investment with roughly full employment.<sup>284</sup> Proponents of the secular stagnation theory argue that many Western economies have reached a point where the real or neutral interest rate is so low that savings and investment are fundamentally out of balance. As a result, central banks such as the Fed face an environment where their ability to stimulate economic growth through monetary policy is limited.

Former Treasury Secretary Lawrence H. Summers has argued that the United States has entered a period of secular stagnation and that sustained federal fiscal stimulus is necessary to restart economic growth in line with historical averages. In February 2016, Summers stated in a lengthy piece in *Foreign Affairs*:

*The core problem of secular stagnation is that the neutral real interest rate is too low. This rate, however, cannot be increased through monetary policy. Indeed, to the extent that easy money works by accelerating investments and pulling forward demand, it will actually reduce neutral real rates later on. That is why primary responsibility for addressing secular stagnation should rest with fiscal policy. An expansionary fiscal policy can reduce national savings, raise neutral real interest rates, and stimulate growth.*<sup>285</sup> (Emphasis added)

While the economy has benefited from sustained economic growth, the overall economic output of the United States is significantly less than what it would normally have been given past experiences with recessions. In fact, Summers concludes that if the U.S. economy had performed as the Congressional Budget Office forecast in August 2009, “U.S. GDP today would be about \$1.3 trillion higher than it is.”<sup>286</sup>

Investing in America’s infrastructure offers benefits to the economy and to American workers and their families. The Center for American Progress’ infrastructure plan calls for increasing annual federal infrastructure spending by \$50 billion above baseline, or \$500 billion over a decade. This investment will address the state-of-good-repair backlog and expand our infrastructures systems where needed. In addition, this plan will provide real benefits to workers and their families by creating and sustaining strong middle-class construction and manufacturing jobs. These expenditures will also provide a fiscal stimulus that will boost overall economic output by increasing aggregate demand, helping to address the problem of secular stagnation outlined by Summers and others.

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## Macroeconomic benefits of additional spending

At a national level, additional infrastructure spending will increase overall economic output above what would otherwise occur without these expenditures. Specifically, infrastructure spending increases the demand for goods such as construction equipment and services such as highway planning. This additional demand immediately creates employment opportunities in construction, durable goods manufacturing, and related industries. As a result, more people will find work in these sectors and many workers already employed will work more hours than they would have without the additional infrastructure spending.

Beyond these direct effects, people who find employment or increase their hours will spend their new or additional earnings on food, clothing, housing, health care, and education, among other goods and services. This consumption can be thought of as an indirect effect of increased spending on infrastructure, creating an overall boost as the initial federal investment ripples out through the economy. In effect, \$1 in federal spending produces more than \$1 in total economic activity. This is known as the multiplier effect.

For instance, a multiplier effect of two indicates that the economy will grow by \$2 for every \$1 spent by the government. The exact size of the multiplier effect depends on three factors: the type of expenditure—infrastructure versus a one-time payments to retirees; the time period over which the expenditure occurs—six months, one year, or longer; and the state of the economy at the time of expenditure—recession or expansion.<sup>287</sup> Compared to other forms of government outlays, infrastructure spending tends to have a larger multiplier effect. Otherwise, infrastructure spending conforms to the general rule that outlays produce the greatest multiplier effect in the short term and when the economy is in a recession.

Importantly, an economic analysis that looks at fiscal multipliers only captures the effect of more government spending on aggregate demand—the total amount of goods and services demanded by consumers, businesses, and governments over a given period of time.<sup>288</sup> However, government spending on infrastructure also increases supply, largely by increasing the productivity of businesses and workers. Education, for example, provides people with crucial skills, raising productivity and innovation. The same applies to infrastructure spending. Similarly, safe and efficient roads, rail lines, and airports lower the cost of doing business and thus allow businesses to become more productive. The impact of more government spending on the supply side of the economy often occurs over years and even decades. The productivity effects from more infrastructure spending are not directly comparable to its short-term demand effects. Put differently, considering only the demand effects of more infrastructure spending on the economy understates the benefits to economic growth over time.

Spending an additional \$50 billion a year on infrastructure for 10 years—from FY 2017 to FY 2026—increases economic output by \$691 billion in 2015 dollars by 2026. Stated another way, the U.S. economy would be 3 percent larger after a decade of additional infrastructure spending than without it.

This model assumes that infrastructure spending has an immediate fiscal multiplier of 1.4, meaning that each \$1 spent on infrastructure creates direct and indirect demand effects of \$1.40 in the year that the government spends the money. This multiplier reflects a one-time effect, which implicitly assumes that there is no offsetting negative effect in the years following the additional spending from higher taxes and higher interest rates. This assumption is reasonable for three reasons. First, interest rates remain at historic lows and will likely remain extremely low for some time. Second, this economic model does not account for positive supply-side effects from more infrastructure spending. Third, the model uses a multiplier of 1.4, which falls in the middle of the range of available fiscal multipliers.<sup>289</sup>

The model relies on the GDP forecast from the Congressional Budget Office to serve as the baseline for calculating the added economic output resulting from increased infrastructure spending.<sup>290</sup> The model takes a nominal—noninflation adjusted—\$50 billion in spending each year and then multiplies this by 1.4 to capture the multiplier effect of these outlays. This results in a total nominal increase in economic activity of \$70 billion per year. This spending has a compound effect over time, as each new dollar not only produces an immediate multiplier effect but also accelerates economic growth over the remaining years associated with it.<sup>291</sup> For example, the economy grows faster by about \$15 billion in 2015 dollars in 2017 because it is larger than it would have been without the additional infrastructure spending.

**TABLE 4**  
**Macroeconomic benefits of added infrastructure spending, in billions of dollars**

	Nominal additional federal outlays	CBO baseline, real GDP	GDP after additional spending	Annual difference in GDP from baseline	Annual gain in jobs
2017	\$50.0	\$19,200	\$19,268	\$68.22	393,134
2018	\$50.0	\$19,700	\$19,837	\$68.72	387,259
2019	\$50.0	\$20,100	\$20,305	\$68.53	377,963
2020	\$50.0	\$20,500	\$20,774	\$68.44	371,535
2021	\$50.0	\$21,000	\$21,344	\$69.77	373,010
2022	\$50.0	\$21,400	\$21,812	\$68.19	357,463
2023	\$50.0	\$21,900	\$22,382	\$70.22	362,841
2024	\$50.0	\$22,400	\$22,952	\$70.40	357,135
2025	\$50.0	\$22,800	\$23,420	\$67.90	338,326
2026	\$50.0	\$23,300	\$23,991	\$70.63	347,406
<b>Total</b>				<b>\$691.02</b>	<b>3,666,071</b>

Source: Authors' calculations based on Congressional Budget Office, "Long-Term Budget Outlook" (2015), available at <https://www.cbo.gov/publication/50250>; Charles Whalen and Felix Reichling, "The Fiscal Multiplier and Economic Policy Analysis in the United States," Working Paper 2015-02 (Congressional Budget Office, 2015), available at [https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/workingpaper/49925-FiscalMultiplier\\_1.pdf](https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/workingpaper/49925-FiscalMultiplier_1.pdf).



Increasing infrastructure spending would also add millions of jobs to the economy. Assuming that an additional one percent in economic growth translates to an increase in employment of 0.75 percent,<sup>292</sup> the U.S. economy would add approximately 3.6 million more jobs by 2026.<sup>293</sup> Moreover, increased federal spending would lower the overall unemployment rate below what would in the absence of infrastructure outlays. According to the model, added spending would push down the unemployment rate by 1 percentage point. Specifically, the overall unemployment rate would fall to 4.4 percent in 2026 instead of the expected 5.4 percent.<sup>294</sup>

In short, extra infrastructure spending would add \$691 billion in 2015 dollars to the economy, help add 3.6 million new jobs, and lower the unemployment rate by 1 percentage point over 10 years.

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### Microeconomic benefits of additional spending

While impressive, these national economic output and unemployment results obscure the fact that additional spending also provides significant benefits to workers. For the majority of workers and households, the principal benefit will be the increased job security resulting from a lower overall unemployment rate. For several million workers, however, additional infrastructure spending will allow them to gain employment or move from a low-wage job into well-paying job in construction.

Consider the following hypothetical example: A low-wage worker earning \$10.88 per hour—150 percent of the federal minimum wage—transitions to a construction job at the national average construction wage of \$29.60 per hour as a result of the additional infrastructure spending. This translates to an annual income gain of \$37,514, or a raise of approximately 117 percent, assuming the worker continues to work full time for an entire year.<sup>295</sup>

These potential gains vary from state to state since the minimum wage in some states is above the national minimum wage and since average construction wages can be above or below the national average construction wage. The table below shows the minimum wage, the expected average wage in construction, and the estimated annual income gain, which is equal to 2,000 times the difference between the average construction wage and 150 percent of the minimum wage in each state. The estimated annual income gain for a full-time worker moving from low-wage work to a well-paying job in construction ranges from a low of \$15,536 in Arkansas to a high of \$56,931 in Alaska.

**TABLE 5**  
**Microeconomic benefits of added infrastructure spending, in billions of dollars**

	150 percent of minimum wage	2016 earnings at 150 percent of minimum wage	Average heavy- construction hourly wage	2016 earnings at heavy- construction wage	Annual difference
United States	\$10.88	\$21,750	\$29.6	\$59,263.6	\$37,514
Alabama	\$10.88	\$21,750	\$24.5	\$48,935.2	\$27,185
Alaska	\$14.63	\$29,250	\$41.1	\$82,280.5	\$53,030
Arizona	\$12.30	\$24,600	\$25.1	\$50,169.4	\$25,569
Arkansas	\$12.00	\$24,000	\$22.8	\$45,535.8	\$21,536
California	\$15.00	\$30,000	\$33.8	\$67,556.6	\$37,557
Colorado	\$12.45	\$24,900	\$30.3	\$60,541.1	\$35,641
Connecticut	\$14.40	\$28,800	\$33.7	\$67,340.1	\$38,540
Delaware	\$12.38	\$24,750	\$30.6	\$61,190.7	\$36,441
District of Columbia	\$17.25	\$34,500	\$31.2	\$62,381.6	\$27,882
Florida	\$12.33	\$24,660	\$24.7	\$49,389.9	\$24,730
Georgia	\$10.88	\$21,750	\$25.2	\$50,494.2	\$28,744
Idaho	\$10.88	\$21,750	\$22.8	\$45,665.7	\$23,916
Illinois	\$12.38	\$24,750	\$39.4	\$78,794.4	\$54,044
Indiana	\$10.88	\$21,750	\$29.2	\$58,332.5	\$36,583
Iowa	\$10.88	\$21,750	\$28.4	\$56,730.2	\$34,980
Kansas	\$10.88	\$21,750	\$26.2	\$52,464.6	\$30,715
Kentucky	\$10.88	\$21,750	\$25.7	\$51,360.3	\$29,610
Louisiana	\$10.88	\$21,750	\$27.0	\$54,023.6	\$32,274
Maine	\$11.25	\$22,500	\$24.5	\$49,000.2	\$26,500
Maryland	\$13.13	\$26,250	\$29.0	\$58,072.7	\$31,823
Massachusetts	\$15.00	\$30,000	\$39.4	\$78,707.8	\$48,708
Michigan	\$12.75	\$25,500	\$28.4	\$56,773.5	\$31,274
Minnesota	\$14.25	\$28,500	\$33.1	\$66,105.9	\$37,606
Mississippi	\$10.88	\$21,750	\$23.9	\$47,701.0	\$25,951
Missouri	\$11.48	\$22,950	\$30.4	\$60,779.3	\$37,829
Montana	\$12.30	\$24,600	\$27.0	\$53,915.4	\$29,315
Nebraska	\$13.50	\$27,000	\$24.1	\$48,264.0	\$21,264
Nevada	\$12.38	\$24,750	\$29.8	\$59,545.1	\$34,795
New Hampshire	\$10.88	\$21,750	\$28.8	\$57,574.7	\$35,825
New Jersey	\$12.89	\$25,770	\$38.0	\$76,044.5	\$50,274
New Mexico	\$11.25	\$22,500	\$22.7	\$45,340.9	\$22,841

	150 percent of minimum wage	2016 earnings at 150 percent of minimum wage	Average heavy- construction hourly wage	2016 earnings at heavy- construction wage	Annual difference
New York	\$13.50	\$27,000	\$39.1	\$78,253.1	\$51,253
North Carolina	\$10.88	\$21,750	\$23.9	\$47,874.3	\$26,124
North Dakota	\$10.88	\$21,750	\$30.9	\$61,710.4	\$39,960
Ohio	\$12.45	\$24,900	\$28.7	\$57,358.2	\$32,458
Oklahoma	\$10.88	\$21,750	\$23.4	\$46,770.0	\$25,020
Oregon	\$14.18	\$28,350	\$30.9	\$61,861.9	\$33,512
Pennsylvania	\$10.88	\$21,750	\$31.6	\$63,291.0	\$41,541
Rhode Island	\$13.50	\$27,000	\$31.0	\$61,991.9	\$34,992
South Carolina	\$10.88	\$21,750	\$22.6	\$45,232.6	\$23,483
South Dakota	\$12.75	\$25,500	\$24.4	\$48,870.3	\$23,370
Tennessee	\$10.88	\$21,750	\$24.3	\$48,653.8	\$26,904
Texas	\$10.88	\$21,750	\$27.0	\$53,937.0	\$32,187
Utah	\$10.88	\$21,750	\$26.7	\$53,309.1	\$31,559
Vermont	\$14.40	\$28,800	\$25.0	\$49,952.9	\$21,153
Virginia	\$10.88	\$21,750	\$26.4	\$52,876.0	\$31,126
Washington	\$14.51	\$29,010	\$34.2	\$68,466.0	\$39,456
West Virginia	\$13.13	\$26,250	\$26.8	\$53,655.5	\$27,406
Wisconsin	\$10.88	\$21,750	\$30.0	\$59,934.8	\$38,185
Wyoming	\$10.88	\$21,750	\$27.5	\$54,998.0	\$33,248

Source: Results based on authors' calculations from Christina Romer and Jared Bernstein, "The Job Impact of the American Recovery and Reinvestment Plan" (Washington: Executive Offices of the President, 2009), available at [http://otrans.3cdn.net/45593e8ecbd339d074\\_l3m6bt1te.pdf](http://otrans.3cdn.net/45593e8ecbd339d074_l3m6bt1te.pdf); Congressional Budget Office, "The 2015 Long-Term Budget Outlook" (2015), available at <https://www.cbo.gov/publication/50250>; Raise the Minimum Wage, "What's the minimum wage in your state?", available at <http://www.raisetheminimumwage.com/pages/minimum-wage-state> (last accessed June 2016); Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," available at <http://data.bls.gov/pdq/querytool.jsp?survey=sm> (last accessed June 2016).

In addition to covering basic expenses, middle-class construction jobs offer people a way to build wealth and economic security. Research by the Federal Reserve shows that households in the bottom one-fifth of the income distribution—where a low-wage worker would most likely fall—have a median net worth of just \$6,400.<sup>296</sup> By comparison, households in the middle one-fifth of the income distribution—where a well-paid construction worker would likely fall—have a median net worth of \$55,400, or 865 percent more than a household in the bottom one-fifth.<sup>297</sup>

Higher wages are also associated with homeownership. Households with income above the median for all families had a homeownership rate of 78.5 percent at the end of 2015, while those with family incomes below the median had a homeownership rate of 49.2 percent.<sup>298</sup> In addition, higher-income earners are more likely to participate in a retirement plan at work. In 2014, full-time private sector workers with earnings between \$20,000 and \$29,999 participated in work-sponsored retirement plans at a rate of 30 percent.<sup>299</sup> For full-time workers with earnings between \$50,000 and \$74,499, the participation rate jumps to 56.9 percent.<sup>300</sup>

Finally, more income also goes along with greater health insurance coverage, although the differences are relatively small in the era of the Affordable Care Act. Close to 90 percent—89.3 percent, to be exact—of people with incomes between \$50,000 and \$74,999 had health insurance in 2014.<sup>301</sup> By comparison, 83.4 percent of people with incomes below \$25,000 had health insurance that same year.

The results of the model are clear: Infrastructure spending boosts economic growth, creates millions of new jobs, lowers the unemployment rate, and substantially increases the economic security of workers and their families.

# Conclusion

America's history is marked by successive periods of sustained infrastructure investment. These investments linked cities and rural communities together, facilitated access to opportunity for millions of people, and efficiently connected the United States to an increasingly global economy. Beyond these benefits, infrastructure investments represent a form of intergenerational commitment. Our country is what it is today because prior generations made sacrifices in order to build the foundation for a secure and prosperous future. While concrete and steel are, at best, prosaic elements of our daily lives, they reflect a deeply American value of always looking to the future and making thoughtful investments that will pay dividends over many years.

The time has come for our leaders to recognize the need for and value of infrastructure and to keep their commitment to the next generation by taking up the mantle of national investment.

*\* **Correction, October 12, 2016:** This report has been updated to accurately state a proposed increase in the annual outlay of the Harbor Maintenance Trust Fund, as well as the user fee revenues over baseline.*

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As progressives, we believe America should be a land of boundless opportunity, where people can climb the ladder of economic mobility. We believe we owe it to future generations to protect the planet and promote peace and shared global prosperity.

And we believe an effective government can earn the trust of the American people, champion the common good over narrow self-interest, and harness the strength of our diversity.

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We develop new policy ideas, challenge the media to cover the issues that truly matter, and shape the national debate. With policy teams in major issue areas, American Progress can think creatively at the cross-section of traditional boundaries to develop ideas for policymakers that lead to real change. By employing an extensive communications and outreach effort that we adapt to a rapidly changing media landscape, we move our ideas aggressively in the national policy debate.

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