Transformative Infrastructure Investment and American Competitiveness

By Damon Silvers, Eric Harris Bernstein, and Dominic Russel
November 16, 2016

About the Roosevelt Institute

Until economic and social rules work for all, they're not working. Inspired by the legacy of Franklin and Eleanor, the Roosevelt Institute reimagines America as it should be: a place where hard work is rewarded, everyone participates, and everyone enjoys a fair share of our collective prosperity. We believe that when the rules work against this vision, it's our responsibility to recreate them.

We bring together thousands of thinkers and doers—from a new generation of leaders in every state to Nobel laureate economists—working to redefine the rules that guide our social and economic realities. We rethink and reshape everything from local policy to federal legislation, orienting toward a new economic and political system: one built by many for the good of all.

About The Authors

Damon A. Silvers is the Director of Policy and Special Counsel for the AFL-CIO. Mr. Silvers serves on a pro bono basis as a Special Assistant Attorney General for the state of New York and is a Senior Fellow for the Roosevelt Institute.

Eric Harris Bernstein is a Senior Program Associate at the Roosevelt Institute, where he acts as a research assistant and project manager.

Dominic Russel is a student at the University of Michigan and a member of the Roosevelt Network Student Board of Advisors.

This Report was made possible by the generous support of NextGen Climate America and the Ford Foundation.

Executive Summary

Policymakers and citizens often think of infrastructure investment as the most routine public policy task—a question of filling potholes and repairing power lines. And in a sense, maintaining our society's physical foundation should be routine and not political or ideological. But in another sense, infrastructure policy is anything but routine: The country that we build will determine our competitiveness throughout the 21st century, whether we are an inclusive and unified society, and whether we are part of the problem or part of the solution on climate change. The decisions we make about infrastructure over the next several years will reveal our vision of the future and our will to make it a reality.

First and foremost, this paper argues that infrastructure investment is a long-term strategic necessity. To maintain our place as a global economic leader, the United States must build the foundation on which 21st century commerce will take place. The oft-stated arguments for infrastructure as short-term stimulus, repairs, and efficiency-enhancing upgrades are valid but secondary. Public investments in high-speed rail, universal broadband, and a carbon-reducing power grid have the potential to expand our economic frontier of growth and usher in a new era of broadly shared economic prosperity.

Unfortunately, the level of spending required to meet these needs has appeared politically unsalable given a hostile Congress for many years. Our plan, crafted from an honest assessment of the country's needs, represents a recommitment to achieving the essential goal of globally competitive infrastructure, regardless of politics. This has been done before: Throughout the 19th and early 20th centuries, America's leaders in both political parties and at every level of government consistently committed to developing the infrastructure that helped make the U.S. the world's leading economy and the wealthiest society in human history.

To renew that commitment, we will not only have to invest, but will have to do so in a way that acknowledges and corrects our past failures. For communities of color, the "golden age" of American infrastructure investment in the 1950s and 1960s was the era of displacement by urban renewal and erasure by public highways. Our program calls for quality school facilities, public transportation, and internet access built for and in partnership with those communities.

Additionally, we propose game-changing public investments in commercial and industrial building retrofits and in a power grid that produces radically lower carbon emissions. These investments will create good jobs and position the United States as the leader of a global technological revolution. Perhaps most importantly, they will place us on a trajectory to meet carbon reduction goals intended to avoid catastrophe.

We argue that America must rediscover its ambition and confidence in its capacity to remake our nation, world, and future for the benefit of all its citizens. Instead of watching our inheritance rust away and hoarding our diminishing capital, we can start acting more like the generations that built our country and make these transformative investments. We must build anew, not only to ensure our national posterity, but so that our children and grandchildren will look back at us with gratitude for making possible the better lives they will enjoy.

Introduction

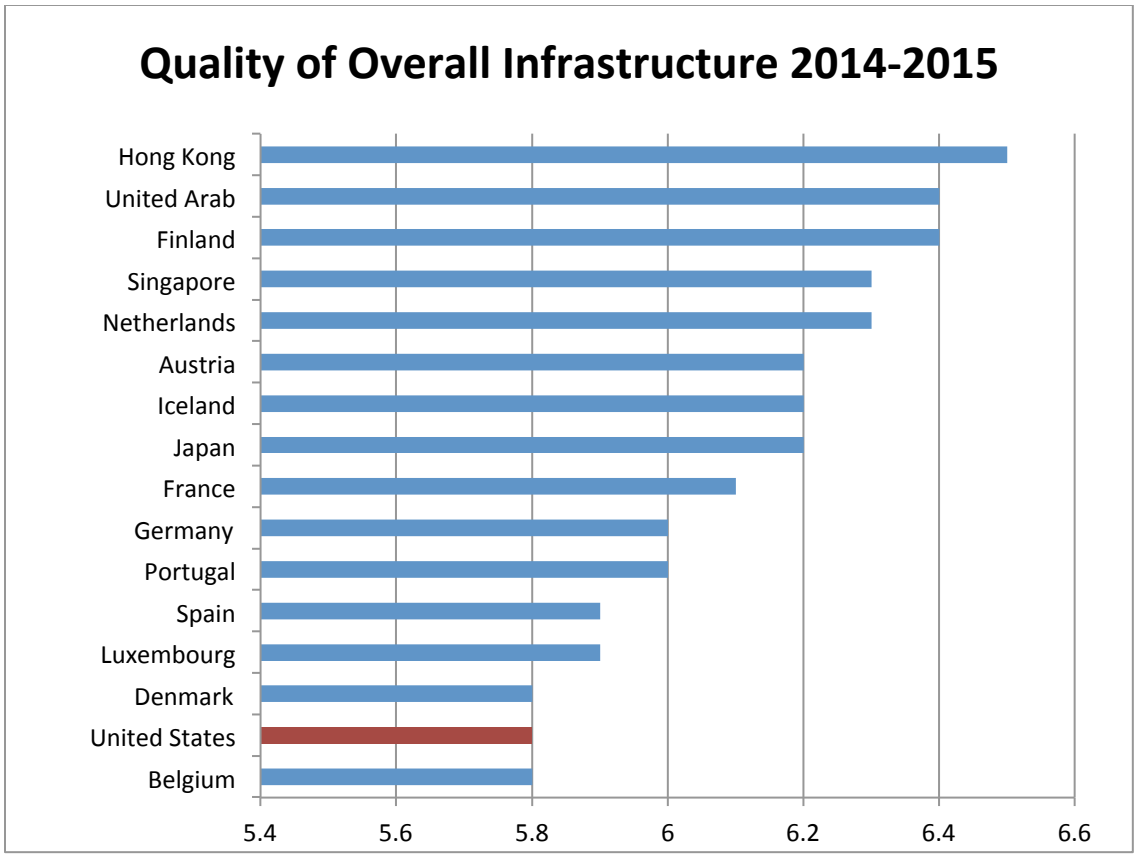
In January 2016, France's Ministry of Ecology and Energy announced a bold infrastructure project: 1,000 kilometers—more than 600 miles—of roads paved with solar paneling that will provide cheap and renewable energy for 8 percent of the country's population. The project is designed to make France a global provider of solar road technology: France's Colas Group will manufacture and install the panels, providing a massive opportunity for the firm to hone, perfect, and showcase its product on a global stage while creating green tech jobs in the near term.[1]

Such progress is not confined to Western Europe. For much of the 1990s, China's slow, overcrowded railways were a metaphor for its lumbering economy. Today, China's high-speed passenger trains travel at speeds over 200 miles per hour, and in 2013, its high-speed rail system carried more passengers than the entirety of U.S. domestic aviation.[2] Chinese business travelers can now go from Beijing to Shanghai—a distance comparable to that from New York to Chicago—in less than five hours. China's massive investment in high-speed rail has paid off in export growth: In the fall of 2015 it was announced that China had won a $5 billion contract to build a high-speed rail line in Indonesia.[3]

The picture looks very different in the United States. On August 1, 2007, the I-35 bridge over the Mississippi River in Minneapolis collapsed, killing 13 people. In addition to the tragic loss of life, the collapse resulted in massive losses to local businesses and individuals.[4] Before repairs were factored in, the Minnesota Department of Transportation estimated the 2007–2008 cost to local residents at $60 million. More than nine years later, roughly one out of every 10 bridges in the United States remains "structurally deficient," according to Department of Transportation designations.[5]

On May 12, 2015, a northbound Amtrak train derailed near Philadelphia, killing eight passengers and injuring more than 200. The accident, which occurred on a span of track that lacked automatic train control technology considered standard in many European countries, cut off a major transportation route between Washington, D.C., and New York City for nearly a week and created residual delays on two additional lines at an estimated cost of $100 million per day.[6]

These tragedies are not random; the United States has failed on a multitrillion-dollar scale, over decades, to invest in our nation's infrastructure. Less than 24 hours after the Philadelphia derailment, Congress cut Amtrak's budget by 18 percent.[7] In 2015, U.S. public investment as a percentage of GDP was at its lowest level since 1947.[8] But more jarring than the comparison with our history is the comparison with our competition: Since the early 1990s, U.S. public infrastructure spending as a share of GDP has been roughly a quarter of China's and half that of other developed Asian countries.[9] The World Economic Forum ranked America 16th in quality of infrastructure, and in 2013 the American Society of Civil Engineers gave U.S. infrastructure a "D+," estimating that our current level of spending would result in a $3.6 trillion GDP shortfall by 2020.[10]



Source: World Economic Forum, The Global Competitiveness Report 2014-2015[11]

So how did we get to these desperate circumstances? As a nation, we are not poorer than we were in the 1960s, and there is no shortage of promising and necessary investments to make, yet every year we allow the crisis to worsen. The answer, unfortunately, is political.

The rise of neoliberal economics in the 1980s promoted and popularized the notion that the private sector, left to its own devices, could provide for the public good, and that putting more money in the hands of the wealthy would drive inclusive economic growth. This preference for public austerity and private deregulation, combined with powerful pro-privatization interests in the financial sector, created the common belief that states along with the private sector would be able and willing to provide large-scale financing for the kinds of infrastructure projects that were historically undertaken by the federal government.[12] Unfortunately, this boom in private investment never came to pass, and the physical foundation of our nation's economy has eroded to the point where even relatively pro-privatization experts such as McKinsey & Company suggest that private equity capital alone cannot properly address the U.S. infrastructure deficit.[13]

It is past time for a transformational investment in America's public goods—the web of transportation, energy, telecommunications, and other public assets that make our society possible. We need to invest on a scale that matches our need. We need to think in trillions, not billions.

Infrastructure investment was historically an area of public policy characterized by bipartisan cooperation. Unfortunately, as our nation's infrastructure needs have grown, Congress has become increasingly hostile to

investing in the future. There are reasons now to be hopeful that we can return to a more bipartisan approach in this critical area: Early in the 2016 campaign, Donald Trump called for major investments in our infrastructure and said he was committed to more spending than Hillary Clinton. Unfortunately, on the campaign trail, President-elect Trump's calls for infrastructure investment did not come with clear positions on critical details such as how projects would be selected, to what labor standards they would be held, or how he would ensure that investments reached economically devastated communities in both rural and urban America. Equally disturbing was the Trump campaign's apparent hostility to infrastructure investments that addressed the causes of climate change.

It is critical that when we make large-scale public investments, the projects are well suited to the 21st century economy and the jobs we create are good ones. This report spells out the true scale of our nation's infrastructure needs and offers a path forward to rebuild America in a way that promotes growth, creates jobs, and strengthens communities. We believe it should be a roadmap for any leader serious about transforming our nation's infrastructure.

Our approach is bottom-up and engineering-driven. It would create millions of jobs and stimulate our economy, and we show how it can be done within the fiscal capacity of the United States. It would also make tragedies like the Philadelphia derailment far less common. But none of those are the core reason why we must enact this plan.

The fundamental reason to make a transformative investment in our nation's infrastructure is to propel our nation's economy into the 21st century—to make the United States once again the world's most technologically advanced society, restore our competitive advantage in making and selling the world's leading technologies and services, and usher in an era of inclusive growth. Our plan's contours, and its scale, result from looking at what we need to do to achieve the goal of competitive infrastructure.

A transformational infrastructure program is also essential to addressing two profound challenges facing our nation: the threat of climate change, and the economic and social marginalization of poor communities and communities of color. There is no way to meet the targets for reduction in carbon emissions that scientists say are necessary to stabilize our climate without massive investments in energy efficiency, low-carbon energy, and carbon capture and storage. Similarly, there is no way to address the economic isolation of the urban and rural poor without comprehensive public transportation, universal broadband access, and world-class public school buildings.

Policymakers and citizens often think of infrastructure investment as the most routine public policy task—a question of filling potholes and repairing power lines. And in a sense, maintaining our society's physical foundation should be routine and not political or ideological. But in another sense, infrastructure policy is anything but routine: The country that we build will determine our competitiveness throughout the 21st century, whether we are an inclusive and unified society, and whether we are part of the problem or part of the solution on climate change. Decisions surrounding infrastructure over the next several years will reveal our vision of the future and our will to make it a reality. At its core, the infrastructure question is about whether America's greatness is a thing of the past or a meaningful vision of our future.

Properly understood, infrastructure covers a wide range of physical assets, some of which, such as roads and bridges, have almost always been publicly owned, while others, such as telecommunications equipment and freight railroads, have almost always been privately owned. There is a great deal of regional variation in the ownership of infrastructure, and while it is beyond our scope to specify in each example which entity would do what, this paper in no ways argues for large-scale socialization or the disruption of natural patterns of ownership.

Similarly, there is a great deal of complexity that comes with funding public infrastructure. Much of the nation's historically public infrastructure has been the responsibility of state and local government, but since the New Deal, the federal government has been a substantial direct and indirect funder of state and local infrastructure projects. Furthermore, through tax supports, loan guarantees, and liability limitations, federal leadership has supported much privately owned infrastructure as well.

This paper does not seek to detail exactly how our proposed investment program would be implemented. In lieu of a full taxonomy, we make assumptions about roughly how much of the total program would be public and how much private, as well as about what the gross level of government support for the private portion would likely need to be. We believe that federal leadership would be essential because of the need for national coordination and the federal government's very low cost of capital, but that does not preclude state and local involvement. As it does today, project management in many cases would fall to state and local government, as well as private firms.

In the following paper, we first examine the transformational potential of investment in next-generation infrastructure projects such as universal broadband and high-speed rail. In the second section, we detail the infrastructure investments needed to adapt to the global threat of climate change. In the third section, we explore ways to address the inefficiencies in transportation infrastructure that leave American workers, families, and businesses at a disadvantage. In the fourth section, we highlight the need for targeted investment in communities of color that have historically been excluded from the benefits of innovation. In the fifth section, we detail how large-scale infrastructure investment would invigorate the sluggish economic recovery. And in the final section, we explain how these investments would be funded. Together, these arguments set the stage for a 10-year investment plan that would transform the American economy and establish the United States as a world leader in infrastructure innovation.

I: Preparing for the 21st Century

First and foremost, this paper argues that infrastructure investment is a long-term strategic necessity. To maintain our place as a global economic leader, the United States must build the foundation on which 21st century commerce will take place. The oft-stated arguments for infrastructure as short-term stimulus and repairs are valid but secondary. Public investments in high-speed rail, universal broadband, and a carbon-reducing power grid have the potential to expand our economic frontier of growth, not simply achieve incremental gains through efficiency.

In this section, we will begin by exploring different ways of thinking about economic growth and how infrastructure investment has historically contributed to that growth. We will then look at two different large-scale infrastructure projects that could expand the boundaries of U.S. economic growth well into the future.

The strategic approach to infrastructure investment is founded on the distinction between two types of growth, as conceptualized by economist William Baumol. The first is growth produced by using capital and labor more efficiently, and the second is growth through expansion of the growth frontier, which rockets economic performance into new dimensions.[14] Because it is by definition unprecedented, however, the scale of this growth expansion is often difficult to quantify. Citing economic work from Baumol, William Nordhaus, and Deirdre McCloskey, Roosevelt Institute Fellow Bo Cutter writes:

> The invention and spread of automobiles, the rise of the personal computer, progress in medical treatment, the diffusion of air conditioning—these are what push the frontier outward, and these are what we cannot easily capture through conventional data and static efficiency analysis.[15]

American history illustrates the potential of transformational investments and the limits of static analysis.

In 1956, U.S. President Dwight D. Eisenhower signed the Federal Aid Highway Act, authorizing $25 billion for the construction of 41,000 miles of interstate highway. While the size and scope of the project were ambitious even at the time, it was not the first time the United States had embarked on large infrastructure spending projects. Already, we had created the world's first national system of secondary education to teach workers requisite skills; we had covered a continent first with the railroad and the telegraph, and then the highway and the telephone; and we brought electric power to every corner of our country. Indeed, throughout the 19th and early 20th centuries, America's leaders in both political parties and at every level of government consistently committed to developing the infrastructure that helped make the U.S. the world's leading economy and the wealthiest society in human history.[16]

Yet, leading macroeconomists estimate the net return from public spending on the interstate highway system during its initial construction at about 35 percent.[17] Not only is this low compared to many other estimates of government spending multipliers, it clearly understates the transformative impact of the national highway system.[18] Beyond construction jobs and gravel sales, the interstate highway system propelled massive economic growth for decades, knitting the country together and speeding both passenger travel and shipping to thousands of communities large and small. This spawned economic development from coast to coast and created entire communities as well as booms in tourism and roadside services.[19] The interstate system was of course not sufficient to spur this growth (and its benefits were not shared equally, as we will discuss in detail in a later section), but it was, without a doubt, entirely necessary.

How we measure infrastructure costs and benefits is important: Limited analysis not only understates the value of past initiatives but is itself a part of what sapped our national appetite for transformative public investment. Theories of economic equilibriums, which became the dominant school of economic thought in the years in which the U.S. retreated from public investment, imagine a fundamentally static system that could be largely described and understood through regressions and modeling. In reality, though, technology, society, politics, and other factors form an evolving and never-ending cycle of exogenous and endogenous feedbacks. This

process continuously remakes the world around us, which greatly limits the usefulness of the static equilibrium as a way of understanding economic transformation and formulating economic strategy.

The following passage from a 1997 paper on the economic value of the national highway system further illustrates this point:[20]

> These results raise an important policy question: Does public investment offer a continuing, but neglected, route to prosperity? That is, by building roads, can we return to a path of renewed high productivity growth? The industry data do not support this conclusion: at the margin, we cannot reject that roads now offer a normal (or even zero) rate of return. Thus, the data seem most consistent with a story in which the massive road-building of the 1950s and 1960s offered a one-time boost to the level of productivity, rather than a path to continuing rapid growth in productivity.
>
> This conclusion—that roads were exceptionally productive before 1973 but are not exceptionally productive at the margin—is consistent with simple network arguments. In particular, building an interstate network might be very productive; building a second network may not.

What the author states in this passage—that America's first-ever national highway system offered a one-time, non-repeatable revolution in productivity—seems obvious. After all, once a satisfactory highway network is in place, how much added value would we expect to glean from a second network? The answer, of course, is little if any. The point is not to build a second highway system but to maintain the highway system we have and to build the next network.

In the sub-sections that follow, we give examples of some such "next" networks and explain why their economic benefits would be exponential and long-lasting.

Universal Broadband

The most obvious "next" network is broadband. Currently, 7.5 percent of all U.S. commerce takes place online, and this figure grows anywhere from 2 to 4 percent per quarter.[21] But even this number radically underestimates the centrality of the Internet to our economy and our society. The real measure of the importance of the Internet lies in how it has become integrated into every aspect of life—conventional employment, education at every level, leisure, and so on.[22]

Not having access to the Internet today is tantamount to not having a phone, electricity, or a paved road in the 1950s. At that time, it took President Eisenhower 62 days to cross the country on local roads. It was then that he realized we needed a different type of road—a new, higher, standard. The Internet and other infrastructure networks like the power grid are no different: It is not enough that we have them; if we are going to be globally competitive, they have to include everyone and they have to be the best. And we are nowhere near that goal.

Currently, the United States ranks 16th among the world's countries by average connection speed and is

lagging behind many developed nations in the development of ubiquitous high speed connection.[23] A full 40 percent of our rural population—somewhere in the neighborhood of 25 million people—lack access at the FCC's benchmark.[24] These costs are likely to grow significantly as online commerce becomes a larger and larger part of work and the global economy. On an individual level, lacking proper connectivity is equivalent to economic exclusion. Rural populations are 10 times more likely than urban ones to lack satisfactory Internet access, and communities of color are the most likely to have substandard Internet access.[25]

The frontier-moving potential of universal access to broadband is challenging to estimate, but even the limited and likely understated evidence that does exist is significant. A number of studies examining historical data across states and developed countries show a strong connection between broadband access and employment growth. A study from the Brookings Institute estimates that a $63.6 billion investment to increase household adoption of broadband from 60 to 95 percent would create 140,000 jobs per year for 10 years. These estimates are in line with other international and domestic estimates, including those from a 2009 Information Technology and Innovation Foundation report.[26]

But even these estimates greatly understate the true importance of comprehensive broadband. Here, the history of rural electrification provides an apt analogy. Prior to the New Deal rural electrification efforts, nine in 10 farmers were without electricity. Historian William E. Leuchtenburg wrote that "farmers, without the benefits of electrically powered machinery, toiled in a nineteenth-century world," isolated from the rest of the country.[27] Just as rural electrification meant that Depression-era farmers could read to their children at night and listen to world events on the radio, universal broadband access would present a new level of access to education, work, and information for millions of American households and workplaces. The positive consequences in terms of national productivity and innovation would be with us for decades to come.

The development of next generation transportation systems would offer similar benefits.

Next Generation Transportation

The efficiency benefits of repairing roads, highways, bridges, and trains will be outlined in a later section, but here we focus on much more profound, frontier-moving transportation investments such as high-speed rail. By collapsing geographic distances, high-speed rail has spurred new transformative regional development from advanced countries such as Japan and France to developing nations such as China, and has alleviated their need for significant amounts of costly high-emission air travel. Like other expansionary investments, the "agglomeration benefits" that derive when transportation changes the geographic scope available to firms are difficult to quantify, but several researchers have identified benefits ranging up to an additional 20 percent on top of direct benefits.[28]

One estimate of the economic growth expected from California's proposed high-speed rail connection between San Francisco and Los Angeles found growth potential as high as 2 percent of gross product in affected areas.[29] International precedent also suggests considerable potential upside; in Germany, high-speed rail connection to Frankfurt and Cologne was worth an average increase of gross product of 2.7 percent in affected cities.[30] Considering the enormous economies of San Francisco, Los Angeles, and the communities in between,

expected growth ushered in by the high-speed rail link would be well into the billions annually. It is easy to reduce the benefits of such projects to their lowest common denominator of efficiency gains and emissions savings, but, as seen with China's successful foray into high-speed rail manufacturing, these investments offer the opportunity for long-term growth in entirely new industries.[31]

Ultimately, to remain competitive and usher in an era of sustainable and inclusive growth in the emerging digital economy, America must look beyond static models and narrow cost-benefit analysis and recover its societal muscle memory for public investment on a large scale, as well as its appetite for risk, innovation, and vision.

Yet even as we look to the future, we cannot afford to ignore the crises that are already unfolding around us. In the next section, we turn to the issue of climate change and the infrastructure investment needed to address it.

II: Tackling Climate Change

In the aftermath of the Paris climate talks, there is a growing global consensus on the need for immediate action on climate change. Even if we were able to curb carbon emissions significantly, we are already on a path toward rising temperatures and related infrastructure demands. Estimates suggest that repairing unavoidable damage from rising sea levels and increased storm activity along the eastern seaboard and Gulf of Mexico will cost between $62 and $85 billion by 2050, and as much as $339 billion by 2100. The costs will be much higher if we do not act quickly.[32]

The 2014 Risky Business report, which calculates the potential economic consequences of climate change in the U.S., estimates that on a business-as-usual path (no reduction in emissions), rising sea levels will result in $238–$507 billion worth of coastal property damage by 2100. Due to the increased heat, some mid-western states would lose 50–70 percent of their annual crop yields.[33] These costs, plus the costs of reduced productivity, increased electrical consumption, reduced water supply, irregular weather patterns, and other factors, total in the trillions.[34]

Scientists believe existing and emerging technologies hold the power to minimize the costs of climate change and preserve the foundations of global economic and political stability. But to ensure this, we need to muster the will and foresight to develop and implement carbon emission-reducing technologies now, and we need to do it on a large scale.[35] Doing so will mean we can not only meet our obligations under the Paris climate accords but also position ourselves as a leading seller and servicer of efficient energy technologies on a global scale.

Estimates of the current and potential size of the global green technology sector vary widely, but all suggest an international market of several trillion dollars over the next two decades, and many multiples of that over the course of the 21st century.[36] Unfortunately, as in other infrastructure arenas, our continuing reliance on private parties to make publicly beneficial investments has failed us on green tech. It is simply not economically rational for individual people, households, or firms to incur costs to prevent climate change. But if these

investments are not made, we will all suffer. In this sense, the world's climate is the ultimate public good.

National investment can further fuel innovation in green technologies, which will help the U.S. be competitive in this growing sector globally. But to succeed, we need to invest with both scale and speed. Accordingly, we propose game-changing public investments in commercial and industrial building retrofits, in a power grid that produces radically lower carbon emissions, in more efficient roads and air transport systems, and in alternative fuels and vehicles with high fuel efficiency.[i] These investments will create good jobs and position the United States as the leader of a global technological revolution, which will help revive U.S. manufacturing, and – perhaps most importantly—place us on a trajectory to meet the carbon reduction goals we must in order to avoid catastrophe.

One such investment is the smart grid. A smart grid is deployed in urban areas and works by combining innovative sensors and wireless networks with renewable energy generation facilities in order to reduce energy waste and improve efficiency. The Department of Energy estimates that smart grid deployment could reduce electricity sector emissions by up to 18 percent.[37] Combining investment in the smart grid and a portfolio of renewable generation facilities could reduce carbon emissions from the electrical sector by 58 percent by 2030, according to a 2005 EPRI report.[38]

Adoption of this technology alone is already driving sales and consulting business for multinational corporations like IBM and Cisco. As the costs of climate change begin to be measured in human lives and national GDP, consumers, businesses, and governments will continue to increase demand for low-carbon energy sources and efficient infrastructure, but they will not buy it from the U.S. if it does not position itself properly.

Currently, China is far ahead in the clean technology race, with nearly 50 percent more investment than the U.S., according to the latest estimates, but many unexplored industry-creating opportunities remain if we act now. The winner of this race will benefit not only from improved efficiency at home, but also from leadership in a multitrillion-dollar industry for decades to come. Alternatively, if we continue to neglect our infrastructure, we risk permanent exclusion and the loss of trillions of dollars of potential business over coming decades.[39]

The United States has an opportunity to pioneer new technology and serve as a global seller and consultant on next generation infrastructure. The question is, will we lead or will we follow? In the next section, we examine how the U.S.'s failure to invest at the needed scale has held American workers, families, and businesses back for decades.

[i] As of 2012, with regard to carbon emissions, the United States' electricity system was comparable to Germany's and cleaner than India's or China's. Major economies with low-carbon electricity production, such as France, Brazil, and Canada, rely on clean generation from hydropower or nuclear plants. International comparisons suggest that for the U.S. and China, the world's two largest economies, reducing carbon generated by electricity production will require a mix of new and old technology, including increased use of renewables and nuclear power and developing technologies to radically reduce emissions from carbon-based fuels such as coal and natural gas. The coal dependence of mass electricity producers China and India suggests that early adapters will reap substantial economic benefits from exporting both green capital goods and skilled labor to later-adapting economies.

III: Efficiency Improvements

Every day that the American people are forced to rely on substandard infrastructure to commute, heat their homes, and communicate with one another, we pay a steep price in lost efficiency and risk falling behind in our globally competitive economy. Lack of infrastructure investment will hurt us in the long run, but the problem is not just hypothetical: The costs have already begun to pile up.

Consider the commute from Los Angeles to San Francisco. Unlike many international airports in Europe and Asia, the Los Angeles International Airport (LAX) currently lacks any direct metro rail link with the city proper.[40] This means LAX travelers are forced to drive through congestion, which, on average, results in 25 minutes of daily delays; this adds up to 95 hours per year for residents with a 30-minute commute.[41] Additionally, travelers at LAX are advised to arrive at least 75 minutes early due to crowded security checkpoints, but because nearly 20 percent of all flights out of LAX are delayed and an additional 1 percent are cancelled, there is also a one-in-four chance of much more severe delays.[42] Finally, delayed travelers attempting to work from the road are frustrated by cellular service that, despite some of the highest phone bills in the world, is slower and less reliable than that in many European and Asian countries.[43]

In total, not counting possible flight changes, flying from Los Angeles to San Francisco takes between three and four hours, anywhere from one to one and a half hours longer than it could, and costs around $200, to say nothing of the wasted energy and additional environmental impact.[44] For comparison, the commute from Madrid to Barcelona, which is about equidistant, takes two hours and 30 minutes, and costs about $130 by train; the commute from Tokyo to Kyoto, only 60 miles shorter, can be completed in two hours and 20 minutes for around $110; and the commute from Beijing to Shanghai, more than double the distance, can be completed in only five hours on the bullet train at a cost of just $90.[45]

Of course, the situation on the West Coast is not unique. Just as L.A. residents are largely forced to drive, 45 percent of Americans lack access to mass transit, making the United States one of the most car-dependent countries in the world.[46] Even with this heavy road reliance, politicians have continuously failed to find long-term funding for the nation's highways, resulting in a fall from 7th to 16th in the Economic Forum's quality of road ranking over the last decade.[47] Furthermore, in terms of airline performance, LAX is typical: In 2014 only 76.25 percent of U.S. flights were on time and 2.18 percent were canceled.[48] Trouble with connectivity is also, of course, a national issue: The United States ranks behind many of its peers in average mobile download speed and, at $498 more expensive than Britain, is one of the most costly.[49]

The price of lacking infrastructure, both in time and money, adds up for consumers and firms alike. It raises transaction costs, slows the pace at which we conduct business, and makes Americans' lives busier and less productive. The Department of Transportation values an hour of travel time savings at $12.98 for local and $44.24 for air or high-speed rail. Using this as a baseline, we see that, for example, road delays cost each Los Angeles resident with a 30-minute daily commute over $1,200 per year.[50] The Texas A&M Transportation Institute roughly confirms this finding, estimating that traffic congestion alone cost urban auto commuters 6.9 billion hours and 3.1 billion gallons of fuel in 2014, for a total of $160 billion ($960 per commuter) in additional travel costs—up nearly 300 percent since 1982.[51] The numbers for flight delays are also significant:

In 2010, a study commissioned by the FAA and performed by Berkeley, MIT, and three other universities found that in 2007 various delays associated with flying and poor airport infrastructure cost passengers and airlines $25 billion, not counting an additional $2.2 billion in reduced demand.[52]

Costs like these add up to a systemic disadvantage to American workers, families, and businesses. Not counting the loss of potential growth opportunities discussed in the first two sections, the American Society of Civil Engineers estimates that from 2012 to 2020, flat infrastructure funding would cost the United State $3.1 trillion in lost GDP, in addition to $1.2 and $611 billion in added costs to businesses and households, respectively.[53] The impact is a matter of simple accounting: Higher costs of business, lower incomes, and less productive work hours result in smaller firm and household margins and less overall well-being.

Large-scale infrastructure investment could radically change this picture. World-class infrastructure would improve the attractiveness of the U.S. as a destination for foreign investment and help American firms compete with other developed nations. More mass transit rail in major cities would get travelers to their destinations cheaper, while using less energy and relieving traffic congestion. Airport and air traffic modernizations would shorten delays and wait times, while true high-speed rail would allow many to forego flying all together. Both of these investments would save travel time, but perhaps most importantly, technologies that create a cheaper, faster, and more secure mobile broadband network would supersede the need for much intercity business travel. These and other investments would save time and money, giving America's increasingly digital workforce a much-needed competitive edge in the global market and improving living standards across the country.

In this section, we have examined how the failure to invest in infrastructure improvements and innovations has held back U.S. workers and families broadly. But the design of America's infrastructure programs also has a long history of leaving the country's communities of color at a particular disadvantage. In the next section, we will turn to the need for targeted investment to right these wrongs.

IV: Infrastructure and Social Inclusion

So far, we have outlined the strategic importance of infrastructure investment for long-term economic competitiveness, for fighting climate change, and for correcting the ongoing costs of our current infrastructure deficit. There are also short-term stimulus gains from infrastructure investment, but before discussing these benefits, which we view as largely ancillary, there is one more structural reason—this one moral as well as economic—that the agenda we put forth is absolutely necessary: Infrastructure decay, both in relative and in absolute terms, is most common in our country's poorer communities—which all too often are communities of color.

Better and more inclusive infrastructure is a matter of social justice as well as economic development. So long as large portions of our population lack the tools of modern economic participation, we will never reach our economic potential. Our program calls for quality school facilities, public transportation, and Internet access for America's most impoverished communities, built in partnership with those communities.

For communities of color, the golden age of American infrastructure investment in the 1950s and 1960s was

something quite different. It was the era of displacement by urban renewal projects, the era of highway construction that erased communities and left those that remained physically cut off from more affluent areas. It was the era of redlining that blocked inflows of private capital, of mass transit systems designed to bypass minority neighborhoods, and of public beaches whose parking lots were designed not to accommodate the buses poor people used to get to the beach.

The failure to bring the full benefits of 20th century infrastructure to communities of color has only been compounded by decisions made in the era of disinvestment from public assets more generally. Communities with inadequate access to public transit turn out to also suffer from lack of broadband access. These are the communities whose streets have the most potholes, whose water pipes are most likely to be failing, or worse, poisoning those who drink from them.

The burden of lacking access to public transportation, broadband, or quality educational facilities—or even potable drinking water, as seen in Flint, Michigan—has effectively cut economically disadvantaged Americans off from the larger U.S. economy, even when they are not literally being poisoned.[54] One Detroit autoworker made headlines when the local press got news of his harrowing daily commute, which included 21 miles of walking.[55] Such enormous barriers to entering the labor force are not just objectively shameful for a developed country; they are an enormous drag on growth, as those who cannot access stable employment are unable to contribute to national economic productivity. Like farmers before electrification, many poor and working class Americans "[toil] in a 19th-Century world," and this is something the United States cannot allow if it is to remain globally competitive.[56]

In deindustrialized cities, and in deteriorating inner suburbs like Ferguson, there is a racially structured landscape of economic exclusion defined by long-term mass unemployment, physically decrepit schools, decaying housing, lack of access to the Internet, and—most importantly—no sense among young people of a path to the larger labor market.[57] Many of these inequities date back to the New Deal, which, despite many positive social policies, failed to consider the health of communities in its sweeping programs and failed to deliver racially inclusive investments.[58] Modern infrastructure programs can help rectify these mistakes both in the short and long term: first, by creating work within communities of color; and second, by providing economically isolated communities with the tools they need to join the 21st century economy.

In order to ensure that infrastructure investment is a path to prosperity and not a means of perpetuating inequality, infrastructure investment programs will need to include comprehensive worker protections. These protections should ensure that contractors do not engage in a race to the bottom on wages and benefits. They should also ensure that contractors contribute to the training programs necessary to expand the skilled construction workforce, which will be necessary to execute the ambitious infrastructure investment plan proposed here and will benefit the labor force in the long run. Among the provisions necessary to ensure positive labor market outcomes around infrastructure investment are the Davis-Bacon Act's prevailing wage provision—49 USC Section 5333, often referred to as Section 13(c)—which protects the right of public transportation workers to collectively bargain. In the area of procurement, Buy American provisions such as those found in numerous statutes governing federal infrastructure investment are also important.

To some degree, the tighter labor market that will result from large public investment will force employers to put bias aside and hire from communities of color. But to offer a meaningful solution to racial exclusion, and to do so in a way that is sensitive to the needs and desires of the affected communities, there has to be a serious effort to connect these new jobs to the communities where unemployment is worst. The top-down and racially insensitive approach to infrastructure was one of the most troubling aspects of many New Deal investments, but this 21st century investment presents an opportunity to learn from those mistakes.[59]

This will require engaging employers, workers, and communities at every level. Construction contractors, manufacturing firms, construction and manufacturing unions, labor-management training partners, and community coalitions—both old, like the United Way, and new, like the alliances that have formed around the Black Lives Matter movement—must work together with government at every step. But the foundation of this effort must be a public investment program big enough to give America a true competitive edge. A program that big will mean that hiring unemployed minorities will not be a charitable gesture but a practical necessity.

In the long term, a large-scale infrastructure investment program is not a complete answer to the economic consequences of racism, but it is absolutely a necessary component of any such solution.

V: Recovery and Short-term Economic Benefits

In addition to improving our current and future economic competitiveness, as we have detailed in the previous sections, large-scale infrastructure investment would serve a more immediate purpose: It would provide a much-needed boost to demand and help to correct our current path of post-crisis stagnation.

More than eight years after the financial crisis and more than six years since the official end of the Great Recession, the United States economy remains far from recovered. Despite some labor market progress, the employment-to-population ratio still sits under 60 percent, nearly four percentage points below its pre-crisis level and more than five percentage points below its year 2000 record of 64.7 percent.[60] In its 2013 study of the U.S. recovery, the International Monetary Fund estimated that potential GDP remained 7 percent below its pre-crisis trajectory.[61] Correcting this would have required 4.3 percent annual growth through the end of 2016, according to the Dallas Federal Reserve, but the actual rate has been less than half that.[62] Economists from both groups, in addition to the OECD, all found strong justification for large-scale public investment to stimulate the economy and boost demand, and warned of the danger of premature budget tightening, pointing to the poor economic record of the EU in the aftermath of fiscal austerity.[63]

Furthermore, there is a significant body of economic research that shows the beneficial effects of public infrastructure investment, especially in times of recovery. The Congressional Budget Office estimated that the American Recovery and Reinvestment Act (ARRA), which is just a fraction the size and scale of the long-term agenda proposed here, created as many as 4.6 million jobs through 2011, while another study by the White House Council of Economic Advisors found that infrastructure spending has one of the highest multipliers of any form of government spending, along with food stamps and unemployment insurance. An independent study from Dartmouth estimated that the economic benefits of ARRA infrastructure investments were roughly double what the government spent.[64]

The infrastructure agenda outlined here would create jobs on a much larger scale than the ARRA over a much longer period of time. At a ratio of one job per year per $100,000 in investment, the $400–$500 billion annual combined public and private investment would directly create between 4 and 5 million jobs for 10 years. Using the Economic Policy Institute's model for a somewhat smaller program, which applied a conservative 1.6 GDP multiplier, the GDP impact of this program would be between $640 and $800 billion—equivalent to 0.35–0.44 percent of GDP—and total job creation would be 5.4 million jobs per year of the program. This would imply a reduction in the unemployment rate of between 3 and 4 percent. Measured against a baseline nominal unemployment rate of 5.3 percent, this would create substantial incentives for employers to raise wages in order to tap into long-term unemployed and under-employed populations as well as the low wage workforce.[65]

If funded as we recommend, using the federal government's long-term borrowing capacity for the public

portion of the investments and using federal credit subsidy to support private investments, and with most of the interest and principal paid through progressive reforms to the U.S. tax structure, the total employment gain would still be in the range of 4 million jobs per year over 10 years.

Since the end of the summer of 2015, the signs of weakness in the global economy have been growing, ranging from capital market instability to negative interest rates in major economies such as Japan's. Large-scale infrastructure investment, paid for by long-term federal borrowing, would be among the most effective policy initiatives available to counteract the effect of global headwinds on the U.S. economy.

VI: Funding

There is broad-based support for infrastructure development: Labor and business leaders, as well as politicians at all levels of government and in both major political parties, support some level of increased infrastructure investment.[66] But policymakers have persistently refused to look at the nation's actual infrastructure needs and propose financing measures sufficient to meet those needs. Instead, infrastructure policy has been done backwards—by starting with the constraints of austerity politics, and then trying to find funds for additional public investments around the margins. Inevitably, this approach leads to public investment levels orders of magnitude smaller than the nation's needs. We propose a different approach.

Below, we lay out a plan for financing that incorporates private financing for significant energy and communications infrastructure while leveraging government support to reach necessary levels of speed and scale. While state and local government and regional bodies will be key actors in planning and building 21st century infrastructure, the federal government enjoys much cheaper access to capital.

Infrastructure assets are typically long-lived, and if developed as part of a strategic plan, should lead to increased growth and tax revenues over time. These characteristics make borrowing an appropriate way to fund infrastructure. Borrowing long term to fund growth-enhancing long-lived investments is both a financially and economically sound strategy. On the other hand, constraining investment to cash on hand will likely ensure that our infrastructure investments do not meet our infrastructure needs.

In particular, policymakers should be wary of tying our nation's infrastructure future to proposals for large tax breaks for multinational corporations that have short term positive cash flows associated with them. These repatriation schemes both bring with them perverse incentives to move jobs and profits offshore, and in actuality cost the Treasury money rather than raising money. On the other hand, genuine reform of our international corporate tax system that ended all subsidies for offshoring jobs and profits could make a substantial contribution to funding our infrastructure needs.

Since 2008, the federal government has enjoyed an extraordinary low cost of borrowing.[67] The current rate for 30-year debt sits around 2.5 percent, more or less where it has been for the last two years. The yield on a 10-year Treasury bond is roughly 1.7 percent.[68] It is worth noting that these rates are determined by global capital markets and reflect investors' sense that in a world of instability, the United States is an island of relative security. The federal government, whose credit is guaranteed by the "full faith and credit of the United States," enjoys borrowing costs that are substantially lower than most states and cities, and for good fundamental reasons: Due to its size, diversity, and prosperity, the United States as a whole is far less likely to have difficulty paying its debts than are component parts of our country. Furthermore, state borrowing is often limited to funding for projects with dedicated revenue sources, such as toll bridges. Without federal funds, an enormous number of necessary investments will not be made; in fact, it is hard to imagine how we would

seriously address the deterioration of our legacy infrastructure, not to mention making transformative 21st century investments, without a dramatic increase in federal support for infrastructure investment at the state and local level.

At the same time, many of the projects proposed in this paper are in sectors, such as commercial real estate and electric power, where infrastructure investment has traditionally been funded by private parties. However, in these areas there is a serious need to expand and accelerate investment in 21st century infrastructure beyond the natural ambitions of the private sector. The attached funding tables work off of this analysis to estimate what annual funding needs would be for this program under the following assumptions:

1. All the programs that are traditionally public in nature (roads, bridges, water, air traffic control, ports, etc.) are funded in the first instance by the federal government, and so are funded at the federal government's cost of capital.

2. All the programs that are traditionally private in nature (commercial building energy retrofits, consumer purchases of vehicles, construction of a smart electrical grid) require federal support of some kind, which we approximate by assuming a federal credit guarantee, priced under congressional rules adopted at the time of the Mexican bailout in the mid-1990s.

3. The typical investment has a useful life of 20 years, and is funded at a rate approximating that of a 20-year Treasury bond.

4. The federal government either retires the principal of the debt it incurs to fund the program on a flat amortization schedule over 20 years, or contributes to a sinking fund that will retire the principal on average at the end of 20 years, on the assumption that actual retirement of principal will depend on Treasury market conditions.

5. Funding needs are lower in the first two years than in the later years of the program, as it takes time to complete the design and planning phases, which are less expensive than construction.

All of these assumptions are just that: assumptions designed to roughly model the dynamics of funding a long-term, large-scale infrastructure program that blends public and private projects. Several features of this model—the assumption that all private investment requires the equivalent of a federal credit guarantee, that all public money would be federally funded, and that there would be no offsetting user fees—are almost certainly pessimistic and exaggerate the cost of the program. On the other hand, there is no way to know all the issues that would come into play in financing such a large investment over such a substantial period of time.

We anticipate that the actual mechanisms by which an infrastructure program of this scale would be funded would be numerous and complex. We would anticipate the expansion of credit enhancement programs like the Transportation Infrastructure Finance and Innovation Act and the revival of the Build America Bonds program that was part of the ARRA. These programs lower the cost of capital for state and local government projects and facilitate the involvement of tax-exempt investors like pension funds in low-cost debt financing for public infrastructure.

In addition, many commentators have urged the federal government to establish an infrastructure bank, which would be able to independently invest in both public and private infrastructure projects. There are banks of this type in a number of nations in Europe and in major emerging markets such as Brazil, and they appear to be helpful in funding complex public and private projects. A well-designed bank, capitalized by the federal government, could leverage substantial amounts of infrastructure investment for projects that generate revenue

streams.

Under these assumptions, the attached financial analysis projects the United States could fund $4.6 trillion worth of transformative infrastructure investment over a 10-year period with a cash cost of just over $1 trillion in today's dollars over the first 10 years. Federal government budgeting is generally based on a 10-year projection, and the 10-year cost estimate enables this program to be compared with the 10-year revenue estimates made by the Joint Committee on Taxation. Of course the financing costs will continue beyond the 10-year period, but so should the revenue measures that have supported the program in the first 10.

Consequently, this program needs to be matched with revenue measures that realize $1 trillion in new revenue over the first 10-year budget window. There are a wide range of possible progressive tax increases that, in combination, could fully fund this program even without revenues generated by additional economic growth created by the program itself. Such measures include ending deferral of offshore corporate income ($418 billion over five years), equalizing capital gains rates with ordinary income rates ($632.8 billion over five years), raising top income rates by 1 percentage point ($144 billion over 10 years), restoring the estate tax to Clinton-era levels ($250 billion over 10 years), and implementing a carbon tax ($1.2 trillion over 10 years).[69]

Conclusion

Our proposal is for transformative investments. We argue that America must rediscover its ambition and confidence in its capacity to remake our nation, world, and future for the benefit of all its citizens. Our proposal is that we stop watching our inheritance rust away, stop hoarding our diminishing capital, and start acting more like the generations that built our country. We must build anew, not only to ensure our national posterity, but so that our children and grandchildren will look back at us with gratitude for making possible the better lives they will enjoy.

What follows is a comprehensive 10-year public investment agenda. The details of the program are arranged by sector and divided into two categories of investment. The first is fundamental infrastructure, which is presented with cost estimates and which forms the basis of the financial model that follows. The second is visionary projects, which are meant to be examples of the next stage of infrastructure development that could follow the more immediate investments aimed at making up for decades of underinvestment.

---

[1] Rogers, David. 2016. "France to pace 1,000km of road with solar panels," January 26, *Global Construction Review*. Retrieved February 12, 2016 (http://www.globalconstructionreview.com/trends/france-pa7ve-1000km-ro7ad-so7lar-panel7s/).

[2] Ramzy, Austin. 2010. "Engines of Growth," August 16, *Time*. Retrieved February 12, 2016 (http://content.time.com/time/magazine/article/0,9171,2008791,00.html).

The World Bank. 2014. "China's High-Speed Rail: The Rapid Growth of a New Travel Option." Washington, DC: The World Bank. Retrieved February 12, 2016 (http://www.worldbank.org/en/news/press-release/2014/12/19/china-high-speed-rail-the-rapid-growth-of-a-new-travel-option).

Bradsher, Keith. 2013. "Speedy Trains Transform China," September 23, *The New York Times.* Retrieved July 11, 2016 (http://www.nytimes.com/2013/09/24/business/global/high-speed-train-system-is-huge-success-for-china.html?_r=0).

[3] Rahadiana, Rieka. 2015. "China to Build $5 Billion High-Speed Rail Line in Indonesia," October 15, *Bloomberg*. Retrieved February 18, 2016 (http://www.bloomberg.com/news/articles/2015-10-16/china-to-build-high-speed-rail-line-in-indonesia-joint-venture).

[4] Anderson Jr., G.R. 2007. "Economy in Freefall," September 5, *Citypages*. Retrieved December 28, 2016 (http://www.citypages.com/news/economy-in-freefall-6686460).

Wyant, Carisssa. 2007. "Bridge Collapse Forces Layoffs," August 10, *Minneapolis/St. Paul Business Journal*. Retrieved February 12, 2016 (http://www.bizjournals.com/twincities/stories/2007/08/06/daily42.html).

[5] American Road and Transportation Builders Association. 2016. "Nearly 59,000 U.S. Bridges Still Structurally Deficient, New Analysis Finds." Washington, DC: American Road and Transportation Builders Association. Retrieved March 1, 2016 (http://www.artba.org/2016/02/18/nearly-59000-u-s-bridges-still-structurally-deficient-new-analysis-finds/).
Minnesota Department of Employment and Economic Development. Nd. *Economic Impacts of the I-35 Bridge Collapse.* Minneapolis, MN: Minnesota Department of transportation. Retrieved March 3, 2016 (http://www.dot.state.mn.us/i35wbridge/rebuild/pdfs/economic-impacts-from-deed.pdf).
[6] ABC News Philadelphia. 2015. "Amtrak's Northeast Corridor, SEPTA's Trenton Regional Rail Service To Resume Monday," May 17, *ABC News*. Retrieved February 16, 2016 (http://6abc.com/traffic/amtrak-derailment-impacts-septa-other-transit/719061/).
Shapiro, Emily. 2015. "Amtrak Service Returns Between New York and Philadelphia," May 18, *ABC News*. Retrieved February 12, 2016 **(**http://abcnews.go.com/US/amtrak-service-returns-monday-york-philadelphia/story?id=31109430).
[7] Neate, Rupert and Joanna Walters. 2015. "Congress votes to cut Amtrak's funding hours after fatal train crash," May 13, *The Guardian*. Retrieved February 12, 2016 (http://www.theguardian.com/world/2015/may/13/amtrak-funding-cuts-congress-train-crash).
Gray, Melissa. 2015. "Amtrak Installs Speed Controls at Fatal Crash Site," May 17, *CNN*. Retrieved May 4, 2016 (http://www.cnn.com/2015/05/16/us/philadelphia-amtrak-train-derailment/).
Northeast Corridor Five-Year Capital Plan. 2015. "Northeast Corridor Capital Plan Fiscal Years 2016-2020." Wilmington, DE: Infrastructure and Operations Advisory Commission. Retrieved May 5, 2016 (http://www.nec-commission.com/five-year-capital-plan/report/Northeast%20Corridor%20Five-Year%20Capital%20Plan.pdf).
[8] UBS. 2015. "The Investment Drought: How Can the Problem of Weak Investment be Fixed." (September 2015, Issue 1). New York, NY: UBS.
[9] Congressional Budget Office. 2015. *Public Spending on Transportation and Water Infrastructure, 1956 to 2014*. Washington, DC: Congressional Budget Office. Retrieved May 20, 2016 (https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49910-Infrastructure.pdf).
Dobbs, Richard, Herbert Pohl, Diaan-Yi Lin, Jan Mischke, Nicklas Garemo, Jimmy Hexter, Stefan Matzinger, Robert Palter, and Rushad Nanavatty. 2013. "Infrastructure productivity: How to save $1 trillion a year." McKinsey and Company. Retrieved February 12, 2016 (http://www.mckinsey.com/industries/infrastructure/our-insights/infrastructure-productivity).
[10] Schwab, Klaus and Xavier Sala-i-Martin. 2014. "The Global Competitiveness Report." Geneva: World Economic Forum. Retrieved February 12, 2016 (http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf).
http://www.infrastructurereportcard.org
[11] *Ibid.*
[12] Podkul, Cezary. 2011. "With U.S. infrastructure aging, public funds scant, more projects going private," October 22, *Washington Post*. Retrieved, February 12, 2016 (https://www.washingtonpost.com/business/with-us-infrastructure-aging-public-funds-scant-more-projects-going-private/2011/10/17/gIQAGTuv4L_story.html).
Goff, Emily. 2014. "How to Fix America's Infrastructure." Washington, DC: The Heritage Foundation. Retrieved February 12, 2016 (http://www.heritage.org/research/commentary/2014/6/how-to-fix-americas-infrastructure).
[13] *Op. Cit.* Dobbs et al.
[14] Baumol, William J. 2010. *The Microtheory of Innovative Entrepreneurship.* Princeton, NJ: Princeton University Press.
[15] McCloskey, Deirdre N. 2010. *Bourgeois Dignity: Why Economics Can't Explain the Modern World*. Chiacgo, IL: University of Chicago Press.
[16] Cutter, Bowman. 2015. "The Good Economy." New York, NY: The Roosevelt Institute. Retrieved December 18, 2015 (http://rooseveltinstitute.org/good-economy/).
[17] Nadiri, M. Ishaq and Theofanis P. Mamuneas. 1996. "Contribution of Highway Capital to Industry and National Productivity Growth." Washington, DC: Department of Transportation, Federal Highway Administration. Retrieved December 16, 2015 (http://www.fhwa.dot.gov/reports/growth.pdf).
[18] Whalen, Charles J. and Felix Reichling. "The Fiscal Multiplier and Economic Policy Analysis in the United States." Washington, DC: Congressional Budget Office. Retrieved December 10, 2015 (https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/workingpaper/49925-FiscalMultiplier_1.pdf).
[19] McNichol, Dan. 2006. *The Roads That Built America: The Incredible Story of the U.S. Interstate System.* New York, NY: Sterling.
[20] Fernald, John. 1997. *Roads To Prosperity? Assessing the Link Between Public Capital and Productivity*. Washington, DC: Board of Governors of the Federal Reserve. Retrieved December 12, 2016 (http://www.federalreserve.gov/pubs/ifdp/1997/592/ifdp592.pdf).
[21] U.S. Census Bureau. 2016. *Quarterly Retail E-Commerce Sales 4th Quarter.* Washington, DC: U.S. U.S. Census Bureau, Department of Commerce. Retrieved December 15, 2015 (https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf).
[22] Farrell, Diana and Fiona Greig. 2016. "Paychecks, Paydays, and the Online Platform Economy

Big Data on Income Volatility." JP Morgan Chase Institute. Retrieved March 2, 2016 (https://www.jpmorganchase.com/corporate/institute/document/jpmc-institute-volatility-2-report.pdf).

[23] Akamai Technologies. 2015. *Akamai State of the Internet 8*(3). Akamai Technologies. Retrieved January 15, 2015 (https://www.akamai.com/us/en/multimedia/documents/report/q3-2015-soti-connectivity-final.pdf).

[24] Federal Communications Commission. 2016. *Fact Sheet: 2016 Broadband Progress Report*. Washington, DC: Federal Communications Commission. Retrieved February 10, 2016 (https://consumermediallc.files.wordpress.com/2016/01/doc-337173a1.pdf).

U.S. Census Bureau. Nd. "Geography." Washington, DC: U.S. Census Bureau. Retrieved February 15 2016 (https://www.census.gov/geo/reference/ua/urban-rural-2010.html).

[25] Beard, Marth Perine. 2010. *In-Depth: Reaching Unbanked and Underbanked*. St. Louis, MO: Federal Reserve Bank of St. Louis. Retrieved January 8, 2016 (https://www.stlouisfed.org/Publications/Central-Banker/Winter-2010/Reaching-the-Unbanked-and-Underbanked).

[26] Crandall, Robert, William Lehr, and Robert Litan. 2007. "The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data." Washington, DC: The Brookings Institution. Retrieved January 7, 2016 (http://www.brookings.edu/views/papers/crandall/200706litan.pdf).

Telecommunication Developlment Bureau. 2012. "Impact of Broadband on the Economy." (Telecommunications Sector: Broadband Series, April). Geneva, Switzerland: International Telecommunication Union. Retrieved Febrauary 6, 2016 (https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf).

[27] Leuchtenburg, William E. 2009. *Franklin D. Roosevelt and the New Deal: 1932-1940.* New York, NY: Harper Perennial.

[28] Graham, Daniel J. 2007. "Agglomeration Economies and Transport Investment" (Discussion Paper No. 2007-11). Washington, DC: International Transport Forum, Joint Transport Research Centre, OECD.

[29] Parsons Brinckerhoff. 2015. "California High-Speed Rail Project: Economic Impact Analysis." California High Speed Rail Authority. Retrieved July 11, 2016 (http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2012EIR.pdf).

[30] Parsons Brinckerhoff. 2015. "California High-Speed Rail and the Central Valley Economy." Montreal, QC: Parsons Brinckerhoff. Retrieved July 11, 2016 (https://www.hsr.ca.gov/docs/Newsroom/reports/2015/FINAL_FULL_CENTRAL_VALLEY_ECONOMIC_STUDY_REPORT_020515.pdf).

[31] Yang, Sarah. 2012. "Future of California High-Speed Rail Looks Green," *Berkeley News,* July 26. Retrieved March 3, 2016 (http://news.berkeley.edu/2012/07/26/california-high-speed-rail/).

Op. Cit. World Bank, "China's High Speed…"

[32] Kopp, Robert, DJ Rasmussen, and Michael Mastrandrea. 2014. *American Climate Prospectus: Economic Risks in the United States v1.2.* New York, NY: Rhodium Group, LLC. Retrieved December 10, 2015 (http://climateprospectus.org/assets/publications/AmericanClimateProspectus_v1.2.pdf).

[33] Gordon, Kate. 2014. "Risky Business: The Economic Risks of Climate Change in the United States." New York, NY: American Climate Prospectus. Retrieved December 10, 2015 (http://riskybusiness.org/site/assets/uploads/2015/09/RiskyBusiness_Report_WEB_09_08_14.pdf)

[34] *Op. Cit.* Kopp et. al.

[35] *Op. Cit.* Gordon.

[36] The World Bank. 2014. "New Report Identifies Major Clean-Tech Market Opportunity for Small Businesses in Developing Countries." Washington, DC: The World Bank. Retrieved December 10, 2016 (http://www.worldbank.org/en/news/feature/2014/09/24/new-report-identifies-major-clean-tech-market-opportunity-for-small-businesses-in-developing-countries).

Goossens, Ehren. 2015. "Renewables to Beat Fossil Fuels With $3.7 Trillion Solar Boom," June 23, *Bloomberg Technology.* Retrieved December 14, 2016 (http://www.bloomberg.com/news/articles/2015-06-23/renewables-to-beat-fossil-fuels-with-3-7-trillion-solar-boom).

[37] Pratt, RG, PJ Balducci, C Gerkensmeyer, S Katipamula, MCW Kintner-Meyer, TF Sanquist, KP Schneider, and TJ Secrest. *The Smart Grid: An Estimation of the Energy and CO_2 Benefits.* (Prepared for the U.S. DOE under Contract DE-AC05-76RL01830). Washington, DC: U.S. Department of Energy. Retrieved April 20, 2016 (http://www.pnl.gov/main/publications/external/technical_reports/PNNL-19112.pdf).

[38] Electronic Power Research Institute. 2011. "Estimating the Costs and Benefits of the Smart Grid: A Preliminary Estimate of the Investment Requirements and the Resultant Benefits of a Fully Functioning Smart Grid." (2011 Technical Report). Palo Alto, CA: Electronic Power Research Institute. Retrieved January 11, 2016 (http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001022519).

[39] Pew Charitable Trusts. 2014. "2013: Who's Winning the Clean Energy Race?" Washington, DC: Pew Charitable Trusts. Retrieved January 10, 2016 (http://www.pewtrusts.org/~/media/assets/2014/04/01/clenwhoswinningthecleanenergyrace2013pdf.pdf).

[40] Nelson, Laura J. 2014. "Train Station to Connect Metro Rail Lines With LAX Approved," June 26, *The Los Angeles Times*. Retrieved December 10, 2015 (http://www.latimes.com/local/la-me-lax-train-connection-20140627-story.html).
[41] TomTom. 2015. "TomTom Traffic Index: Measuring Congestion Worldwide: Los Angeles." TomTom. Retrieved January 5, 2016 (http://www.tomtom.com/en_gb/trafficindex/#/city/LOS).
[42] Delta. 2016. "Check-in Requirements." Delta. Retrieved January 10, 2016 (http://www.delta.com/content/www/en_US/traveling-with-us/check-in/requirements.html).
Office of the Assistant Decretary for Research and Technology. 2016. *On-Time Arrival Performance.* Washington, DC: Bureau of Transportation Statistic, United State Department of Transportation. Retieved April 10, 2016 (http://www.transtats.bts.gov/ot_delay/OT_DelayCause1.asp?pn=1).
[43] Goovaerts, Diana. 2015. "Report: U.S. LTE Lags in Global Coverage, Speed Comparison," September 24, *Wireless Week*. Retrieved April 10, 2016 (http://www.wirelessweek.com/news/2015/09/report-us-lte-lags-global-coverage-speed-comparison).
Martonik, Andrew. 2013. "The Cost of Connectivity: Data and Analysis of Broadband Offerings in 24 Cities Across the World." New York, NY: Open Technology Institute. Retrieved April 10, 2016 (https://www.newamerica.org/oti/policy-papers/the-cost-of-connectivity-2014/#27).
[44] Chester, Mikhail and Arpad Horvath. 2010. "Life-Cycle Environmental Assessment of California High Speed Rail." *Access 37.* Berkeley, CA: UC Transportation Center. Retrieved March 3, 2016 (http://www.uctc.net/access/37/access37_assessing_hsr.pdf).
Op. Cit. Yang.
[45] Travel China Guide. 2016. "Beijing-Shanghai High Speed Train." Travel China Guide. Retrieved January 15 (http://www.travelchinaguide.com/china-trains/beijing-shanghai-highspeed.htm).
[46] American Society of Civil Engineers. 2014. "2013 Report Card for America's Infrastructure." New York, NY: American Society of Civil Engineers. Retrieved December 17, 2015 (http://www.infrastructurereportcard.org/a/documents/Transit.pdf).
[47] World Economic Forum. 2014. "Global Competitiveness Rankings Report 2014-2015." Washington, DC: World Economic Forum. Retrieved December 22, 2015 (http://reports.weforum.org/global-competitiveness-report-2014-2015/rankings/).
[48] Office of the Assistant Decretary for Research and Technology. 2016. *On-Time Arrival Performance.* Washington, DC: Bureau of Transportation Statistic, United State Department of Transportation. Retieved April 10, 2016 (http://www.transtats.bts.gov/ot_delay/OT_DelayCause1.asp?pn=1).
[49] *Op. Cit.* Cost of Connectivity.
Bernasek, Anna. 2014. "Two Countries, Two Vastly Different Phone Bills," August 23, *The New York Times.* Retrieved April 20, 2016 (http://www.nytimes.com/2014/08/24/business/two-countries-two-vastly-different-phone-bills.html?_r=0).
[50] Author's Analysis based on: U.S. Department of Transportation. 2014. "TIGER Benefit-Cost Analysis (BCA) Resource Guide." Washington, DC: U.S. Department of Transportation. Retrieved December 20, 2016 (https://www.transportation.gov/sites/dot.gov/files/docs/TIGER%20BCA%20Resource%20Guide%202014.pdf).
[51] Eisele, Bill, Tim Lonax, and Jim Bak. 2015. "2015 Urban Mobility Scorecard." College Station, TX: Texas A&M University. Retrieved December 12, 2015 (http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-scorecard-2015.pdf).
[52] Ball, Michael, Cynthia Barnhart, Martin Dresner, Mark Hansen, Kevin Neels, Amedeo Odoni, Everett Peterson, Lance Sherry, Antonio Trani, and Bo Zou. 2010. "Total Delay Impact Study." The National Center of Excellence Created by the Federal Aviation Administration, Federal Aviation Administration. Retrieved December 10, 2015 (http://www.nextor.org/pubs/TDI_Report_Final_11_03_10.pdf).
[53] *Op. Cit.* American Society of Civil Engineers.
[54] Lurie, Julia. "A Toxic Timeline of Flint's Water Fiasco," January 26, *Mother Jones*. Retrieved January 20, 2016 (http://www.motherjones.com/environment/2016/01/flint-lead-water-crisis-timeline).
[55] http://www.freep.com/story/news/local/michigan/oakland/2015/01/31/detroit-commuting-troy-rochester-hills-smart-ddot-ubs-banker-woodward-buses-transit/22660785/
[56] *Op. Cit.* FDR and the New Deal
[57] Dreier, Peter and Todd Swanstrom. 2014. "Suburban ghettos like Ferguson are ticking time bombs," August 21, *The Washington Post.* Retrieved December 10, 2015 (https://www.washingtonpost.com/posteverything/wp/2014/08/21/suburban-ghettos-like-ferguson-are-ticking-time-bombs/).
Schoen, John W. 2013. "The trickle-down effect of Baltimore's crumbling infrastructure," November 21, *CNBC.* Retrieved December 10, 2015 (http://www.cnbc.com/2013/11/21/-down-effect-of-baltimores-crumbling-infrastructure.html).
[58] Katznelson, Ira. 2013. *Fear Itself: The New Deal and the Origins of Our Time*. New York, NY: Liveright Publishing.
[59] Woolner, David. 2010. "African Americans and the New Deal: A Look Back in History." New York, NY: Roosevelt Institute. Retrieved December 10, 2015 (http://rooseveltinstitute.org/african-americans-and-new-deal-look-back-history/).

[60] Bureau of Economic Analysis. 2016. "National Economic Accounts." Washington, DC: Bureau of Economic Analysis, U.S. Department of Commerce.
Bureau of Labor Statistics. 2016. "Employment-Population Ratio." Washington, DC: Bureau of Labor Statistics, U.S. Department of Commerce.
[61] Reifschneider, Dave, William L. Wascher, and David Wilcox. 2013. "Aggregate Supply in the United States: Recent Developments and Implications for the Conduct of Monetary Policy." Presented at the 14th Jacques Polak Annual Research Conference Hosted by the International Monetary Fund, Washington, DC, November 7-8. Retrieved April 8, 2016 (https://www.imf.org/external/np/res/seminars/2013/arc/pdf/wilcox.pdf).
[62] Atkinson, Tyler, David Luttrell, and Harvey Rosenblum. 2013. *How Bad Was It? The Costs and Consequences of the 2007-2009 Financial Crisis.* (Dallas Fed Staff Papers No. 20). Dallas, TX: Dallas Federal Reserve. Retrieved January 5. 2016 (https://dallasfed.org/assets/documents/research/staff/staff1301.pdf).
Center on Budget and Policy Priorities. 2016. "Chart Book: The Legacy of the Great Recession." Washington, DC: Center on Budget and Policy Priorities. Retrieved June 20, 2016 (http://www.cbpp.org/research/economy/chart-book-the-legacy-of-the-great-recession).
Op. Cit. BEA
[63] Furceri, David and Annabelle Mourougane. 2009. "The Effect of Financial Crises on Potential Output: New Emperical Evidence from OECD Countries." (OECD Economics Department Working Papers No. 699). Retrieved January 5, 2016 (http://www.oecd-ilibrary.org/economics/the-effect-of-financial-crises-on-potential- output_224126122024?crawler=true).
OECD. 2014. "General Assessment of the Macroeconomic Situation." Washington, DC: OECD. Retrieved January 17, 2016 (http://www.oecd.org/eco/outlook/General-assessment-of-the-macroeconomic-situation.pdf).
World Economic Forum. 2014. "An Uneven Global Recovery Continues." Washington, DC: World Economic Forum. Retrieved January 5, 2016 (http://www.imf.org/external/pubs/ft/weo/2014/update/02/index.htm).
[64] Congressional Budget Office. 2011. *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from January 2011 Through March 2011*. Washington, DC: Congressional Budget Office. Retrieved January 8, 2016 (https://www.cbo.gov/publication/41461?index=12185).
Bivens, Josh. 2014. "The Short- and Long-Term Impact of Infrastructure Investments on Employment and Economic Activity in the U.S. Economy." Washington, DC: Economic Policy Institute. Retrieved December 20, 2015 (http://www.epi.org/publication/impact-of-infrastructure-investments/).
Feyrer, James and Bruce Sacerdote. 2011. "Did the Stimulus Stimulate? Real Time Estimates of the Effects of the American Recovery and Reinvestment Act." (Working Paper 16759). Cambridge, MA: Bureau of Economic Research. Retrieved January 17, 2016 (http://www.nber.org/papers/w16759.pdf).
[65] Author's Analysis, based on: The Short- and Long-Term Impact of Infrastructure Investments on Employment and Economic Activity in the U.S. Economy." Washington, DC: Economic Policy Institute. Retrieved December 20, 2015 (http://www.epi.org/publication/impact-of-infrastructure-investments/).
[66] The Economist. 2014. "Concrete benefits," October 4, *The Economist.* Retrieved January 15, 2016 (http://www.economist.com/news/finance-and-economics/21621801-public-investments-infrastructure-do-most-good-times).
[67] U.S. Treasury Department. 2016. *Daily Treasury Real Yield Curve.* Washington, DC: U.S. Department of the Treasury. Retrieved February 12, 2016 (https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=realyield).
[68] CNBC. 2016. "U.S. 10 Year Treasury." *CNBC.* Retrieved January 15, 2016 (http://data.cnbc.com/quotes/US10Y).
[69] Joint Committee on Taxation. 2014. *Estimates of Federal Tax Expenditures For Fiscal Year 2014 – 2018* (JCX-97-14). Washington, DC: Congressional Budget Office.
Congressional Budget Office. 2014. *Options for Reducing the Deficit: 2015 to 2024*. Washington, DC: Congressional Budget Office. Retrieved April 20, 2016 (http://www.cbo.gov/sites/default/files/cbofiles/attachments/49638-BudgetOptions.pdf).
Americans for Tax Fairness. 2015. "Next Steps Toward Tax Fairness: Options for Closing Loopholes for the Richest 2% and Big Corporations." Washington, DC: Americans for Tax Fairness. Retrieved April 20, 2016 (http://www.finance.senate.gov/imo/media/doc/Americans%20for%20Tax%20Fairness.pdf).

AMERICAN RENOVATION INVESTMENT

project financing

NAME	SOURCE	SUMMARY	COST BY YEAR										ESTIMATED TOTAL 10 YR COST (MILLIONS)
			1	2	3	4	5	6	7	8	9	10	
National Broadband at 100 MBPS	Federal Communications Comission, "September Comission Meeting" September 29, 2009	Estimated incremental cost of making broadband speeds of 100 Mbps or more available nationally	$1,750	$2,625	$3,828	$3,828	$3,828	$3,828	$3,828	$3,828	$3,828	$3,828	**$3,828.13**
Nationwide Public Safety Broadband Network	FEC, "The Public Safety Nationwide Interoperable Broadband Network: A New Model for Capacity, Performance, and Cost" ; Televate "The Business Modeling of the Nationwide Public Safety Network"	Creation of a unified public safety communication system and LTE infrastructure that will allow downloads of video transmission of images	$700	$1,050	$1,531	$1,531	$1,531	$1,531	$1,531	$1,531	$1,531	$1,531	**$14,000**
Establishing Public Wi-Fi Hot Spots in the 10 Largest U.S. Cities	New York City, "LinkNYC" ; New York Times, "Pay Phones in New York City Will Become Free Wi-Fi Hot Spots"	Kiosks with free wifi, domestic calls, a touchscreen to access City services and directions, and charging for mobile devices, in the 10 largest U.S. cities	$100	$150	$219	$219	$219	$219	$219	$219	$219	$219	**$2,000**
5G Mobile Broadband Research Investment	European Comission, "Mobile communications: Fresh €50 million EU research grants in 2013 to develop '5G' technology	One time investment in developing 5G technology, similair to levels in UK and EU	$50	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$50**
NEC Improvements/ High Speed Rail	Amtrak, "The Amtrak Vision for the Northeast Corridor"	Improvements for high-speed rail in NEC	$2,350	$3,525	$5,140.63	$5,140.63	$5,140.63	$5,140.63	$5,140.63	$5,140.63	$5,140.63	$5,140.63	**$47,000**
California High-Speed Rail	California High-Speed Rail Authority, "California High-Speed Rail Program"	1- Year cost assuming equal funding per year	$1,808	$2,712	$3,955	$3,955	$3,955	$3,955	$3,955	$3,955	$3,955	$3,955	**$36,156**
Midwest High-Speed Rail	University of Illinois and Illinois DOT, "220 MPH High Speed Rail Preliminary Feasibility Study"	Midwest high-speed rail with service connecting Chicago, Champaign, St. Louis, and Indianapolis.	$2,500	$3,750	$5,469	$5,469	$5,469	$5,469	$5,469	$5,469	$5,469	$5,469	**$50,000**

NAME	SOURCE	SUMMARY	COST BY YEAR										ESTIMATED TOTAL 10 YR COST (MILLIONS)
			1	2	3	4	5	6	7	8	9	10	
Electricity Infrastructure Updates to Meet Demand and Carbon Emission Standards and Building Retrofits	The Edison Foundation, "Transforming America's Power Industry: The Investment Challenge 2010-2030"	Build and repair generation facilities (including maintaining service based on EPRI's Prism Analysis) as well as transmission and distribution lines, and developing Energy Efficency programs, Carbon Capture, Renewable Generation, and Nuclear power. The low "realistically achievable" estimate of efficiency programs ($85 billion over 20 years) is replaced with a more comprehensive estimate from the Rockefeller Foundation of $279 billion.	$59,725	$89,588	$130,648	$130,648	$130,648	$130,648	$130,648	$130,648	$130,648	$130,648	**$1,194,500**
Protecting Transformers Against Electromagnetic Pulse (EMP) Events	American Enterprise Institute, "Lights Out"	Upgrade to transformers that would protect the nation from both natural EMP events and attacks.	$100	$150	$219	$219	$219	$219	$219	$219	$219	$219	**$2,000**
5 Million New Electric and Plug-in Hybrid Electric Vehicles	The International Renewable Energy Agency, "Road Transport: The Cost of Renewable Solutions"	The current incremental cost for 10 million new electric, hybrid electric vehicles plus the charging station infrastructure needed to meet demand.	$3,146	$4,719	$6,882	$6,882	$6,882	$6,882	$6,882	$6,882	$6,882	$6,882	**$62,920**
Average 54.5 MPG Cars by 2015	National Automobile Dealers Association, "The Obama Administration's Triple Regulation of Fuel Economy"; WardsAuto, "U.S. Car and Truck Sales, 1931-2014"	Estimated cost per vehicle ($3,000) of new fuel efficiency standards mulitplied by a 10-year estimate of the number of new light vehicle purchases.	$26,295	$39,443	$57,520	$57,520	$57,520	$57,520	$57,520	$57,520	$57,520	$57,520	**$525,900**
Bike Sharing	Georgetown Public Policy Review, "Beyond Urban Planning: The Economics of Capital Bikeshare" ; US News & World Report "Bike Sharing Systems Aren't Trying to Peddle for Profit"	Expanding bike share systems with similair costs to 10 new American cities a year for 10 years.	$43.50	$65.25	$95.16	$95.16	$95.16	$95.16	$95.16	$95.16	$95.16	$95.16	**$870**
LED Streetlight Replacement	U.S. Department of Energy, "Solid-State Lighting: LEDs for Street Lighting-Here Today"	Replacing streetlights nationwide with more energy efficient and less matienance-intensive LEDs.	$663	$994	$1,449	$1,449	$1,449	$1,449	$1,449	$1,449	$1,449	$1,449	**$13,250**
Essential Airport Investment	American Society of Civil Engineers, "Failure to Act: The Impact of Current Infrastructure Investment on America's Economic Future"	Replace the nation's 1960s radar technology with the "NextGen" satellite-based air traffic control system and make other improvements.	$7,400	$11,100	$16,188	$16,188	$16,188	$16,188	$16,188	$16,188	$16,188	$16,188	**$148,000**
Essential Freight Investment Program	Brookings, "Establish a National Freight Investment Program to Improve Trade and Economic Performance"	The federal government should establish a multimodal freight investment program that includes a combination of formula and competitive grants to drive regional growth.	$1,180	$1,770	$2,581	$2,581	$2,581	$2,581	$2,581	$2,581	$2,581	$2,581	**$23,600**

NAME	SOURCE	SUMMARY	COST BY YEAR										ESTIMATED TOTAL 10 YR COST (MILLIONS)
			1	2	3	4	5	6	7	8	9	10	
Essential Passenger Rail (Non-NEC)	Amtrak, "Fiscal Year 2015 Grant and Legislative Request"	Represents capital investments necessary in Amtrak's state supported business lines, long distance business lines, and corporate development business lines met for a 10 year period. Does not include NEC rehabilitation costs, which are included with the cost of upgrading NEC to high-speed rail.	$205.50	$308	$450	$450	$450	$450	$450	$450	$450	$450	**$4,110**
Essential Bridge and Highway Condition and Performance Improvements	Federal Highway Administration, "2013 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance"	Investment would result in a 26.7 percent reduction in average pavement roughness, an 8.0 percent reduction in average delay per vehicle mile traveled, and an improvement in average bridge sufficiency from 82.0 percent to 84.7 percent.	$61,850	$92,775	$135,297	$135,297	$135,297	$135,297	$135,297	$135,297	$135,297	$135,297	**$1,237,000**
Essential Mass Transit Repair and Expansion	Federal Highway Administration, "2013 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance"	Includes the 10-year cost of rehabilitation and replacement as well as expansion of transit fleets, facilities, and mass transit rail networks required to support projected growth in mass transit demand.	$12,250	$18,375	$26,797	$26,797	$26,797	$26,797	$26,797	$26,797	$26,797	$26,797	**$245,000**
National Inland Waterways and Marine Ports Investments	American Society of Civil Engineers, "Failure to Act"	Nationwide creation of wider and more efficient locks, harbors, and waterways.	$1,624	$2,436	$3,552	$3,552	$3,552	$3,552	$3,552	$3,552	$3,552	$3,552	**$32,476**
Essential Drinking Water Utilities Investments	EPA, "Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress"	Thousands of miles of pipe as well as thousands of treatment plants, storage tanks, and other key assets to ensure the public health, security, and economic well-being of our cities, towns, and communities.	$9,605	$14,408	$21,011	$21,011	$21,011	$21,011	$21,011	$21,011	$21,011	$21,011	**$192,100**
Essential Wastewater Infrastructure Investments	EPA, "Clean Watershed Needs Survey: Report to Congress"	This amount includes $192.2 billion for wastewater treatment plants, pipe repairs, and buying and installing new pipes; $63.6 billion for combined sewer overflow correction; and $42.3 billion for stormwater management. Small communities have documented needs of $22.7 billion.	$7,452.50	$11,179	$16,302	$16,302	$16,302	$16,302	$16,302	$16,302	$16,302	$16,302	**$149,050**
Essential Natural Gas Pipeline Repairs	Blue Green Alliance & AFL-CIO, "Interconnected: The Economic Impact and Climate Change Benefits of Accelerating Repair and Replacement of America's Natural Gas Distribution Pipelines"	Cost of repairing all "leak-prone" pipelines in the United States including those made out of aging bare steel, unprotected coated steel, and cast iron.	$1,375	$2,063	$3,008	$3,008	$3,008	$3,008	$3,008	$3,008	$3,008	$3,008	**$27,500**
Essential Levee Repair and Rehabilitation	American Society of Civil Engineers, "2013 Report Card for America's Infrastructure"	Nationwide repair, rehabilitation, and replacement on America's 100,000 miles of levees	$5,000	$7,500	$10,938	$10,938	$10,938	$10,938	$10,938	$10,938	$10,938	$10,938	**$100,000**

NAME	SOURCE	SUMMARY	COST BY YEAR										ESTIMATED TOTAL 10 YR COST (MILLIONS)
			1	2	3	4	5	6	7	8	9	10	
Essential Rehabilitation of All High Hazard Dams	Association of Dam Safety Officials, "State and Federal Oversight of Dam Safety Must be Improved"	Repairing our most critical dams: $11.2 billion for publicly owned dams and $7 billion for private.	$910	$1,365	$1,991	$1,991	$1,991	$1,991	$1,991	$1,991	$1,991	$1,991	**$18,200**
Essential Improvement of School Facilities	National Center for Eductaional Statistics, "Condition of America's Public School Facilities: 2012-2013"	Cost to put all public school facilities in good overall condition.	$9,850	$14,775	$21,547	$21,547	$21,547	$21,547	$21,547	$21,547	$21,547	$21,547	**$197,000**
Essential Parks and Recreation Maintenance	American Society of Civil Engineers, "2013 Report Card for America's Infrastructure"	Reversing declining funding to parks to clear backlog of deferred maintenance including roads and bridges that run through the park system	$13,575	$20,363	$29,695	$29,695	$29,695	$29,695	$29,695	$29,695	$29,695	$29,695	**$271,500**