A US Infrastructure Plan
Building for the Long Haul

SUSTAINING CAPITALISM
A series focused on nonpartisan reasoned solutions in the nation’s interest to the central challenges we face in order to provide prosperity for all Americans.
Executive Summary

Addressing America’s severe infrastructure needs—finally—must be at the top of the nation’s agenda. Improving infrastructure is one of the few issues that enjoys strong bipartisan support among the American public. Eighty percent of Americans support rebuilding our nation’s infrastructure—more than almost any other top issue facing the nation—and roughly two-thirds of Americans rate their own local roads as in fair or poor condition.¹ A similar proportion say that the country is not doing enough to meet infrastructure needs.²

Modern, effective infrastructure is essential for virtually all US commerce and, therefore, for growth and prosperity that is widely shared among all Americans. Transportation and other forms of infrastructure must remake themselves to remain productive as the economy changes around them.

But the devastating impact of the COVID-19 pandemic on the US economy makes improving our infrastructure, keeping America competitive, and getting Americans back to work that much more urgent. The pandemic has forced an accelerated integration of technology into the work, school and personal lives of many Americans. But that has revealed inequities in access to reliable, high-speed internet. This experience is one more example of how our nation’s deficient infrastructure slows our economic growth generally. Around 24 million US households lack access to reliable, affordable, high-speed internet. If not addressed, weak infrastructure can deprive many Americans of equal access to opportunity. And at the same time, climate change threatens the foundations of our economy.

With the need recognized all along the political spectrum, it is time for action and the opportunity for a bipartisan solution is now.

To advance an agenda of more effective infrastructure investment, this statement

- Defines and explains US infrastructure;
- Presents reasoned principles for how to meet the likely considerable cost of closing the substantial US infrastructure gap with greater efficiency; and
- Addresses policy approaches across the several unique categories of infrastructure to increase the benefit of US infrastructure investment.
### Definition of Infrastructure

A reasonable definition of infrastructure projects includes those relating to surface transportation; aviation; ports; water resources projects; energy production, generation, storage, transmission, and distribution; pipelines; stormwater and sewerage; drinking water; broadband internet communication; and cybersecurity. This long list of vital items illustrates the reach of infrastructure throughout US economic life.

### Principles for Closing the Infrastructure Gap

1. Improve infrastructure planning and decision making through principled public benefit-cost analysis and increased coordination;

2. Encourage and facilitate innovation;

3. Modernize and streamline regulation;

4. Achieve appropriate private-sector involvement in public infrastructure choices through sound use of public-private partnerships (PPPs) and market tests to validate efficient investment choices;

5. Explore alternative approaches for utilizing private investment resources;

6. Incorporate user fees, including carbon, as one part of a tool kit of more sustainable funding and a method of guiding efficient choices; and

7. Incorporate climate risk into evaluations of potential infrastructure investments.
CED Policy Recommendations

Insights for what’s ahead

Infrastructure is essential to the strength of the US economy. A sharp focus on infrastructure’s role and key issues can lead the nation toward faster economic growth and job creation, environmental protection, equal opportunity and shared prosperity, and save public funds in the long run.

In that light, we present the following recommendations for a bipartisan, comprehensive, cost-efficient and fiscally sustainable infrastructure program:

- Full funding of prepandemic infrastructure projects will restore jobs, and further jobs will be created as greater priority is devoted to infrastructure construction and maintenance. But short-term job creation should be a result of long-term investment value, rather than serve as an end in itself.

- Long-term federal fiscal sustainability will create more room for enduring investment.

- Rigorous cost-benefit analysis is essential. The federal government can provide technical expertise, but locally based on-the-ground input as to both costs and benefits is needed as well.

- Consideration of long-term risks, such as climate risk and resilience, must be part of the evaluation process for long-term investments.

- Long-term investment is needed, but maintenance and renewal must be allowed to compete for infrastructure dollars on the basis of benefits and costs.

- Federal, state, and local decision makers (including across states and localities) must coordinate to avoid duplication and delay during project approvals.

- Infrastructure decisions must anticipate changing technologies such as autonomous vehicles and advancing digital communications.

- Research into infrastructure investment technology will be needed to improve productivity and reduce costs (such as in longer-lasting highways with thicker paving).

- Maximum competition is needed to get the best infrastructure at the least cost.

- Regulation must promote competition. Streamlining regulatory procedures and cutting red tape across federal, state, and local governments is key to increasing investment, decreasing cost and maximizing efficiency.

- Use the best funding tool for each unique project. Where it is feasible, “user pays” financing can steer infrastructure investment to where it provides the greatest value. Where public-private partnerships are appropriate—which is for only some infrastructure—they can supplement public expertise and resources and facilitate consideration of maintenance and full-life-cycle cost.
• The Highway Trust Fund must be put on a sustainable footing. In the short run, that will require increases in the fuel tax. The longer term poses significant funding challenges, assuming a continuing shift toward renewable fuels that do not bear the current fuel tax. Options to make up the differential include utility taxes, or possibly a mileage charge at least as a partial substitute for the fuel tax, but any alternative in the intermediate term must not negate totally the environmental incentives of the fuel tax.

• The electricity sector needs reliability, which requires some redundancy and excess capacity, along with rigorous evaluation and maintenance of the power grid and distribution network. Investing in developing better battery technology is essential. Climate risk must be factored into decisions about long-lived assets. Synergies between distributed power generation and electric vehicles are among the many technological uncertainties that must be considered.

• Privatization of air traffic control and congestion charges for slots at airport gates are worthy of serious consideration to reduce congestion and speed travel.

• Access to quality broadband has become a necessity of citizenship, like public education (of which broadband has become a prerequisite), postal delivery, telephone service, and electrification. Broadband is also a building block for individual prosperity and a tool to fight inequality. Beyond emergency response to the current pandemic, policy should ensure that broadband is accessible to every citizen and that it is affordable.

• Failures of water systems, both drinking water and wastewater, have harmed the public health. Population migration and shifting demand have challenged new and old communities alike, while aging systems have wasted scarce water. Federal lending programs for investment and improvement must be expanded.
Defining Infrastructure

Infrastructure is often called the “backbone” of the economy, connecting people and businesses to jobs, goods, services, information, and customers both inside and outside of the United States. Components for goods need to travel through supply chains to final producers and then through sellers to buyers. Workers must either commute or travel to their workplaces or (increasingly, especially in the current pandemic) interact from their homes through digital communications systems. Producers and households need reliable utility services to produce and to achieve a high quality of life.

Ports, waterways, railroads, airports, roads, reliable electricity, and internet connectivity are critical for the arrival of necessary inputs and the delivery of finished products and, thus, for creating jobs. Infrastructure equally contributes to achieving a safe, healthy, mobile, and educated workforce. Thus, efficient investment in cutting-edge infrastructure connects businesses, workers, and consumers to more opportunities, increases productivity, undergirds American competitiveness, and also protects the environment—reducing disproportionate adverse environmental impacts on vulnerable communities. And so, US infrastructure is vital to sustain capitalism and maintain US economic leadership.

A reasonable definition of infrastructure projects includes those relating to surface transportation; aviation; ports; water resources projects; energy production, generation, storage, transmission, and distribution; pipelines; stormwater and sewerage; drinking water; broadband internet communication; and cybersecurity. This long list of vital items illustrates the reach of infrastructure throughout US economic life.

Because infrastructure is critical to the strength of the US economy, improvements or degradations in infrastructure have enormous consequences for economic and fiscal health. Preliminary data from the Bureau of Transportation Statistics and the Census Bureau suggest that over $14 trillion worth of goods were shipped domestically and abroad utilizing US transportation infrastructure in 2017. Infrastructure is also critical to household finances, through its effect not only on jobs, wages, and consumer prices, but also on spending. In 2017, the average household spent an estimated 13 percent of its pretax income on transportation, the second-largest category after housing. That US households generally pay less for electricity than other advanced economies has much to do with natural resources, but is also related to differences in infrastructure and its regulation.

As the Committee for Economic Development (CED) has explained, smart infrastructure investments raise economic growth, improve productivity, and increase land values. Sound upgrades in infrastructure also can create positive long-term spillovers through increased public health and reduced social inequities, higher energy efficiency, more robust economic development, better education, and numerous other improvements.

Many potential benefits from smart infrastructure investment are future-oriented, helping to boost global competitiveness and innovation in the long run. Infrastructure also influences where businesses locate, with important knock-on effects in economic opportunities that might otherwise go abroad. Infrastructure investment can attract and retain highly educated workers and businesses seeking to employ them, and thereby help struggling communities to create jobs and raise wages. Some analysts have estimated that, holding everything else equal, an additional dollar of public infrastructure investment generates on average over 10 cents of output per year over the long run.
On All Counts, US Infrastructure Performance Is Inadequate

Our population and our economy are growing, which expands the base of need that our infrastructure must satisfy—and also increases congestion, which in and of itself increases infrastructure needs. In all of our infrastructure, though to varying degrees across the several categories enumerated above, changing technology changes infrastructure needs, which cannot be met without new investment, revisions, and upgrades. Meanwhile, infrastructure wears out with the passage of time, and with use—including from population and economic growth—requiring maintenance and replacement. The United States routinely fails to fulfill these requirements.\(^\text{12}\)

The United States routinely lags other advanced nations in infrastructure quality. This has been an enduring and growing problem. An important cause is that, measured according to the relative sizes of the world’s leading economies, the level of US infrastructure investment falls short of our competitors and has declined over time (see Chart 1).\(^\text{13}\) This failure includes new construction but, notably, also maintenance, capital preservation, and renewal.

Although comparisons between countries are difficult given divergent needs and the challenges of measuring quality, the relative state of US infrastructure appears to have declined since the strong public investment during the Great Depression and following

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Chart 1

Federal nondefense physical investment has generally declined since the 1960s

Direct investment plus, percent of GDP

Source: Budget of the United States Government, Fiscal Year 2021, Historical Tables, Table 9.3.

BUDGET-2021-TAB.pdf (govinfo.gov)
World War II, including the construction of the federal highway system. Analysis of International Monetary Fund data suggests that, compared to other advanced economies, the United States had much-higher-than-average stocks of public capital as a share of GDP in the 1960s but had fallen to below-average levels by the mid-1980s.

By 1988, a congressionally chartered study of public works rated US infrastructure as only average in terms of its performance and capacity. A temporary uptick of infrastructure investment in the financial crisis recovery legislation of 2009 became a virtual bubble, merely a small and short interruption in the longer-term decline (Chart 1 above). While the US economy has remained strong, in part on the basis of past infrastructure investments, infrastructure is no longer a world-leading booster of its performance. For example, one set of global competitiveness rankings that placed the United States second overall, ranked the United States only 13th in terms of its overall infrastructure and 23rd in terms of its water and electric utilities infrastructure, achieving its higher overall competitiveness ranking on the basis of other attributes.

While budgetary stringency squeezes new investment, it crushes maintenance even more, because there is no ribbon-cutting ceremony to motivate the filling of a pothole. Delayed maintenance imposes even more expense, as needed repairs become more costly and catastrophic failure more likely. Lower-quality infrastructure adds business costs that reduce profits and productivity or raise consumer prices—eventually lowering effective wages and employment, economic growth, and the tax base.

The public sector provides the bulk of the nation’s investment in most categories of infrastructure. But not all of that infrastructure investment or decision-making is public—which means that public-private cooperation, government leadership, and the influence of markets are essential to the fulfillment of all of our infrastructure goals. The quality of regulation is an important part of that cooperation and leadership, and of the maintenance of competition in the supply of infrastructure.
Infrastructure Is a Leading Policy Issue that Requires Long-Term Repair

Virtually every part of our diverse, multifaceted infrastructure system is problematic in the view of the US public. And following from that long-term and broadly held dissatisfaction, infrastructure has for several decades been cited as an important first policy initiative for each new administration, and as an opportunity for bipartisan cooperation. Yet somehow, new presidents and Congresses in recent decades have generally not capitalized upon that opportunity.

In 2020, both major-party presidential election candidates campaigned on improving US infrastructure, and both the Republican administration and Democratic congressional leaders proposed significant increases in investment. The then-current President’s infrastructure proposal was the best received part of his agenda, and it enjoyed bipartisan support. The Fiscal Year 2021 budget proposal included a roughly $200 billion infrastructure initiative to increase near-term investments in key priorities, as well as a 10-year, $810 billion reauthorization of existing surface transportation programs equivalent to a roughly 4 percent annual increase in nominal funding levels. The leadership in the House proposed a framework for spending $760 billion on infrastructure over the next five years. But those efforts broke down, as they had over the previous four years, under the pressure of politics.

Continued delays in investment have only increased the urgency of upgrading and modernizing US infrastructure. But policy makers and business leaders should not rush to make short-term patches or quick fixes, which have always produced inadequate results. Instead, leaders in the private and public sectors should join to formulate and advance policies that sustainably deliver world-leading infrastructure—policies that will continually meet the nation’s growing and evolving needs and will support widely shared economic growth while mitigating climate change. The possible inclusion of infrastructure spending in a forthcoming economic stimulus package further increases the importance of building that initiative upon a foundation of reforms that will make it an even more powerful source of near-term growth with an added long-run return on investment. The possible role of private ownership and investment in important sectors of US infrastructure is another motivator of careful policy formulation and reform.
Who Owns, and Who Controls, Our Infrastructure?

To the vast majority of Americans, the word “infrastructure” probably connotes roads and bridges. And, in fact, the interstate highway system is the federal government’s largest commitment to the nation’s infrastructure. However, when viewed more broadly, infrastructure is relatively evenly shared among the federal, state, and local governments, and the private sector. The federal government has enormous influence over infrastructure investment, not only through grants to states and localities, but also through regulation of private investment. But a sound long-term infrastructure program will require cooperation and coordination among multiple economic actors, even though the federal government’s power to tax and borrow, and its constitutional authority over interstate commerce (as well as other matters), give it enormous influence.

Table 1 shows the amounts of investment in various categories of infrastructure undertaken in 2017 (the latest year for which final data are available) by the private sector, federal government, states, and localities. Government is clearly the dominant investor in roadways and mass transit (and also passenger rail), which may be top of mind for many Americans as they encounter daily congestion and delay on their way to their regular destinations. However, the private sector dominates in air, water, and freight rail transportation. And then in nontransportation forms of infrastructure, the federal role is significantly less. State and local governments dominate in education and in water utilities (reliant partly on federal grants, to be sure). Private investors are dominant in energy and telecommunications (though subject to government regulation).

These data are provocative in that government is sometimes believed to be the source of all weaknesses in infrastructure. That surely overstates the case; but the data do not fully acquit government. Clearly, the public are massively dissatisfied with their day-to-day surface transportation, which is primarily the responsibility of government. For example, a Monmouth University poll in 2018 found that 64 percent of all Americans rated the roads and bridges in their area, almost universally funded by and in the control of government, as only fair or poor.23

But US infrastructure fails as well in other areas where private-sector influence is greater. Electric power supply is one. Three researchers have reported that, “The average US customer loses power for 214 minutes per year. That compares to 70 in the United Kingdom, 53 in France, 29 in the Netherlands, 6 in Japan, and 2 minutes per year in Singapore. These outage durations tell only part of the story. In Japan, the average customer loses power once every 20 years. In the United States, it is once every 9 months, excluding hurricanes and other strong storms.”24

Foreign travelers often report that their internet experience overseas is superior to what they enjoy here. A May 2020 Opensignal test rated the United States 25th in the world in overall internet speed.25 The Speedtest November 2020 rankings show the United States 22nd in mobile speed, and 11th in fixed broadband.26 In cellular download speed in May 2019, Opensignal rated the United States 30th.27 These shortfalls relative to the global
state of the art are to some degree due to government regulation, but responsibility must be shared between the public and private sectors.

Thus, responsibility for the deterioration of US infrastructure is shared—between the policy makers from both political parties, and between the public and private sectors. We seek to correct such failures, rather than to relitigate them. Unless those failures are overcome, the nation will continue to labor under a growing weight of insufficient and inefficient infrastructure. This statement begins with a principled framework to address and solve our nation’s infrastructure problems.

### Table 1

**Capital spending on infrastructure in 2017, by category**

(billions of nominal dollars)

<table>
<thead>
<tr>
<th>Category</th>
<th>Public</th>
<th>State &amp; Local</th>
<th>Total</th>
<th>Private</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Federal</td>
<td></td>
<td></td>
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<tr>
<td><strong>Transportation Infrastructure</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Highways (a)</td>
<td>43.8</td>
<td>50.0</td>
<td>93.8</td>
<td>n.a.</td>
<td>93.8</td>
</tr>
<tr>
<td>Mass transit (a, b, c)</td>
<td>8.7</td>
<td>12.5</td>
<td>21.2</td>
<td>4.0</td>
<td>25.2</td>
</tr>
<tr>
<td>Freight railroads (a, d)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>24.8</td>
<td>24.8</td>
</tr>
<tr>
<td>Passenger railroads (a, e)</td>
<td>1.8</td>
<td>0.0</td>
<td>1.8</td>
<td>0.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Aviation (a)</td>
<td>4.4</td>
<td>5.9</td>
<td>10.3</td>
<td>29.6</td>
<td>39.9</td>
</tr>
<tr>
<td>Water transportation (a, f)</td>
<td>1.5</td>
<td>2.1</td>
<td>3.6</td>
<td>5.5</td>
<td>9.1</td>
</tr>
<tr>
<td><strong>Total Transportation</strong></td>
<td>60.2</td>
<td>70.5</td>
<td>130.7</td>
<td>63.9</td>
<td>194.6</td>
</tr>
<tr>
<td><strong>Other Infrastructure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking Water and wastewater (a)</td>
<td>3.5</td>
<td>28.0</td>
<td>31.5</td>
<td>n.a.</td>
<td>31.5</td>
</tr>
<tr>
<td>Energy (g, i, c)</td>
<td>3.5</td>
<td>10.4</td>
<td>13.9</td>
<td>134.5</td>
<td>148.4</td>
</tr>
<tr>
<td>Telecommunications (j, k, c)</td>
<td>0.9</td>
<td>n.a.</td>
<td>0.9</td>
<td>240.9</td>
<td>241.8</td>
</tr>
<tr>
<td>Pollution control and waste disposal (l, i, c)</td>
<td>8.7</td>
<td>4.2</td>
<td>12.9</td>
<td>7.6</td>
<td>20.5</td>
</tr>
<tr>
<td>Postal facilities (h)</td>
<td>0.5</td>
<td>0.0</td>
<td>0.5</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Prisons (i)</td>
<td>0.9</td>
<td>4.6</td>
<td>5.5</td>
<td>n.a.</td>
<td>5.5</td>
</tr>
<tr>
<td>Schools (m, i, c)</td>
<td>0.5</td>
<td>95.7</td>
<td>96.2</td>
<td>41.8</td>
<td>138.0</td>
</tr>
<tr>
<td>Water and other natural resources (a, n)</td>
<td>4.1</td>
<td>5.4</td>
<td>9.5</td>
<td>n.a.</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Total utilities and other</strong></td>
<td>22.6</td>
<td>148.3</td>
<td>170.9</td>
<td>424.8</td>
<td>595.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>82.8</td>
<td>218.8</td>
<td>301.6</td>
<td>488.7</td>
<td>790.3</td>
</tr>
</tbody>
</table>

Notes and sources:


b. Includes subways, bus transportation, and commuter rail.


f. Includes inland waterways, harbors, and port facilities.

g. Includes electricity generation, transmission, and distribution; natural gas transmission and distribution; and oil pipelines.

h. Federal Investment Budget Authority and Outlays: Grant and Direct Federal Programs, Table 17–2, An American Budget: Analytical Perspectives, Fiscal Year 2019; author’s analysis.


j. Includes wired and wireless telecommunications, Internet service providers, fiber-optic networks, and broadcasting.

k. 2017 Annual Report, p. 7, Universal Service Administrative Company; author’s analysis.

l. Includes disposal of hazardous waste and solid waste, includes a small amount of private spending on drinking water and wastewater treatment systems.

m. Includes primary, secondary, higher, vocational, and special education.

n. Includes conservation, dams, and flood control.
Principles of a Sound, Sustainable Infrastructure Policy

Although US infrastructure includes diverse forms of investment controlled by different segments of the public and private sectors, there are some valid common principles in our nation’s approach. And given also the public role in financing and regulation, the nation clearly needs a common resolve if it is to address successfully our infrastructure needs.

Reasoned principles for how to meet the likely considerable cost of closing the substantial US infrastructure gap with greater efficiency include:

- Improve infrastructure planning and decision making through principled public benefit-cost analysis and increased coordination;
- Encourage and facilitate innovation;
- Modernize and streamline regulation;
- Achieve appropriate private-sector involvement in public infrastructure choices through sound use of public-private partnerships (PPPs) and market tests to validate efficient investment choices;
- Explore alternative approaches for utilizing private investment resources;
- Incorporate user fees, including carbon, as one part of a tool kit of more sustainable funding and a method of guiding efficient choices; and
- Incorporate climate risk into evaluations of potential infrastructure investments.

Sufficiency: How can we achieve an adequate infrastructure foundation for our economy?

Because the responsibility for infrastructure investment finance is divided among public and private stakeholders, the decline of US investment relative to need and to the performance of other countries (as reported by the International Monetary Fund; see Chart 1) cannot be blamed on any one entity or class of entities. But, in fact, there is some commonality of behavior across different US decision makers.

In the United States, state and local governments write the largest public checks for infrastructure, though the federal government provides support for those investments through grants, loans, and tax preferences, and also engages in its own direct spending. Federal funding is a significant source of support for transportation and water infrastructure. The Highway Trust Fund, financed primarily by federal motor fuel taxes (supplemented at the state and local levels) and subsidized by federal general revenues (i.e., borrowing), is the largest source of federal funding for infrastructure. Private-sector involvement in the development and operation of public infrastructure, such as in public-private partnerships (PPPs), also has a long history in the United States. However, PPPs
currently account for less infrastructure investment in the United States than in other advanced economies.\textsuperscript{31}

Despite the large economic benefits of smart infrastructure spending, public investment has fallen. According to Bureau of Economic Analysis data, average annual investment in nondefense public infrastructure fell from 4 percent of GDP in the 1960s to 2.7 percent in the 2010s.\textsuperscript{32} Although federal spending, including transfers to states and localities, constitutes less than half of public infrastructure investment overall, the relative decline in federal support—as the economy and population have grown—contributes to declining total public investment. Average annual federal nondefense investment in major public physical capital, including transfers, declined by roughly 30 percent from 1960–1979 to the 2010s.\textsuperscript{33} Given comparative international assessments (such as by the International Monetary Fund) that the United States has suffered, absolutely and relatively, because of the reversal of its prior infrastructure advantage, this investment decline cannot be explained away as the result of an improvement of the productivity of that infrastructure or a decline of need. To the contrary, economic and population growth, and consequent demands imposed by congestion and accelerated wear and tear, would suggest the need for more infrastructure investment, not less.

The United States has not only forgone new productivity-enhancing infrastructure construction and improvements, but also underinvested in maintenance, capital preservation, and repair. Some analysts have estimated that executing all currently deferred maintenance for public infrastructure at the state and federal levels combined could cost as much as $1 trillion.\textsuperscript{34} The monumental rush-hour collapse in Minneapolis of the I-35W bridge over the Mississippi River in 2007 is just one indication of the potential consequences of delay.\textsuperscript{35} And apart from such catastrophes that could cost human life, added costs of damage and time lost are everyday occurrences of worn-down roads and bridges, and of weaknesses in other forms of infrastructure.

Additional resources are clearly needed. However, simply increasing resources without also significantly improving how the US allocates and finances those resources would be shortsighted. Instead, the US needs to confront the fundamental challenges to effective, efficient, and sustained investment that led to the current predicament. Additionally, the US should not only repair all existing assets but also adapt, upgrade, and modernize US infrastructure to meet the long-run needs of a cutting-edge, 21st-century economy.

Summoning the discipline to consider future needs in the face of current wants can be difficult. Dollars are always fungible. Businesses sometimes use rules of thumb to set investment and maintenance budgets up front, and then build their spending for consumables around those long-term needs. Applied with foresight and judgment, such budgeting processes can be successful. However, rules of thumb are vulnerable to a changing world, where hands can gradually shrink and objects to be carried can grow. In particular, public policymakers must recognize when new solutions are needed that require resources to be reallocated from one category of investment or maintenance to another. At the end of the day, discipline has no substitute.

However, the federal government is in a different position now than it was during large infrastructure investments in the mid-20th century. After the record-setting debt accumulation during World War II, the public debt burden (the debt held by the public, as a
percentage of the gross domestic product (GDP); that is, the debt relative to the income flow out of which it must be serviced) fell almost consistently through 1980—from 106.1 percent at the end of fiscal year 1946, to a minimum of 23.2 percent in 1974, and still as low as 25.2 percent in 1981. Over the following 40 years, with a noteworthy interruption in the 1990s, the debt burden has risen substantially—at 79.2 percent at the end of fiscal year 2019, likely not far from 100 percent when final numbers for fiscal year 2020 are available, and without major policy change exceeding the World War II record level within this decade.

There is no definitive safe limit for the public debt burden, and interest rates (and therefore debt-service costs) are currently extraordinarily low, but today’s debt level would have been unthinkable and alarming in the extreme just a few short years ago. Interest rates may remain low for some time, but if they do, they will violate all historical patterns. In particular, if the economy recovers with any vigor, as every American hopes it will, interest rates will surely rise (because businesses will foresee more-profitable investment opportunities and will be willing to pay higher interest rates to raise funds to purchase those investments). When that happens, net interest cost—and therefore the budget deficit and debt—will rise sharply, threatening an accelerating vicious cycle. Financial markets will force extraordinary stringency on spending as well as revenues.

Enterprises that are forced into such budgetary stringency are commonly described as “managing for cash”—a state among whose most prominent attributes are deferring investment and deferring maintenance. That is, of course, an accurate characterization of the thrust of the federal government’s infrastructure policy over the last 40 years, when scholars have said that our competitive infrastructure advantage over other nations has eroded. It would be speculation to assert that the federal government’s large and growing budget deficit over the last 40 years has caused the deterioration of the infrastructure that is wholly or partly federally financed (that is, including state and local government infrastructure whose cost is shared through federal grants). However, it would be fanciful to say that the infrastructure deficit can be easily filled in a coming period of continuing and worsening budgetary stringency. If a nation is to be forward-looking and to make significant commitments for its future, it must have financial stability; and, clearly, on the current course and speed, this nation does not.

Infrastructure investment sufficiency in private-sector programs is less-precisely determined by the federal government’s budgetary stability. However, the federal budget can influence private investment decisions, and, in the extreme, will do so severely. If the federal government were to alarm the financial markets to drive interest rates significantly higher, that would almost surely raise interest rates on those private-sector bonds through “yield spreads” over Treasurys, and so would inhibit private infrastructure investment (and constrain maintenance) as well. (Other sector-specific issues that influence investment and maintenance spending by both public and private entities exist, and they will be discussed below.)

Finally, our large and diverse nation has suffered from differing needs from state to state and region to region. Willingness to fund a national agenda has been weakened by a fear that resources will go somewhere else. Sound decision-making requires awareness that there can be national benefit from infrastructure that meets needs on the ground.
In sum, no single determinant of the willingness and ability of decision-making entities to finance infrastructure investment and maintenance exists. It is clear, though, that federal government fiscal responsibility would facilitate forward-looking policy, and federal government fiscal irresponsibility would make such policy far more difficult. And the federal government’s spending on prudent infrastructure investment and maintenance does itself increase the federal government’s borrowing, and so infrastructure spending itself must be measured and wise.

**Efficiency: How can we build the best infrastructure in a world of scarce resources and competing priorities?**

Resources are always scarce, and so people must set priorities and make choices. Thus, public policymakers have always needed to choose between infrastructure investment and other needs, from national defense to income support for the needy. However, since the one-two fiscal punch of the financial crisis and the coronavirus pandemic caused such enormous budget deficits and exploded the public debt, budget needs at every governmental level have been in even sharper conflict with one another. Infrastructure is one of many high public priorities that must be weighed and traded off against every other need.

For that reason, efficiency—making the best choices, and getting the most for every infrastructure dollar—is even more imperative than ever. Efficiency has an even more precise meaning in economics, where the value of an investment is defined by the willingness to pay for the output of that investment by consumers. And that willingness to pay can be distorted by the nature of some infrastructure as a “public good”—once it is put in place, it can be impossible to exclude any member of the public from using it (as has usually been true of a road, for example). Thus, some economic actors may induce others to pay for a road, and then proceed to use it for themselves.

It therefore behooves policymakers to find ways to measure the true demand for and benefit from infrastructure investments, and then ensure that those investments are available to the citizens for whom they have the greatest value. And in addition, efficient infrastructure requires effective maintenance, which often can be forgotten and ignored when the political process rewards ribbon-cutting ceremonies for new trophy projects much more than necessary repair for existing investments, which may have a higher return on investment than new assets.

**Choose the right projects**

Task number one in an efficient infrastructure system is to choose the best projects to build. The nation cannot afford to miss high-priority needs and waste scarce resources on projects with lesser public benefits.

**IMPROVE INFRASTRUCTURE PLANNING AND DECISION-MAKING THROUGH COST-BENEFIT ANALYSIS AND INCREASED COORDINATION**

Smart investment requires serious cost-benefit analysis that goes beyond narrow, parochial interests to advance projects with the greatest net benefits to society as a whole. At the federal level, that means national benefits; states and localities must
select projects with value within their jurisdictions. Given the substantial role of federal financing in many state and local infrastructure projects, and also the regional, multi-jurisdiction impacts of infrastructure, smart project selection requires substantial coordination in long-term design and planning, bringing together private and public stakeholders across different levels of government and political or geographic boundaries. Improved project selection would reflect data-driven management of both already existing and planned infrastructure assets, identifying the true needs, potential benefits, and life-cycle costs—and compare the relative net value of maintenance or upgrades to existing infrastructure against the construction of new and additional capacity.37

Project selection in our federal system, with an important national financing role, is not easy. From the local point of view, it may appear that distant, faceless bureaucrats are making the decisions. From Washington, local decision-makers with limited perspective can appear to request low-public-value projects that benefit a favored few. In an attempt to drive outcomes, so-called “earmarks” in federal legislation can be abused—and both Republicans38 and Democrats39 have a history of manipulating the system for personal gain.40

Neither the national nor the local perspective has all of the answers. The US approach to infrastructure project selection has been, and should remain, decentralized. State and local decision makers can identify needed and high-value infrastructure improvements. But decision makers at all levels should face scrutiny and accountability for funding choices. And standardized metrics, which can be developed and executed at the federal level, should guide project selection, incentivize cooperation among private and public stakeholders, and encourage best practices in financing and management with federal infrastructure funds. Such an analysis of top-priority infrastructure projects nationally could illustrate the application of cost-benefit analysis across regions and types of projects, encourage discussion and critiques, and build support for high-value projects that may be difficult to execute under current jurisdictional arrangements.41

The selection criteria and analysis must address social inequities, climate change, and environmental stewardship.

Encourage innovation

Infrastructure investments will both shape and be shaped by technological innovation. Helping US businesses take full advantage of improvements and breakthroughs in science and technology will maximize economic opportunities and prosperity for all Americans.

As technology advances, Federal infrastructure policy must respond to the changing environment. It cannot be constrained to particular categories of infrastructure, following past allocation formulas, and rules of thumb. Instead, it must push spending toward assets and solutions that best achieve a community’s or region’s particular needs, recognizing that the best choices will change with the changing times. For example, dedicated funding for roads or rails will lead to rigid road- or rail-based solutions in proportion to the funding provided last year or 10 years ago, even if a different balance or approach—perhaps one not yet recognized or that places more emphasis on data infrastructure, including access to high-performance broadband, over physical mobility—could better achieve the region’s goals. It is difficult to prescribe which innovative infrastructure
investments the nation should pursue, precisely because change is constant, and no one knows the future. However, it is certain that policy must be forward-looking and nimble.

**Reduce the cost of financing**

Both as a possible matter of constitutional law and as a subsidy to state and local government borrowing, taxable income under the federal income tax generally excludes interest on state and local government bonds. This exclusion is characterized by some as a pernicious “loophole,” but that is not necessarily true. If all taxpayers (individuals and corporations that are potential bond buyers) faced the same marginal tax rate, they would bid away all of the tax advantage for state and local government bonds relative to, say, corporate bonds of the same degree of risk. (Thus, as an example, if all taxpayers were in a 20-percent tax rate bracket, and a taxable corporate bond of a given level of risk yielded 5 percent, a state or local government bond of the same risk would be bid to a yield of 4 percent, and there would be no net yield advantage to a taxable investor from buying either bond; the issuing jurisdiction would save 1 percentage point—20 percent—of the interest cost.)

However, not all taxpayers are in the same marginal tax rate bracket, and so there can be a pure tax advantage for taxpayers in higher tax rate brackets. (In the example above, a taxpayer in a 40-percent tax rate bracket would earn an after-tax premium by buying a state or local government bond yielding 4 percent.) At the same time, nontaxable entities (such as endowments or pension funds) have no reason to buy state or local government bonds at all. The result is a smaller market for state and local government bonds, and a benefit to high-income taxpayers over and above the subsidy to the borrowing governments. This outcome is undesirable on both counts.

Federal policymakers should explore the option of a refundable tax credit, available even to nontaxable entities, to replace the tax exclusion for state and local bond interest. This alternative would make state and local government bonds potentially attractive to an entirely new market of endowments, pension funds, and insurance companies. It would also eliminate the windfall to upper-bracket individual income taxpayers. There would surely be a debate over how large the tax credit should be, and some advocates of the affected governments might fear that the tax credit could be cut in the future. However, the fundamental benefit of this policy change is worth investigation.

**Build at the lowest cost without sacrificing quality**

Once infrastructure projects are selected, they must be built at the lowest possible cost without sacrificing quality to make our scarce resources go further. In recent years, however, infrastructure investment has suffered from considerable cost drags, and projects that pursued false economies have added to long-term costs.

**Stagnant construction productivity**

The cost of infrastructure investment in the United States has grown significantly and appears to be higher than in other advanced economies, though the drivers are not clear.\(^{42}\) One study found, after adjusting for inflation, the cost of building a mile of interstate highway in the United States tripled between the 1960s and the 1980s,
while labor and materials prices did not increase much.\textsuperscript{43} Similarly, studies have found US rail projects to be significantly more expensive than comparable projects in other advanced economies.\textsuperscript{44}

Slow productivity gains may also be restraining US infrastructure purchasing power. One 2016 study found that US construction sector productivity, which was largely stagnant in the 1990s, declined significantly and steadily after 2000.\textsuperscript{45} Additionally, given the nation’s large existing investment needs and slow productivity growth in construction, the United States should review its research and development efforts in infrastructure for new and unexploited opportunities. Increasing investment in innovation, perhaps making use of advances from other parts of the nation’s research portfolio, could spur comparatively quick and long-lasting improvements in economic opportunity and quality of life.

Reduce regulatory burdens

Health, safety, and environmental standards have proliferated over time, leading to longer review times that slow planning and add costs, motivating attempts at reform.\textsuperscript{46} A 2018 analysis found that the median time for review of a federal project under the National Environmental Policy Act (NEPA) in the 2010s was more than three and a half years, with an average completion time of more than seven years for Federal Highway Administration and Federal Aviation Administration projects.\textsuperscript{47}

CED has consistently advocated “smart regulation,” subjecting new regulations to rigorous cost-benefit analysis and reviewing existing regulations for continuing cost-effectiveness to enhance efficiency and achieve both greater benefits and lower costs.\textsuperscript{48} With long delays between project conception and execution, and often multiple layers of jurisdiction and review, a smart regulation approach could ensure that the rules governing review and permitting of projects address all important concerns and ensure that net benefits are maximized over time at all levels of government, on a comprehensive and timely basis.

The federal government and the affected states should convene all stakeholders and public entities throughout the relevant region to ensure that the oversight process is stripped of duplication and optimized for the national interest across all levels of government. Like other efforts aimed at encouraging innovation, an efficient regulatory regime would facilitate faster deployment of new technologies and upgrades to existing infrastructure assets to capture economic opportunities, increase resilience, and reduce environmental impact. In areas like broadband, regulations should ensure that providers must compete over customers based on innovation, quality, and price rather than rely on barriers to entry or other forms of “crony capitalism.”

Better utilize private-sector involvement through appropriate public-private partnerships

Much of the nation’s infrastructure investment is in the nature of public goods, which are, by nature (or should be, in the public interest) available to all without restriction. However, in some instances, the services provided through infrastructure can be priced, and should be provided on the basis of willingness to pay. In those instances, well-designed
public-private partnerships (PPPs) can incentivize efficiency, innovation, and long-term performance while transferring certain financial risks—like cost overruns and delays—from the public to private investors.49

PPPs vary in form, with private-partner responsibilities ranging from the execution of simple operation and maintenance contracts for fixed periods of time, all the way to accepting ground-up involvement in the development, design, delivery, and long-term management of a new public asset. Private-sector investors and operators expect to recoup their costs and profit from users directly or from government payments for the development or upkeep of an asset. As a result, the clearest cases for PPPs arise when a project can be funded, directly or indirectly, from a revenue stream derived from users. This includes the case of some existing assets where privatization or private-partner operation could encourage innovation, efficient operations, and sustained upkeep and modernization. Long-term contracts of that nature can force the rigorous consideration of full life-cycle costs; one of the strongest criticisms of the worst examples of public provision of infrastructure is that a “build-it-and-forget-it” approach—where available resources are exhausted in construction—leaves the asset to deteriorate to inefficiency.

Although it was a small project, Florida’s I-595 corridor project is often held up as a model PPP, where periodic performance-based payments to the private-sector builder, operator, and maintainer of the project have primarily come from public revenues levied through tolls on the express lanes constructed as part of the improvement project.50 The use of a private-sector provider helped speed completion of the asset by several years, benefiting drivers sooner, and allowing the state to begin collecting express lane toll revenues sooner as well.51

PPP agreements may relieve a government of some development, design, construction and maintenance tasks—or supervision of private-sector contractors in such tasks—in which the government may not be expert. However, PPPs are limited as a comprehensive solution, since they are usually applicable to the most profitable projects and they are not a guarantee of success. Private-sector partners may fail to complete a project or contract and may underperform in long-term responsibilities such as maintenance, leaving the contracting government to seek legal remedies in a protracted lose-lose relationship.

Furthermore, contrary to the presumptions of some, private financing cannot increase overall infrastructure funding, and it may or may not match what are usually very low-risk (or no-risk, in the case of the federal government) interest rates; thus, some argue for tax incentives to aid private partners in raising up-front capital. Private contractors may attempt to exploit only the most profitable projects, meaning that public authorities must vigorously pursue competition among alternative builders. However, a well-conceived PPP might speed the funding process and, when user fees are the expected future revenue source, help signal that project benefits are expected to exceed costs.52 Additionally, by establishing the financing of operations and repairs up front, PPPs can be a kind of credible commitment by public entities to the long-term upkeep of infrastructure assets.

A 2020 Congressional Budget Office review concluded from limited evidence that PPPs appeared to lead to faster design and build times and lowered costs compared to
public-sector equivalents but only “by small amounts on average.” Thus, a PPP is not a certain path to project success; as in any public infrastructure investment (or for that matter, any private enterprise), execution is everything.

While most sound infrastructure projects will not suit PPP-style collaboration, policy leaders should take full advantage of PPP models when appropriate. American governments at all levels should encourage private-sector participation with proper oversight, including against manipulation.

Explore alternative approaches to utilize private investment resources

PPPs are one way in which private investment resources can be utilized to improve public-sector infrastructure investment, but not the only way. Private-sector funding, particularly through tax-exempt municipal debt issuances, is a central element of the current US approach to infrastructure financing. However, creative financing mechanisms like Transportation Infrastructure Finance and Innovation Act assistance and the currently lapsed Build America Bonds program have also been successful in encouraging the efficient upfront utilization of private investment resources, including by expanding which nongovernmental investors can participate in infrastructure project financing.

Policy makers should continue to explore, evaluate, and support creative alternatives that could broaden the range of investors, lead to gains in cost-efficiency, or otherwise widen the available options for drawing private-sector capital into public infrastructure investment.

Employ user fees to gauge the value of, and finance, infrastructure projects

In theory, “user-pay” models can promote efficient project choices and achieve sustainable financing (and arguably, social fairness) by ascribing the cost of operating infrastructure to the people who most directly benefit from it. Thus, one argument for PPP arrangements, when they are appropriate, is that they impose an acid test that the public must value a project above its cost, or else no private investor will undertake it. On the other hand, because infrastructure can have spillover benefits like increased property values, improved environmental outcomes, or decreased congestion for alternative assets, identifying actual beneficiaries is more complicated, and it is possible that benefits to the broader society that cannot be priced would justify a project that cannot finance itself with user-paid collection.

But, generally, where they are appropriate, user-pay models yield better and fairer outcomes. Because sustainable long-run funding for the maintenance, improvement, or replacement of infrastructure assets is hard to come by, governments should explore funding a greater share of infrastructure needs through user-based fees. Opportunities for new or improved user-pay approaches to financing should be considered across infrastructure assets, including for rail, airports, and ports. Highway construction and maintenance have long been funded by user fees, but particular circumstances complicate that issue, as discussed below.

A further development of user-pays financing is peak-load pricing. In several applications, including highway use and electric power, peak-load pricing can encourage users collectively to utilize infrastructure more evenly across the day. That can reduce the need for greater capacity to handle the heaviest load of traffic or the greatest demand for power.
The Congressional Budget Office has concluded that imposing user-pays models with peak-load pricing would significantly reduce the need for infrastructure investment, and thereby save resources and better meet society’s needs for infrastructure and for other public priorities simultaneously.60

**Recommendations**

1. Reestablish long-term federal fiscal sustainability, to create more room for enduring investment.

2. Rigorous cost-benefit analysis is essential. The federal government can provide technical expertise, but on-the-ground input as to both costs and benefits is needed as well.

3. Long-term investment is needed, but maintenance and renewal must be allowed to compete for infrastructure dollars on the basis of benefits and costs.

4. Federal, state, and local decision makers must coordinate (including across states and localities) to avoid duplication and delay during project approvals.

5. Research into infrastructure investment technology is needed to improve productivity and reduce costs (e.g., longer-lasting highways with thicker paving). Maximum competition is also needed to get the best infrastructure at the least cost, and regulation must promote competition.

Where it is feasible, “user pays” financing can steer infrastructure investment to where it provides the greatest value. Where public-private partnerships are appropriate—which is for only some of infrastructure—they can supplement public expertise and resources and facilitate consideration of maintenance and full-life-cycle cost.

**How can we balance near-term pressures against long-term needs?**

With “managing for cash” having become routine—even reflexive—postponing investment and maintenance is the default position in the nation’s fiscal plans. But now in the pandemic, it is too easy to reshape such short-termism into a new but equally ineffectual form.

The pandemic hit on the nation’s economy is extreme. The nation lost almost 14 percent of its employment—much more than the total of the 2008 financial crisis, and most of the three-year drop during the Great Depression—in one month. Recovery was sharp but incomplete.

In past recessions, public infrastructure has been seen as a quick fix—an easy lever to pull to create jobs with “shovel-ready” projects.

An early increase in public resources for infrastructure could contribute to economic recovery now. Ensuring that all public infrastructure budgets are fully restored would
bring back the construction jobs that have been lost. However, that cannot be the point of a comprehensive, long-term infrastructure policy. The initial scale would be too small, and the timing would be too late.

In November 2020, nonfarm payroll employment was down 9.8 million from its February 2020 peak.61 Restoring public infrastructure spending cuts would bring back the 70,000 (0.07 million) heavy construction jobs within that much larger total. However, as Chart 2 shows, the job loss in construction was proportionately about the same as in the economy as a whole, and the worst of the problem lies elsewhere.

Similarly, as shown in Table 1, total public infrastructure investment spending in 2017 was under $300 billion. Infrastructure investment requires machinery and materials as well as labor. Presumably, the maximum feasible quick-turnaround increase in investment spending would be some fraction of that $300 billion. But pandemic recovery legislation in 2020 spent about $2 trillion.

It would make sense, as CED has recommended,62 to restore any funding cuts to public infrastructure programs, and resume activity to the fullest degree consistent with public health. Simply reopening suspended projects that were already approved would address already recognized and agreed-upon needs. Its employment impact would be comparatively small, but it would take the infrastructure industry back to its level at a time of full employment just before the pandemic. Ultimately, we believe that the infrastructure industry will need to be larger (given the large existing infrastructure gap), but also
different; and expanding the industry even in its current outlines will take time, as logic and recent history teach us.

Formulating new infrastructure projects beyond what was already approved before the pandemic will take time. A precedent for that process would be the relevant provisions of the 2009 American Recovery and Reinvestment Act (ARRA), which was intended to provide early impetus to economic recovery in the wake of the financial crisis of 2008. As Chart 3 shows, the infrastructure-related provisions of ARRA outlayed funds into the economy significantly slower than the other provisions in that law. Furthermore, although some had hoped that the economic recovery law would prove a sea change, the economic-stimulus-driven provisions of ARRA proved to be only a one-time boost to public investment, as Chart 4 indicates; and the US infrastructure deficit clearly persists, as the discussion above makes clear. And finally, some (but not all) new jobs in infrastructure would replace, rather than add to, existing employment.

CED believes that the new Administration and Congress should capitalize on the current opportunity to create a new and expanded approach to US infrastructure investment. And CED believes that such a program will contribute to a more-rapid economic recovery. But we do not believe that short-term economic stimulus should be the main focus of a comprehensive infrastructure program. Rather, we urge that our newly elected policymakers create a cost-efficient, sustainable, long-term-oriented infrastructure program, which builds the productive capacity and productivity of the economy, and which

![Chart 3](https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49958-ARRA.pdf)
provides, but is not designed exclusively and specifically for, near-term stimulus for the current economic recovery.

**Incorporate technological change, climate risk, resilience and adaptability concerns into evaluations of potential infrastructure investments**

The life cycle of many infrastructure investments is measured in decades, but the pace of technological and environmental change, already shocking to those who have lived through the post-World War II decades, continues to accelerate. One key reason why CED believes that infrastructure policy must focus on the long term, perhaps more than ever before, is because change is so extraordinarily rapid. Uncertainty is, perhaps, unprecedentedly high. Short-sighted policy could, therefore, incur enormous costs but, equally importantly, could miss important opportunities.

One example of opportunities potentially lost, highlighted below, is the promise of autonomous vehicles. Sensors on autonomous vehicles require minimum standards and consistency in roadway markings. Highway investments that do not anticipate such needs could require expensive retrofitting in only a short time. This is just one example of potentially lost opportunities; there are many more, including potential improvements in the generation of electric power, which will also be discussed below.

But shortsightedness, or simple failure to appreciate uncertainty, carries pure downsides as well as missed upsides. Investment decisions made today can lock in current technologies, with their carbon footprints and weather and climate effects. Given present large uncertainty, analyzing and pricing such risks will be essential to achieving

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**Chart 4**

*Infrastructure increase in 2009 stimulus proved only temporary*

Federal direct nondefense physical investment, percent of GDP

Source: Budget of the United States Government, Fiscal Year 2021, Historical Tables, Table 9.3.

BUDGET-2021-TAB.pdf (govinfo.gov)
sound infrastructure decisions. To avoid making such mistakes, options that preserve flexibility, even though they may add some short-term cost, may be preferable to irreversible decisions.

Changes in climate pose potentially sizable risks to the apparent value propositions of long-term assets, even though the timing and severity of those risks will likely remain uncertain. Serious cost-benefit analysis requires that preparation for climate-related stresses or hazards—including more extreme weather events, such as increased flood, wildfire, and drought risks, and other negative outcomes—be included in the evaluation of potential infrastructure investments.

**Recommendations**

1. Full funding of pre-pandemic infrastructure projects will restore jobs, and further jobs will be created as greater priority is devoted to infrastructure construction and maintenance. But short-term job creation should be a result of long-term investment value, rather than serve as an end in itself.

2. Infrastructure investment decisions should consider long-term risks such as climate change and resilience.

3. Infrastructure decisions must include preparations for changing technologies such as autonomous vehicles and advancing digital communications.

**Equity: How can we advance every segment of our society, including currently underutilized regions and their human resources?**

If parts of the country are underdeveloped, infrastructure in isolation may not provide the value to support itself. But without that infrastructure, those parts of the country may stay underdeveloped, and fall farther behind. The resources there, most notably human resources, are wasted; and the entire nation is poorer as a result. Thus, insisting on a strict execution of the “user pays” principle can achieve a more efficient distribution of infrastructure resources today, and a lesser supply of all resources tomorrow. It can make our federal system much more like a zero-sum game. A comprehensive plan to address our extensive infrastructure needs must address the needs of less-developed regions of the country.
Major Sectoral Infrastructure Issues

The broad principles discussed above apply, to a greater or lesser degree, to each of the categories of infrastructure as defined for purposes of this statement. But in many respects, these different categories of infrastructure are distinct and pose unique challenges. Within sound general principles, public policy must address each of these branches of infrastructure separately.

Roads and bridges: Federalism, financing, technology, and the environment

The nation’s roadways are probably the most visible and recognized segments of its infrastructure.[63] Before the pandemic slowed commerce and accelerated remote work in the economic activity that continued, congestion and delays in daily commutes and other travel were frequent complaints in opinion polls. Congestion has intensified as the economy and the population grew, particularly around urban centers, and policy makers have not made any perceptible public policy response. In fact, the federal government’s highway spending authorization bill, which is routinely reenacted in a five-year cycle, expired on September 30, 2020, and has not yet been reauthorized. Problems extend beyond the delay of new investment; maintenance is at risk as well. The 2007 collapse of the Mississippi River bridge in Minnesota not only caused injuries and loss of life but also had estimated negative economic impacts in the state of up to $60 million spread across two years.[64]

Federal funding for the states to build and maintain roads, bridges, rail, and other modes of surface transportation comes from the federal highway trust fund. The great bulk of the revenues into the trust fund comes from the federal excise tax on motor fuels, and thus inflows into the trust fund generally equal what those tax revenues happen to be in any given year. The federal motor fuels tax, which is set as a number of pennies per gallon of gasoline, has not increased since 1993 and, thus, has fallen behind inflation. Meanwhile, under the pressure of the environment and climate change as translated into federal fuel economy standards, the number of gallons of fuel consumed per vehicle mile has fallen. Of course, highway wear and tear per vehicle mile remains the same, while population growth has increased the demand for highway capacity.[65]

The federal grants from the highway trust fund to the states are based on formulas, both in terms of the aggregate and how it is distributed. For more than a decade, the inflows from the fuel tax have been less than the formula outflows, and so the trust fund balance has eroded, save for occasional general revenue transfers to replenish it.

With the highway trust fund, in effect, managing for cash, highway spending has continued on autopilot despite an environment of technological turbulence and growing congestion. This has constrained all highway spending, but to the extent that population growth and relocation to growing centers of commerce have increased demand for
construction, pressure has fallen especially hard on maintenance. And it is in this stalemate that the surface transportation program is waiting for reauthorization, and the underlying policy has been essentially frozen for years.

Such inaction can be costly. It degrades road and rail transportation, imposing additional risk to the safety or health of drivers and passengers and increasing congestion, delivery times, environmental impacts, and repair costs for vehicles. The average American worker spent 225 hours commuting to and from work in 2018, a record high.66 One analysis found that congestion costs urban Americans extra travel time and extra fuel worth $166 billion annually.67 The estimated average congestion time lost per auto commuter has increased over 40 percent since the turn of the century as capacity and alternative transportation options failed to keep up with growing numbers of commuters in population centers.

The places that best, and most quickly, adopt the regulatory and infrastructure investment posture needed to facilitate the economic opportunities and gains from new technologies will have a considerable advantage in the decades ahead.68 The potentially key technology of autonomous transport could transform how we organize and conduct business and consumer activities. A city or a nation that achieves the necessary infrastructure changes—digital and physical—for autonomous transport may gain significant early mover benefits if the technology proves to be transformative.69 Standardization of road markings and curbside spaces, regulation of safety standards, cybersecurity standards and insurance rules, and harmonization of potentially confusing jurisdictional issues may be critical.70

The federal government could also achieve better results per dollar invested by improving standards for cost-benefit analysis of new projects, as recommended by the National Surface Transportation Policy and Revenue Study Commission,71 and rewarding states that achieve such standards with greater funding. Research also has shown that thicker asphalt roadways, though more expensive in the near term, are cost-effective in the long run because they are more durable.72 Such research suggests that additional funding for research on infrastructure could be productive.

But all such advances require adequate finances. The current system has demonstrably failed, but consensus on an alternative is elusive. Every roadway user naturally wants a system under which someone else pays more. That has always been true with respect to the formula for geographical sharing of federal fuel tax revenues, and states are reluctant to raise their own fuel taxes because of their fear of fueling stations and revenues moving across their borders to other states.

Environmental concerns are yet another complication. The fuel tax has long been seen as an incentive to reduce consumption, to in turn reduce carbon emissions and other pollution. In the past, fuel consumption was a reasonable proxy for highway use as well, and so the fuel tax was a reasonable approximation of a “user pays” fee. With the growing market share of electric vehicles (or electric hybrids, collectively referred to as EVs), however, the link between fuel use and highway use is breaking.73

The market share of electric vehicles is rising slowly now, in part because of low US gasoline prices, but Deloitte projects that by 2030 electric vehicle sales will reach 27 percent of the US market (and will be much higher in the rest of the developed world).74
As EV sales increase, fuel tax revenues fall or at least grow more slowly, aggravating the shortfalls in the highway trust fund. (Of course, if electric vehicles completely took over the market, there would be virtually no funding for highway construction and repair, apart from the miscellaneous smaller sources received by the trust fund.)

The most prominent alternative to the fuel tax is a mileage tax that would be charged through wireless sensors installed in vehicles; such sensors are used for toll payments on a voluntary basis, but would need to be made mandatory, installed in all vehicles, verified for compliance, and protected in terms of user privacy if they were to provide for all highway construction and repair funding. Optimally, they would also need to transmit the weight and location of the vehicle to correlate fees to true wear and tear on the road.

If the early growth of electric vehicles continues, which will probably require further technological innovation in battery storage, the debate on a mileage-based fee will intensify. And while some would see a transition to a mileage fee as an appropriate shift toward charging all users of roadways for the wear and tear they impose, others will challenge it as a penalty on users of environmentally preferable low- or no-emissions vehicles, and would instead favor the much simpler step of merely increasing the fuel tax or (for the federal government) imposing a new federal tax on consumption of electricity or (for state and local governments) increasing any existing taxes on electricity.

And certainly, given the physical challenge and expense of a transition to a mileage-based charge for the entire vehicle fleet, and the urgency of restoring adequate revenues for the highway trust fund, a near-term increase in the fuel tax would seem imperative. Realistically speaking, the cost of driving in the United States remains quite low relative to much of Europe and even neighboring countries like Mexico. This is a large country, and many customary driving distances are long; but the nation can afford to maintain its roads and bridges collectively, and accurate user-pays pricing through an increase in the current fuel tax or the imposition of an alternative tax such as an electric utilities tax should be considered.

States share the cost of maintenance and expansion of the highway system out of their own revenues, in addition to the grants they receive from the federal government. The states do face a tradeoff between the bond ratings they maintain and enjoy, and their potential access to credit that they could use to contribute to the cost of their highway systems.

In sum, the US system of roadway finance must change; financing has been inadequate for more than a decade. With adequate financing, highway policy can not only secure greater infrastructure adequacy today, but also become more future-focused to achieve greater productivity (through autonomous vehicle travel) and greater durability and therefore fewer travel delays for extensive maintenance and rebuilding.

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**Recommendations**

The Highway Trust Fund must be put on a sustainable footing. In the short run, that will require increases in the fuel tax. In the longer term, assuming a continuing shift toward renewable fuels, a tax on electricity consumption or a mileage charge should be considered as at least a partial substitute for the fuel tax but must not in the intermediate term be allowed to negate totally the environmental incentives currently delivered by the fuel tax.
Air travel: Uncertainty and technology

Given the pandemic, the future of air travel is highly uncertain. As is the case with so many entities in the economy, the future will depend on the course of the pandemic itself, the extent to which policy shores up shaky enterprises until the pandemic lifts, and just what public health restrictions will remain in the close confines of passenger aircraft, and for how long.

Prepandemic, perhaps the major complaint of the flying public was congestion. Congestion adds uncertainty to travel time, which harms both commerce and quality of life. A 2014 analysis by the US Travel Association suggested that air travel delays and cancellations stemming from airport congestion could motivate up to 38 million fewer plane trips annually, with a potential economic loss of roughly $36 billion.

A key cause of delays in our air travel system is our outmoded and inefficient air traffic control (ATC). Critics argue that the management of air traffic control by the federal government, through the Department of Transportation’s Federal Aviation Administration (FAA), is inappropriate for what amounts to a high-tech, multibillion-dollar service business, which could just as easily meet safety and other social concerns under private management—as do the airlines themselves, cruise lines, and other service businesses with similar responsibilities.

The FAA has been working on modernizing the system, with the Next Generation Air Transportation System, or NextGen, for many years, and full rollout is likely to take another half decade or more. As planned, NextGen would facilitate quicker takeoffs and landings, better ground-traffic management of aircraft, and would allow aircraft to cruise closer together with better ground control and no loss of safety.

Critics, seeing past delays in the system, fear that government decision-making and funding uncertainty threaten continuity and rollout. Although progress has been made, those critics would argue for a more businesslike relationship between the air traffic control authority and air carriers and would fund the system through negotiated charges with the carriers rather than the current government ticket fees. They argue that more-efficient pricing of scarce ATC resources would lead to more-efficient flight scheduling and therefore reduce congestion and delay both in the air and on the ground. Privatization of ATC deserves careful consideration, given that many similar responsibilities already are devolved to the private sector.

An additional cause of air travel delays is inefficient use of airport facilities, which are constrained by the availability of gates. Pricing gate availability with a kind of congestion fee would affect the tradeoff between the number of flights and the sizes of aircraft used, especially on heavily traveled routes and in larger airports, and could reduce congestion both in the air and on the ground.

Many Americans who experience air travel delays sitting in an airport may conclude that the best way to ease the pain is to make the airport more comfortable and more aesthetically pleasing. Eliminating the delay in the first place may be the best first step, but airport crowding is clearly unpleasant. The vast majority of US airports are owned by state or local governments or regional consortia of such governments, and must live within their means from Passenger Facility Charge (PFC) fees, and fees and rents on tenants,
with some federal grants. Many legacy airports in congested metropolitan areas where expansion is difficult and replacement would entail serious service interruptions have difficulty meeting passenger preferences within those budget constraints. If the nation should decide that it is a public priority to modernize airports, there will be enormous conflict in deciding which localities should benefit from federal assistance, or whether there should be a fund for all airports that should be distributed by some formula.

### Recommendations

Privatization of air traffic control and congestion pricing of airport gates are worthy of serious consideration to reduce congestion and speed travel.

### Electric and natural gas power: Sun, wind, tides, and storage

The US electric and natural gas generation, transmission and distribution system is a case study in long-lived assets in a world of rapid technological change. The backbone of the electricity transmission and distribution network is generally 50 to 70 years old and is showing its age; the natural gas pipeline system is similarly aging. The electricity grid is also capacity-constrained in some of its segments and has shown vulnerability to severe weather and cyber or terrorist attacks.

US power interruptions appear to be more frequent than in comparable developed nations around the world, although authorities argue whether that is a sign of weakness, or merely economizing on reliability that is “good enough” in market sectors where the highest reliability is not critical. A publication of the Energy Analysis and Environmental Impacts Division of the Lawrence Berkeley National Laboratory reports that “Adverse weather, equipment failure, human error, vegetation management practices, wildlife, and other, occasionally unknown factors have been documented as causes of power interruptions. The US Department of Energy (DOE) reports that adverse weather is the most common cause of power interruptions, and that the weather-related impacts to the power system have increased significantly over the past 20 years... In addition to the potential for more frequent and extreme weather, aging power system infrastructure and an observed decrease in power system reliability highlight the importance of projecting the costs of future power interruptions to customers.”

California has suffered a unique combination of brownouts and wildfires in recent summers. Their causes are an infelicitous coincidence of short generating capacity caused by rapidly decommissioning conventional power plants in a rush to decarbonize; record hot and dry seasons, without wind (which has reduced wind turbine output); and electricity grid and distribution network failures (caused by a lack of maintenance including failure to clear combustible trees near the lines, which have interfered with the rerouting of scarce power and started some of the wildfires). One lesson of the California experience for other states is that a reserve of generating capacity must be maintained as existing fossil fuel units are phased out.
Market change has been rapid. Both climate concerns and cost have driven fuel demand away from coal and toward natural gas. But at the same time, renewable sources are becoming more prevalent, again because of climate concerns and because of falling cost; total energy consumption has been essentially flat for 15 years (notably, in a growing economy and with a growing population, meaning that the economy as a whole has become more energy efficient), while consumption of renewable power has almost doubled, admittedly from a very low base.\textsuperscript{90} In a sense, the adoption of electric vehicles is in a race with the growth of distributed power generation (and all energy-efficiency and storage improvements) to determine needed total electricity-generating and transmission capacity.

The necessity of carbon reduction in power generation imposed a constraint on our economy, and constraints impose costs. The advances in carbon-reduction technology did not come cheaply. But necessity here has proved to be the mother of invention, and now that some (hopefully much) of that cost has been borne, the nation is left with the opportunity of cheaper, as well as lower-carbon, power.\textsuperscript{91}

Some might argue that the aging electricity grid is a rational response to technological uncertainty, in that distributed generation and renewable power could reduce the need for additional capacity. However, interruptions and vulnerabilities would remain a concern, and if the grid were to take advantage of distributed generation to purchase and share power, it would need to be technologically updated to better integrate central production of power with distributed sources. Further, costs of grid improvement added to utility rate bases would raise rates for lower-income households, which suggests the use of creative or even public financing to hold those costs down.

Questions remain as to how rapidly distributed-power technology will advance. Distributed solar and wind power generation are of course intermittent, at this time storage technology lags behind generation, and resilience in the face of weather events remains a question. The electricity sector needs reliability and resilience, which requires that a system increasingly composed of solar and wind power assets must have grid resilience assets such as natural gas power plants available to supply power during periods of intermittent solar and wind production and interruptions because of extreme weather events.

Development of advanced battery technology is also a top priority. Technologists and environmentalists are interested in the use of the batteries in electric vehicles for residential storage of power, but there are technical issues, and their capacity is limited.\textsuperscript{92} If centralized base-load generating capacity remains necessary for emergency situations or when sun and wind power fail, then so will a capable power grid. Experts will debate what the fuel for centralized base-load capacity should be. That question may be answered by both the generation and the carbon-mitigation technologies that are available and what their potential scales could be. Effective carbon capture for centralized generation would be a competitor for either distributed or centralized generation with renewables.

Research on low- and no-carbon power generation is potentially highly valuable.\textsuperscript{93} Quicker permitting for both centralized power generation facilities and a more robust
distribution grid, consistent with environmental, health, and safety protection, are needed. Cyber security and safety from extreme weather events are necessary as well.

**Recommendations**

The electricity sector needs reliability, which requires some redundancy and excess capacity, along with rigorous evaluation and maintenance of the power grid and distribution network. Investing in developing advanced battery technology is a top priority. Climate risk must be factored into decisions about long-lived assets. Synergies between distributed power generation and electric vehicles are among the many technological uncertainties that must be considered.

**Broadband: Competition, democracy, and the last mile**

Even before the pandemic, there was an evidentiary case to be made that the United States has suffered from insufficient access to high-quality broadband. One industry-aided study finds that doubling broadband speeds in OECD countries is associated with a 0.3-percent increase in annual economic growth, while a 2009 study estimated that a 10-percentage-point increase in broadband penetration in high-income economies would lead to a 1.2-percent increase in the growth rate of GDP per capita.

In addition to forgone improvements in speed, the failure to expand broadband penetration more widely can have economic consequences. Workers living in communities with unreliable or limited access to high-performance broadband will miss out on opportunities for education, skill building, and employment that could increase their prosperity, while businesses employing such workers will have less flexibility in how they function without reliable options for remote work. Systematic shortfalls in broadband access in, say, core urban and rural areas can contribute to economic inequality today and reduced opportunity that perpetuates that inequality tomorrow. Conversely, broadband connectivity can be transformative across multiple problem areas of American society.

Declining infrastructure investment could lead US businesses and communities to miss out on or be slow to adopt new technologies that provide critical advantages in assessing markets or delivering services more efficiently or more widely. Infrastructure plays an enormous role in connecting Americans, and American products, to each other and the world, both physically and digitally.

In recent decades, connectivity to broadband is credited with changing how companies operate and how business is conducted, but adoption remains incomplete, with some US communities and their economic competitiveness disadvantaged by unreliable or low-quality service. The Federal Communications Commission estimates that more than 20 million Americans still lack access to broadband connections of a minimum speed capable of originating and receiving high-quality voice, data, graphics, and video telecommunications, including roughly a third of Americans who live in rural areas.
In some sectors, a lack of affordable, high-quality access to globally competitive broadband is likely already restraining potential productivity growth. For example, a 2019 USDA analysis found that deploying existing agricultural technologies at scale—which requires high-performance broadband connectivity—would result in “economic benefits equivalent to nearly 18 percent of total production” on farms.99

But now, experience in the pandemic has demonstrated even more vividly that the nation’s failure to invest in internet capability has come at a cost. The ultimate reach of remote learning opportunities this past spring is unclear. Although more than four-fifths of surveyed parents reported that their children were engaged in an online learning program at the beginning of April, a survey of teachers found that less than 40 percent of them were interacting with students on a daily basis.100 A Center on Reinventing Public Education analysis found that only 1 in 3 districts required that teachers “provide instruction, track student engagement, or monitor academic progress” for all students, though many teachers outside of those districts likely did so.101

One online math program showed a deep and durable drop in student participation after mid-March, as well as a drop (but then a gradual recovery) in the pace of coursework completion.102 Of further concern, the drops in participation and completion were larger and more permanent for students attending schools in low-income ZIP codes. By comparison, the pace of online math coursework completion by students in higher-income areas increased substantially in the pandemic period, presumably because more learning was shifted to the online program.103 This shows the disadvantage suffered by the one-third of Americans lacking broadband connections who live in rural areas, and the many others likely in poor urban neighborhoods. And even with connectivity, low-income families often need support to obtain the computers and other devices to use it.104 The other side of the “digital divide” is left even further behind in the pandemic.

We need to do better and provide access to broadband to all Americans. Given the extreme stress on state and local budgets, the federal government should redouble its efforts to define areas with inadequate connectivity, and solicit bids from private providers to go beyond trunk lines and build the “last mile” connection to underserved communities.105 It is essential that the right to participate, and to provide the ultimate internet connection, be open to a wide range of potential providers. Competition must be maintained, and influence over public policy by the well-connected must not prevent innovation.

Recommendations
Access to quality broadband has become a necessity of citizenship, like public education (of which broadband has become a prerequisite), postal delivery and electrification. Broadband is also a building block for individual prosperity and a tool to fight inequality. Beyond emergency response to the current pandemic, policy should ensure that every citizen has access to broadband and that it is affordable.
Water: A legacy of delayed investment

US water and wastewater infrastructure is aging, and suffering from a lack of maintenance and delayed replacement. The US drinking water system is comprised of 1 million miles of pipes, many of which were installed in the middle of the last century with expected lives of 75 to 100 years. But they are being replaced at a rate of only 0.5 percent per year, at which rate much of the system will be forced to outlast its expected useful life. An estimated 240,000 water main breaks occur each year, which along with smaller leaks waste from 14 to 18 percent of the nation’s treated water. Water consumption is declining, but that is a mixed blessing, because it reduces needed revenues for utilities in the short run. Similarly, because of shifting population and especially increased population concentration around commercial hubs, some utilities in shrinking communities lose revenue while others in growing areas have challenging increases in demand. Much of the nation’s drinking water is supplied by the few largest systems in population centers; smaller utilities in more sparsely populated areas suffer from a lack of economies of scale to build or hire expertise.

But meeting the cost of safe water can be a mere detail for many Americans. More than 30 million Americans had water that failed to meet safety standards (if they had water at all) in 2019.106

Wastewater systems face a contrasting outlook of increasing total loads, in part because more of the population is moving from septic systems to connection to wastewater systems. Wastewater sewers also are aging, and treatment plants sometimes cannot handle the inflow. Systems that mix stormwater and wastewater can be overloaded by heavy storms as well. Discharges of untreated sewage are an important threat to public health. Separating wastewater and stormwater would entail substantial upfront costs but would have important benefits with respect to resilience from climate change. Flood protection proved sadly lacking in New Orleans—especially and painfully for low-income residents and neighborhoods—during Hurricane Katrina.107

The poor condition of US water and wastewater infrastructure is estimated to cost $2.6 billion per year through water main breaks, with one industry group in 2013 having projected annual costs to businesses and households managing unreliable water delivery and wastewater treatment in the tens of billions of dollars.108 Those costs can be especially painful in regions of the country where water has become a valuable, scarce commodity.109

Mistakes in infrastructure management are also costly. For example, one study found that the public health crisis resulting from mismanagement of the Flint, Michigan drinking water supply not only harmed the short- and long-term health of residents and required over $340 million in ameliorative state and federal spending, but also at least temporarily depressed the value of Flint’s housing stock by between $350 million and $500 million.110

The federal government has invested through grants and loans in water systems. With the large challenges to water systems, the federal role may need to expand.
Given the long but important payoffs, more-robust federal lending could help to put important investments in motion. At the very least, water systems need to plan realistically for the aging of their infrastructure and the cost and disruption of replacement or renewal.

**Recommendations**

Failures of water systems, both drinking water and wastewater, have harmed the public health. Population migration and shifting demand have challenged new and old communities alike, while aging systems have wasted scarce water. Federal lending programs for investment and improvement must be expanded.
Conclusions

Infrastructure is essential to the strength of the US economy. A sharp focus on infrastructure’s role and key issues can lead the nation toward faster economic growth, environmental protection, and opportunity for all Americans, while saving public funds in the long run.

US infrastructure may be the nation’s most popular unattained policy priority. Partisan bickering on all manner of other issues has derailed bipartisan support.

The Trustees of CED hope that data-based analysis and a bipartisan perspective could lead to this one step forward. We even dare hope that this one step could become a march to a better nation, a stronger economy, and a renewed awareness of community.

We respectfully commend these ideas to our elected policymakers at what may be a unique opportunity for bipartisan collaboration on a top priority to the American public, and we offer the support of the business community for a strong infrastructure foundation for our economy and society.
Endnotes


3. “Executive Order on Strengthening Buy-American Preferences for Infrastructure Projects,” The White House, January 30, 2019. The taxonomy of US infrastructure is fluid and shifts as the needs of society and business change but generally includes the shared physical assets necessary for modern living and commerce. To take one attempt at definition, Henry Petroski, a professor of history and engineering at Duke University, held up infrastructure as connoting “the sum of a society’s physical improvements and denotes the public works (that is, structures and systems like roads, bridges, and water supplies that serve the public) as well as the works of private enterprise (for example, the fiber-optic, wireless, cellular, and other information and communication networks) that enable a civilization to function in a civilized way.” See: Henry Petroski, The Road Taken: The History and Future of America’s Infrastructure, Bloomsbury USA, February 16, 2016.


5. See note 3, above.


Speedtest Global Index – Monthly comparisons of internet speeds from around the world


“Public Spending on Transportation and Water Infrastructure, 1956 to 2017,” CBO, October 2018.

Robert Kirk and William Mallett, “Funding and Financing Highways and Public Transportation,” Congressional Research Service, June 7, 2019. State governments also engage, directly but often indirectly, in borrowing for infrastructure. State infrastructure agencies (which are standalone incorporated authorities) are conservative with respect to debt issuance and guard high credit ratings (A to AA) whereas their equivalents in many European jurisdictions would often be established as private borrowers (in the form of PPP concessionaires) with leverage typically targeted to be at low investment grade (BBB/BBB-), with the lower rating due to higher leverage undertaken through the deep capital markets. If US state agencies adjusted their rating standards to typical European levels, their leverage could increase and the call on public funding reduced (because debt held by such private borrowers does not add to the stock of public debt).

Jonathan Woetzel, Nicklas Garemo, Jan Mischke, Martin Hjerpe, and Robert Palter, “Bridging Global Infrastructure Gaps,” McKinsey Global Institute, June 2016. Between 2010 and 2014, PPPs accounted for roughly 1 percent of total infrastructure spending in the US compared to a 3 percent average among advanced economies. In part, lower levels of PPP funding likely reflect differences in demand compared to other advanced economies owing to the market for state and municipal bonds.


“Historical Table 9.3—Major Public Physical Capital Investment Outlays in Percentage Terms: 1940–2021,” Office of Management and Budget, 2020. It has also been relatively deprioritized, shrinking more than 2 percentage points, or roughly 40 percent, as a share of total federal outlays between the 1960s and 2010s, as federal spending on other categories, particularly health care, steadily increased.


“Minneapolis Bridge Collapse,” Minnesota Public Radio. . The role of a design error in the failure should not distract from the importance of inspection and maintenance to reveal such problems before catastrophe occurs. Minnesota Legislative Reference Library, “Minnesota Interstate 35W Bridge Collapse,” October 2020.

Some have argued that such short-sightedness is exaggerated by a congressional budgeting system that requires identification of future resources up-front, at the initial appropriation of the project.


A controversial “bridge to nowhere” became a symbol of this concern. As is often the case, there are two sides to the debate. Ronald Utt, “The Bridge to Nowhere: A National Embarrassment,” Heritage Foundation, October 20, 2005; Liz Ruskin, “Stevens Says He’ll Quit if Bridge Funds Diverted,” Anchorage Daily News, October 21, 2005.

Such a model might serve as an American version of the kind of long-term assessment of infrastructure needs typically outlined in other advanced economies by national infrastructure commissions. See: Andrew Bennett and Kirsty Innes, “Economic Infrastructure for the Internet Era,” Tony Blair Institute for Global Change, December 6, 2019.


Brooks and Liscow, “Infrastructure Costs.”

For example, a 2015 analysis found that the four most expensive of 144 rail projects in 44 countries, on a per-kilometer basis, were all located in the US, though relatively higher US rail project costs may be owing to differences in station construction, with contracting practices another potential driver. See: Gordon and Schleicher, “Higher Costs May Explain Crumbling Support;” Alon Levy, “Why American Costs Are So High (Work-in-Progress),” Pedestrian Observations, March 3, 2019.

46 “Fact Sheet: CEO’s Proposal to Modernize Its NEPA Implementing Regulations,” Council on Environmental Quality, January 9, 2020; Christy Goldfuss, “5 Recommendations to Speed Infrastructure Permitting without Gutting Environmental Review,” Center for American Progress, September 6, 2018. Additionally, another source of increased cost owing to regulation may take the form of decision makers redirecting investment to more expensive projects than in the past to avoid running into legal challenges or to more clearly satisfy environmental standards. See: Brooks and Liscow, “Infrastructure Costs.”


57 As in all other instances of public or private burdens on low-income persons, appropriate adjustment should be achieved through broadly based devices such as the earned income tax credit (EITC), the Supplemental Nutrition Assistance Program (SNAP), and other cash and noncash assistance devices.


59 Extrapolating from current toll roads, some might fear that peak-load pricing for highway use would drive traffic from major arteries to residential streets. However, in the context of an overall highway user fee, the same peak-load fee would apply if a driver left a major artery. In fact, drivers could be charged more for re-routing into residential neighborhoods.


61 Table B-1. Employees on nonfarm payrolls by industry sector and selected industry detail (in thousands) (bls.gov), Bureau of Labor Statistics.

62 First 100 Days Plan, CED, December 2020.


64 “Economic Impacts of the I-35W Bridge Collapse,” Minnesota Department of Transportation; Feng Xie and David Levinson, “Evaluating the Effects of the I-35W Bridge Collapse on Road-users in the Twin Cities Metropolitan Region,” Transportation Planning and Technology 34, no. 7 (August 22, 2011): 691–703.


48 "Electric Vehicles."


50 State taxes on all utilities (not just electricity, potentially including at least taxes on natural gas, steam power, telephone service including cell phones and pagers, broadcast satellite television, cable television, internet service, sewer service, solid waste, stormwater, and drinking water) raised $12.4 billion in 2018; by comparison, the federal fuel tax collected $42.6 billion, state and local government fuel taxes raised $49.8 billion, and state and local government highway capital outlays (including grants from the federal government) were $104.4 billion. (2018 State & Local Government Finance Historical Datasets and Tables, US Census Bureau.; Budget of the US Government, Fiscal Year 2021, Historical Tables, Table 2.4, US Office of Management and Budget.) Therefore, any new taxes or increases in taxes on electricity to replace significant shares of the current fuel tax would need to be quite large, and if such taxes were not targeted exclusively on use of electricity for auto transportation would potentially bear very heavily on people who do not even own electric vehicles, or automobiles of any kind for that matter.


57 Robyn, "Air Support."


59 "Airport Infrastructure Funding," Airports Council International.


63 Thirty states (plus three territories and the District of Columbia) have imposed renewable energy standards; seven other states have stated voluntary goals. California’s renewable energy standard, at 44 percent by 2024, is currently the second most rigorous in the nation; Vermont has had a 55 percent standard since 2017, raising to 75 percent by 2032. Several other states have requirements that will become more rigorous in the future than California’s is today and can learn from California’s experience. Connecticut has a 44-percent standard by 2030; Hawaii has a 70-percent standard by 2040; Maine has an 80-percent standard by 2030; Maryland, Nevada and Nevada have 50-percent standards by 2030; New Mexico has an 80-percent standard by 2040; New York has a 70-percent standard by 2030; Oregon has a 50-percent standard for large utilities by 2040; Virginia has a standard of 65 percent or 100 percent (depending on the characteristics of the utility) by 2040; Washington state has a 100-percent requirement by 2045; and Washington, D.C. has a 100-percent requirement by 2032. “State Renewable Portfolio Standards and Goals,” National Conference of State Legislatures, January 4, 2021.

64 Renewable Alternatives and Fuels and Total Energy, US Energy Information Administration.

65 For example, Emily Holbrook, “Dallas-Fort Worth Airport’s Energy Initiatives Result in $1 Million in Savings,” Environment + Energy Leader, April 17, 2019; see also the Dallas-Fort Worth Airport’s website sustainability page.


67 Some might object that some forms of no-carbon power are not desirable; nuclear power generation, for example, is unattractive to some. See Massachusetts Institute of Technology, “The Future of Nuclear Power,” 2003 and its 2009 Update, for one assessment.


In the analysis, a school is high-income if it is in an area that fell within the lowest quartile of share in poverty in 2010, and low-income if it fell within the highest quartile of the distribution. In a similar study of online learning engagement performed by Curriculum Associates, data suggests that only 60 percent of low-income students were regularly logging into online instruction compared with 90 percent of high-income students. See: Emma Dorn, Bryan Hancock, Jimmy Sarakatsannis, and Ellen Viruleg, “COVID-19 and Student Learning in the United States: The Hurt Could Last a Lifetime,” McKinsey & Company, June 1, 2020.

As one example of action on this front, see Alex Hines, “Lewis County Schools purchase laptops for students,” 12WBOY, Weston, West Virginia, July 29, 2020.


SUSTAINING CAPITALISM

Achieving prosperity for all Americans could not be more urgent. Although the United States remains the most prosperous nation on earth, millions of our citizens are losing faith in the American dream of upward mobility, and in American-style capitalism itself. This crisis of confidence has widened the divide afflicting American politics and cries out for reasoned solutions in the nation’s interest to provide prosperity for all Americans and make capitalism sustainable for generations to come. In 1942, the founders of the Committee for Economic Development (CED), our nation's leading CEOs, took on the immense challenge of creating a rules-based post-war economic order. Their leadership and selfless efforts helped give the United States and the world the Marshall Plan, the Bretton Woods Agreement, and the Employment Act of 1946. The challenges to our economic principles and democratic institutions now are equally important. So, in the spirit of its founding, CED, the public policy center of The Conference Board, will release a series of 2021 Solutions Briefs. These briefs will address today’s critical issues, including health care, the future of work, education, technology and innovation, regulation, China and trade, infrastructure, inequality, and taxation.