An Economic Analysis of Infrastructure Investment

The Department of the Treasury
with the Council of Economic Advisers

October 11, 2010

AN ECONOMIC ANALYSIS OF INFRASTRUCTURE INVESTMENT

A REPORT PREPARED BY THE DEPARTMENT OF THE TREASURY

WITH THE COUNCIL OF ECONOMIC ADVISERS

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Executive Summary

On Labor Day, President Obama announced a bold plan to renew and expand America's infrastructure. The plan includes a $50 billion up-front investment connected to a six-year reauthorization of the surface transportation program and the creation of a National Infrastructure Bank to leverage private capital and select projects of regional and national significance. The Department of the Treasury, with the Council of Economic Advisers, has conducted an analysis of the economic effects of transportation infrastructure investment. Our analysis found four key reasons why now is an optimal time to increase our investment in transportation infrastructure:

- Well designed infrastructure investments have long term economic benefits;
- The middle class will benefit disproportionately from this investment;
- There is currently a high level of underutilized resources that can be used to improve and expand our infrastructure; and
- There is strong demand by the public and businesses for additional transportation infrastructure investments.

Return on Investment

- Many studies have found evidence of large private sector productivity gains from public infrastructure investments, in many cases with higher returns than private capital investment. Research has shown that well designed infrastructure investments can raise economic growth, productivity, and land values, while also providing significant positive spillovers to areas such as economic development, energy efficiency, public health and manufacturing.

- Not all infrastructure projects are worth the investment. Investing rationally in infrastructure is critically important, as is providing opportunities for the private sector to invest in public infrastructure. There is currently very little direct private investment in our nation's highway and transit systems due to the current method of funding infrastructure, which lacks effective mechanisms to attract and repay direct private investment in specific infrastructure projects. The establishment of a National Infrastructure Bank would create the conditions for greater private sector co-investment in infrastructure projects. A National Infrastructure Bank would also perform a rigorous analysis that would result in support for projects that yield the greatest returns to society and are most likely to deliver long-run economic benefits that justify the up-front investments.

Helping the Middle Class

- Investing in transportation infrastructure creates middle class jobs. Our analysis suggests that 61 percent of the jobs directly created by investing in infrastructure would be in the construction sector, 12 percent would be in the manufacturing sector, and 7 percent would be in retail trade, for a total of 80 percent in these three sectors. Nearly 90 percent of the jobs in the three sectors most affected by infrastructure spending would be middle class jobs, defined as those paying between the 25^{th} and 75^{th} percentile of the national distribution of wages.

- The President's proposal emphasizes transportation choices, including mass transit and high speed rail, to deliver the greatest long-term benefits to those who need it most: middle class families. The average American family spends more than $8,600 a year on transportation, one-third more than they spend on food. For the 90 percent of Americans who are not among the top decile in income, transportation costs absorb one out of every six dollars of income. This burden is due in large part to the lack of alternatives to expensive and often congested automobile travel. Multi-modal transportation investments are critical to get American families moving again without wasting their time and their money sitting in traffic.

Investing in Infrastructure Uses Underutilized Resources

- The average unemployment rate among those who gain employment as a result of additional investment in infrastructure is currently over 15 percent. This is more than one and one-half times the national unemployment rate. Within the construction sector, where the majority of direct employment occurs as a result of infrastructure investment, the unemployment rate is over 17 percent.

- Construction costs and other costs associated with building projects are especially low in the current environment. The Department of Transportation's (DOT) experience with Recovery Act funding has shown that more than 2,000 additional airport, highway, bridge and transit projects were funded because of low bids, or projects being completed under budget. DOT also reported that among its $1.1 billion in aviation investments, winning bids for the projects came in $200 million below their initial engineering estimates.

Americans Want Additional Investment

- As a result of years of under-investment in our transportation system, Americans' satisfaction with our public transit system, when compared to public satisfaction with public transit systems around the world, ranks 25th out of 32 OECD nations. While our nation has historically favored road building over public transit, we rank only 17th out of 32 -- in the middle of the pack -- with respect to our satisfaction with our roads and highways. The relatively higher satisfaction with roads and highways is consistent with the observation that our nation's historic investment pattern favored highways and roads over public transit.

- One study found that almost 19 out of 20 Americans are concerned about America's infrastructure and 84 percent support greater investment to address infrastructure problems.

An Economic Analysis of Infrastructure Investment

I. Introduction

On Labor Day, President Obama announced a bold plan to renew and expand America's infrastructure. This plan includes a $50 billion up-front investment connected to a six-year reauthorization of the surface transportation program and the creation of a National Infrastructure Bank. The President's plan would rebuild 150,000 miles of roads, construct and maintain 4,000 miles of passenger rail, rehabilitate or reconstruct 150 miles of runways while upgrading our outdated air traffic control system, bringing American aviation travel into the 21st century. This report considers various economic effects of infrastructure investments.

Public infrastructure is an essential part of the U.S. economy. Every day, Americans use our nation's transportation infrastructure to commute to work, visit their friends and family and travel freely around the country. Businesses depend on a well functioning infrastructure system to obtain their supplies, manage their inventories, and deliver their goods and services to market. This is true for companies whose businesses rely directly on the infrastructure system, such as UPS and CSX, as well as others whose businesses indirectly rely on the infrastructure system, such as farmers who use publicly funded infrastructure to ship crops to buyers, and dot.com companies that send goods purchased online to customers throughout the world. A modern transportation infrastructure network is necessary for our economy to function, and is a prerequisite for future growth. President Eisenhower's vision is even more relevant today than it was in 1955, when in his State of the Union Address he said, "A modern, efficient highway system is essential to meet the needs of our growing population, our expanding economy, and our national security." Today, that vision would include making not only our highways, but our nation's entire transportation system more efficient and effective.

Our analysis indicates that both demand- and supply-side factors support the conclusion that further infrastructure investments would be particularly timely and beneficial for the U.S. economy. First, estimates of economically justifiable investment, expert reports and public opinion indicate that American infrastructure is not keeping pace with the needs of our economy and the desires of the American people. Second, because of high unemployment in sectors such as construction that were especially hard hit by the bursting of the housing bubble, there are underutilized resources that can be used to build infrastructure. Moreover, states and municipalities typically fund a significant portion of infrastructure spending, but are currently strapped for cash; the federal government has a constructive role to play by stepping up to address the anticipated shortfall and provide more efficient financing mechanisms, such as Build America Bonds.

The President's plan addresses a significant and longstanding need for greater infrastructure investment in the United States. Targeted investments in America's transportation infrastructure would generate both short term and long term economic benefits. However, transforming and rehabilitating our nation's transportation infrastructure system will require not only greater investment but also more efficient use of resources, because simply increasing funding does not guarantee economic benefits. This idea is embodied in the President's proposal to reform our nation's transportation policy, as well as establish a National Infrastructure Bank, which will leverage private and other non-federal government resources to make wise investments in projects of regional and national significance.

In this report, we begin by reviewing *demand-side* factors that should influence investment in infrastructure. Next, we review evidence on *supply-side* factors, including the availability of workers with the requisite skills, which suggest that now is a particularly favorable time to initiate these investments.

II. Demand-Side Considerations

Long Run

The United States has a rich history of investing in infrastructure and reaping the long-term economic benefits. Influential research by David Aschauer and others has explored the link between public infrastructure investment and economic growth.[1,2,3] Many studies have found evidence of large private sector productivity gains from public infrastructure investments, in many cases with higher returns than private capital investment. A recent analysis by the Congressional Budget Office found that additional investment in infrastructure is among the most effective policy options for raising output and employment.[4] Since much of the public capital stock is owned by state and local authorities, more recent research has compared the economic benefits of infrastructure investments between regions in the U.S., generally finding smaller but economically significant benefits in comparison to Aschauer's estimates.[5]

Investments in infrastructure allow goods and services to be transported more quickly and at lower costs, resulting in both lower prices for consumers and increased profitability for firms.

[1] Aschauer, David. "Is Public Expenditure Productive?" J. Monet. Econ., Mar. 1989a, 23(2), pp. 177-200.
[2] Aschauer, David. "Public Investment and Productivity Growth in the Group of Seven," Econ. Perspectives, 1989b, 13(5), pp. 17-25.
[3] Aschauer, David. "Does Public Capital Crowd Out Private Capital?"J . Monet. Econ., 1989c, 24(2), pp. 171- 88.
[4] Congressional Budget Office, "Policies for Increasing Economic Growth and Employment in the Short Term," January 2010.
[5] Munnell, Alicia H, 1992. "Infrastructure Investment and Economic Growth," Journal of Economic Perspectives, American Economic Association, vol. 6(4), pages 189-98, Fall.

Major transportation infrastructure initiatives include the building of the national railroad system in the 19th century and the creation of the Eisenhower Interstate System in the 1950s and 1960s. In these cases, many observers have concluded that there was a causal link running from infrastructure investments to subsequent private sector productivity gains.[6] Alternatively, it is possible that infrastructure investments occur when productivity gains are also likely to follow but for unrelated reasons. Determining causality is difficult.

A study by John Fernald makes progress on establishing causality by comparing the impact of infrastructure investment on industries that *a priori* should experience different benefits from infrastructure.[7] He finds that the construction of the interstate highway system in the 1960s corresponded with a significant increase in the productivity of vehicle-intensive industries (such as transportation and gas utilities), relative to industries that do not depend on vehicles (such as apparel and textiles and industrial machinery). Fernald's findings suggest that previous investments in infrastructure led to substantial productivity gains, and suggest the potential for further increases in productivity through additional, well targeted investment.

Another study by Climent Quintana-Domeque and Marco Gonzalez-Navarro makes progress on estimating the causal effect of infrastructure investment, using an experimental design.[8] Specifically, the study randomly assigned some roads to be paved and others to be in a control group in the Mexican city of Acayucan. Their analysis suggests that such infrastructure investment substantially raised housing values on the newly paved roads, which reflects an improvement in living standards, as well as provided benefits for home values on nearby streets. The rise in housing values on affected streets significantly exceeded the cost of paving.

Edward Gramlich argues that the greatest return on investment can be garnered from spending on maintenance of existing highways.[9] Citing data from the Congressional Budget Office, he finds an extremely high rate of return from bringing road conditions up to their minimum state of good repair. Interestingly, he also finds that improvements beyond the state of good repair are not associated with positive returns. Allocating maintenance dollars to where they are most needed is likely to generate high rates of return and improve safety, suggesting that our spending on infrastructure going forward should prioritize funding roads that are in a state of disrepair.

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[6] Munnell, Alicia H, 1992. "Infrastructure Investment and Economic Growth," Journal of Economic Perspectives, American Economic Association, vol. 6(4), pages 189-98, Fall.

[7] Fernald, John G., "Roads to Prosperity? Assessing the Link Between Public Capital and Productivity," *The American Economic Review*, Vol. 89, No. 3 (Jun., 1999), pp. 619-638

[8] Quintana-Domeque, Climent and Marco Gonzalez-Navarro, "Street Pavement: Results from an Infrastructure Experiment in Mexico," Industrial Relations Section, Princeton University, Working Paper No. 556, (Jul., 2010)

[9] Gramlich, Edward, "Infrastructure Investment: A Review Essay," *Journal of Economic Literature*, Vol. 32, No. 3 (Sept., 1993), pp. 1176-1196

Not surprisingly, the literature suggests that the economic benefits from various infrastructure projects vary widely.[10,11] Additionally, even if previous infrastructure investments had economic benefits, it is not clear that policymakers should expect the same rate of return for subsequent infrastructure investments. This is especially true when one considers the network effects that are associated with the creation of original transportation networks. We must continue to take advantage of new investment opportunities made available by technological progress and be mindful of the fact that at some point, the economy reaches the point of diminishing returns from further investments in a particular area. As Fernald observed, "Building an interstate network might be very productive; building a second network may not."[12]

The merits of infrastructure investments must also be considered alongside projections of population growth, trading patterns and expected changes in American lifestyles. As the economy and population grow, infrastructure resources will be stretched thinner as existing systems age and additional needs for new systems arise. With the American population expected to grow to over 400 million people by 2050 and interstate commerce expected to grow as well, targeted infrastructure investments can be one strategic tool that policymakers use to prepare for the future.[13]

American firms rely on infrastructure to manage their supply chain and transport goods to the point of sale. Investments in transportation infrastructure will allow firms in all 50 states to have the opportunity to benefit from growth in foreign markets. Exports account for 7 percent of total U.S. employment; smart investments in infrastructure have the potential to create more jobs in export-oriented U.S. companies. The President's National Export Initiative calls for the "Departments of Commerce and Transportation [to enter] into a Memorandum of Understanding to work together and with stakeholders to develop and implement a comprehensive, competitiveness-focused national freight policy. The resulting policy will foster end-to-end U.S. freight infrastructure improvements that facilitate the movement of goods for export and domestic use."[14] Moreover, the Department of Transportation "estimates that population growth,

[10] Gramlich, Edward, "Infrastructure Investment: A Review Essay," *Journal of Economic Literature*, Vol. 32, No. 3 (Sept., 1993), pp. 1176-1196

[11] Gramlich, for example, cites CBO data that demonstrate different rates of return across different types of infrastructure investments, including new construction and maintenance.

[12] Fernald, John G., "Roads to Prosperity? Assessing the Link Between Public Capital and Productivity," *The American Economic Review*, Vol. 89, No. 3 (Jun., 1999), pp. 619-638

[13] "U.S. Interim Projections by Age, Sex, Race, and Hispanic Origin." U.S. Census Bureau, 2004. <http://www.census.gov/population/www/projections/usinterimproj/>

[14] "Report to the President on the National Export Initiative: The Export Promotion Cabinet's Plan for Doubling U.S. Exports in Five Years." National Export Initiative, 2010. <http://www.whitehouse.gov/sites/default/files/nei_report_9-16-10_full.pdf>

economic development, and trade will almost double the demand for rail freight transportation by 2035."[15]

There are other positive benefits from infrastructure investments. According to the Bureau of Economic Analysis, publicly-owned transportation infrastructure makes up nearly 13 percent of our total non-residential capital stock, and this stock has resulted in significant positive externalities.[16] Available evidence suggests that infrastructure investment can raise property values, which reflects an improvement in living standards. For example, research suggests that proximity to public transit raises the value of residential and commercial real estate. Bernard Weinstein studied the effect of the Dallas light rail system on property values, and found a jump in total valuations around DART stations that was about 25 percent greater than in similar neighborhoods not served by the system.[17] This is consistent with studies conducted in St. Louis[18], Chicago[19], Sacramento[20] and San Diego[21], all of which find that property values experience a premium effect when located near public transit systems.

Agglomeration benefits from transportation extend beyond the benefits to property values. For example, in Chicago, transportation agglomeration benefits have led to greater business clustering and economic growth associated with manufacturing, as businesses took advantage of Chicago's position in a national transportation network.

Finally, well-maintained transportation infrastructure, which allows individuals to access multiple modes of transportation, will result in significant efficiency benefits for Americans. Well-maintained roads, coupled with access to driving alternatives, can lower traffic congestion and accident rates which not only saves Americans time and money, but can also save lives. These benefits can also reduce dependence on foreign oil, improve energy efficiency, and reduce air pollution. For example, one study in the Los Angeles area found that traffic congestion has a

[15] "National Rail Freight Infrastructure Capacity and Investment Study." American Association of Railroads, 2007. <http://www.camsys.com/pubs/AAR_RRCapacityStudy.pdf>
[16] Treasury calculation based on data from the National Income and Product Accounts, from the Bureau of Economic Analysis.
[17] Weinstein, B. et al. "The Initial Economic Impacts of the DART LRT System." Center for Economic Development and Research, University of North Texas, 1999.
[18] Garrett, T. "Light Rail Transit in America: Policy Issues and Prospects for Economic Development," Federal Reserve Bank of St. Louis, 2004.
[19] Gruen, A. "The Effect of CTA and METRA Stations on Residential Property Values." Regional Transportation Authority, 1997.
[20] Landis, J. et al. "Rail Transit Investments, Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Systems." Institute of Urban and Regional Development, UC Berkeley, 1995.
[21] Cervero, R. Et al. "Land Value Impacts of Rail Transit Services in San Diego County," Urban Land Institute, 2002.

significant effect on CO_2 emissions, and that reducing stop-and-go traffic conditions could potentially reduce emissions by up to 12%.[22]

Building a National Community

The advent of railroads brought time standardization to the United States. Before rail travel was available, cities and towns across America set their clocks based on local sunrises and sunsets. However, the lack of time coordination across cities caused rail travelers considerable confusion.[23]

To address this issue, railroad managers developed the current nationwide time system with four distinct time zones to allow for a uniform schedule for arrivals and departures. Thus, the development of rail lines furthered the goal of a national community by allowing people and goods to travel quickly from one place to another, reducing the time to travel across the country from five to six months to just five days and by leading to the development of a national time standard.

Just as the development of railroads provided greater opportunities for Americans, boosted economic productivity, and helped build a national community in the past, increased investment in transportation infrastructure can provide these same benefits today. Research has found significant benefits from increased agglomeration of people, firms and industrial activity, particularly in manufacturing.[24] Strategic investments in infrastructure can help connect Americans in new ways to sustain communities and increase economic growth.

The United States' infrastructure stock benefits working families by reducing transportation costs and increasing efficiency. We should continue to invest in infrastructure so working Americans can continue to accrue these benefits.

Americans Want More Infrastructure Investment

American workers, families and businesses are demanding more infrastructure investment. Americans have voted repeatedly for increased investment in transportation infrastructure. In 2008 alone, over 80 percent of the 59 transportation infrastructure projects proposed in local referenda were approved by the public. Even more striking is that over 98 percent of the funds requested for these projects were approved by the voting public.[25,26,27,28] Another study found

[22] Barth, Matthew and Kanok Boriboonsomsin. "Real-World CO2 Impacts of Traffic Congestion." University of California at Riverside, 2008. <http://www.uctc.net/papers/846.pdf>

[23] Mintz, S. (2007). "Building the Transcontinental Railroad." *Digital History*. Retrieved October 6, 2010 from <http://www.digitalhistory.uh.edu/database/article_display.cfm?HHID=177>.

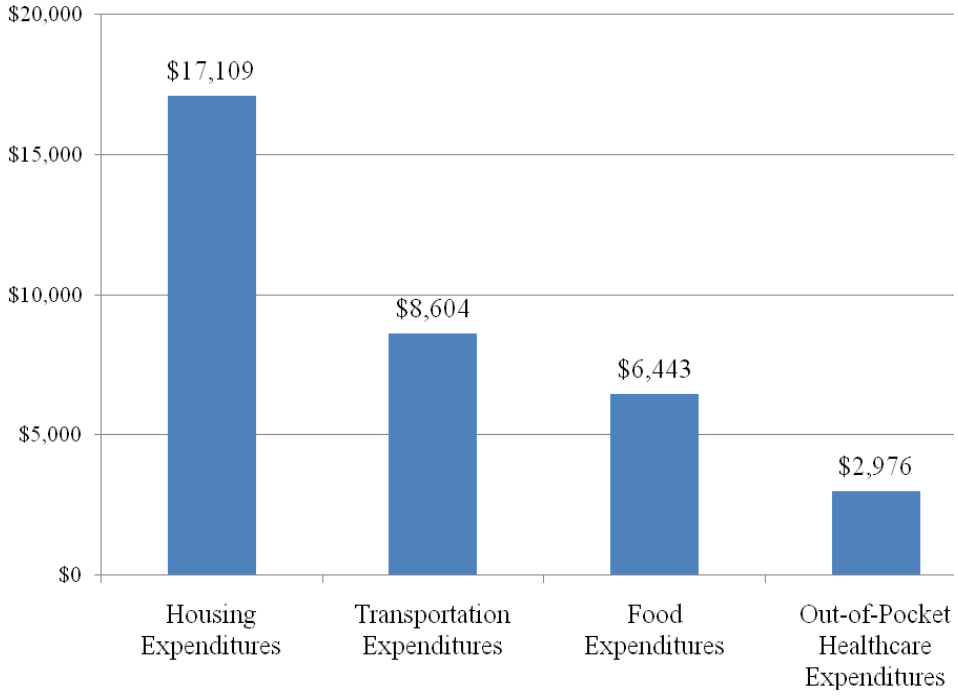
[24] Edward L. Glaeser, Ed. Agglomeration Economics Chicago: University of Chicago Press, 2010.

[25] Treasury calculation based on information compiled from [26], [27], and [28]. Where the funds were approved on an annual basis for an indefinite number of years, it was assumed that the measure was not extended beyond the initial year. The measures for which the total funding impact is ambiguous were excluded from this calculation.

that almost 19 out of 20 Americans are concerned about America's infrastructure and 84 percent support greater investment to address infrastructure problems.[29]

Public support for infrastructure is not surprising, given that for the average American family, transportation expenditures rank second only to housing expenditures. As can be seen in Figure 1, the average American annually spends one-third more on transportation than food, and more than two times as much as on out-of-pocket healthcare expenses. Given how much Americans spend on transportation expenditures, public investments which lower the cost of transportation could have a meaningful impact on families' budgets. Decreasing the need for car maintenance due to potholes and poor road conditions, increasing the availability of affordable and accessible public transit systems, and reducing fuel consumption by making better use of the land would benefit Americans and allow them to spend less money on transportation.

Figure 1: Average Household Expenditures, 2008



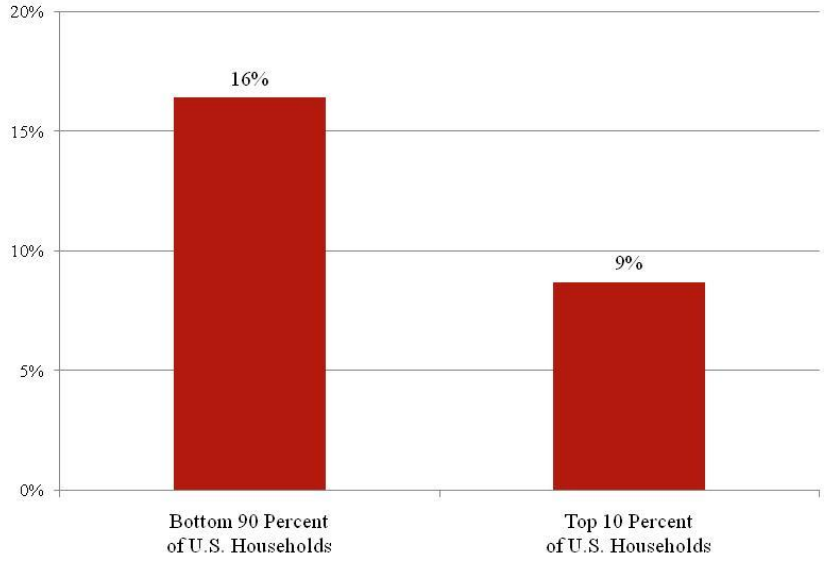
Source: Based on 2008 Consumer Expenditure Survey

[26] "2008 Transit Ballot Measures." Center for Transportation Excellence. <http://www.cfte.org/success/2006BallotMeasures.asp#2008CompletedTransitBallotMeasures>
[27] "State and Local Ballot Initiatives." The Associated General Contractors of America. <http://www.agc.org/cs/State_and_Local_Ballot_Initiatives>.
[28] "NCSLnet Search Results: 2008 State Initiatives and Referenda." National Conference of State Legislatures. <http://www.ncsl.org/?tabid=13597>
[29] "The Building America's Future National Survey," Luntz et al. 2009. <http://bafuture.org/Websites/investininfrastructure/Images/Press%20Release%20memo2.pdf>

Middle Class Americans Are the Biggest Beneficiaries of Improved Infrastructure

For the 90 percent of Americans who are not among the top decile in income, transportation costs absorb one out of every six dollars of income. Transportation expenses relative to income are almost twice as great for the bottom 90 percent as they are for the top 10 percent.

Figure 2: Percent of Income Spent on Transportation by Household Income, 2008



Source: Estimates based on 2008 Consumer Expenditure Survey, Interview Survey. Figures are total transportation expenditures relative to total income for each group.

Improving our nation's transportation system can save middle class families money by reducing the costs associated with congestion and the additional automobile maintenance caused by poor road conditions. One recent study found that poor conditions of roads cost the average motorist who drives in cities on a regular basis over $400 a year.[30,31]

Moreover, providing high speed rail and improved public transportation will provide middle class families with more options to save time and money, so that they can keep more of their income for other purposes and spend more time doing what they want, rather than spending time getting there. One study concluded that a two adult household using public transportation saved $6,250 a year compared to a similar family that is unable to use public transportation.[32]

[30] America's Roughest Rides and Strategies to Make Our Roads Smoother, Sept. 2010, www.tripnet.org/urban_roads_report_Sep_2010.pdf.
[31] See appendix for chart of 20 urban areas where costs are the highest
[32] ICF International, Public Transportation and Petroleum Savings in the U.S., Linda Bailey, January 2007.

The business and labor communities have also expressed a desire for more transportation infrastructure investment. Proposals from the American Public Transport Association (APTA), the American Association of State Highway and Transportation Officials **(**AASHTO), the U.S. Chamber of Commerce and AFL-CIO call for greater infrastructure investment. APTA advocates for nearly $15 billion of investment for federal public transportation programs, and at least $2.5 billion to be put towards high speed and intercity rail systems. AASHTO reported in 2009 that between $132 billion and $166 billion of investment is necessary to rebuild and repair America's highways.[33] The view that more transportation infrastructure is necessary is consistent with other research, including the recently issued bi-partisan report by two former Secretaries of Transportation, Norman Mineta and Samuel Skinner. Their report estimated that an additional investment of $134 to $194 billion per year is needed to maintain our transportation system, and an even larger sum, from $189 to $262 billion, would be needed to improve it.[34] The U.S. Chamber of Commerce has stated that "to have a transportation system that supports a 21st century economy, the United States needs a high level of investment targeted at improving performance across all modes and geographies. There can be no more business as usual."[35]

[33] Oakley, Janet. "Investing in Transportation Infrastructure." Government Research Association Annual Policy Conference. American Association of State Highway and Transportation Officials. 29 July 2009. <http://www.transportation.org/sites/aashto/docs/Oakley-2009-07-28pdf.pdf>

[34] Mineta, Norman, and Skinner, Samuel, "Well Within Reach: America's New Transportation Agenda"

[35] "Transportation Index National Results From 1990 to 2008." U.S. Chamber of Commerce. <http://www.uschamber.com/lra/transportation-index/national-results>

Creating a More Livable Community

Infrastructure investment should create a more livable community for working Americans. The Department of Transportation has identified six principles that the transportation system should satisfy to improve the lives of working families:

- **Provide more transportation choices** to decrease household transportation costs, reduce our dependence on oil, improve air quality and promote public health.
- **Improve economic competitiveness of neighborhoods** by giving people reliable access to employment centers, educational opportunities, services and other basic needs.
- **Target federal funding toward existing communities** – through transit-oriented development and land recycling – to revitalize communities, reduce public works costs, and safeguard rural landscapes.
- **Align federal policies and funding** to remove barriers to collaboration, leverage funding and increase the effectiveness of programs to plan for future growth.
- **Enhance the unique characteristics of all communities** by investing in healthy, safe and walkable neighborhoods, whether rural, urban or suburban.
- **Expand location- and energy-efficient housing choices** for people of all ages, incomes, races and ethnicities to increase mobility and lower the combined cost of housing and transportation.

International Competitiveness

By most measures, the United States is investing less in infrastructure than other nations. While there are reasons for this disparity, international comparisons can offer a useful benchmark to assess our investment decisions. We spend approximately 2 percent of GDP on infrastructure, a 50 percent decline from 1960.[36,37] China and Europe, by contrast, spend close to 9 percent and 5 percent of GDP on infrastructure, respectively.[38] To be clear, simple cross country comparisons do not account for differences in the current public capital stock, differences in demographics and population densities, and different transportation preferences across nations. However, it is clear that persistent neglect of our infrastructure will impact America's competitive position *vis-*

[36] Milano, Jessica. "Building America's 21st Century Infrastructure." Progressive Policy Institute, 15 January 2009. <http://www.ppionline.org/ppi_ci.cfm?knlgAreaID=450020&subsecID=900194&contentID=254788>
[37]"Remarks by the President at CNBC Town Hall Discussion on Jobs" The White House Office of the Press Secretary, 2010. <http://www.whitehouse.gov/the-press-office/2010/09/20/remarks-president-cnbc-town-hall-discussion-jobs>
[38]Ibid.

a-vis the rest of the world. Indeed, the U.S. Chamber of Commerce noted this in their *Policy Declaration on Transportation Infrastructure*, stating, "Long term underinvestment in transportation infrastructure is having an increasingly negative effect on the ability of the United States and its industries to compete in the global economy."

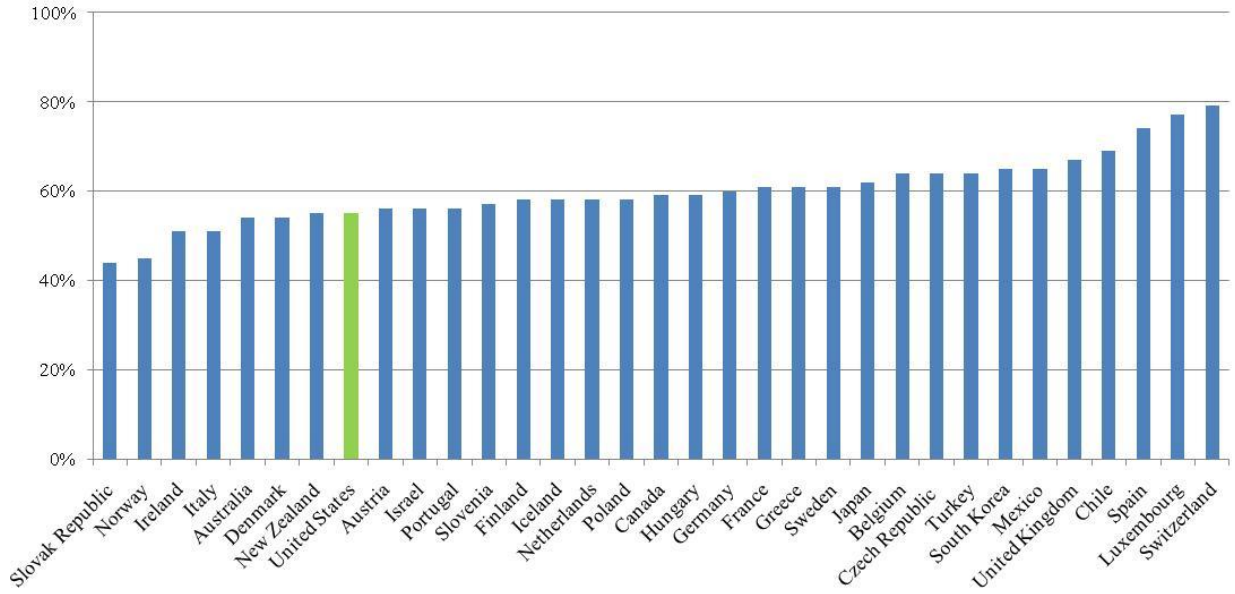
Looking at the case of high speed rail specifically, other nations are laying the groundwork for large-scale passenger rail systems in the future, while the U.S. is lagging behind. For example, China plans to spend an estimated $300 billion to have a high speed rail system in the country by 2020. China has already completed the fastest high speed rail line in the world, connecting Wuhan and Guangzhou, two cities with populations over 8 million people. The line covers 600 miles in only 3 hours.[39] Another high speed rail line, running between Shanghai and Beijing, is set for completion in 2011. European nations and Japan have long had high speed rail systems.

The Recovery Act contained $8 billion for high speed rail projects, and several states, including California, have approved billions more from their own coffers. However, significant additional investment is required if we hope to develop high speed rail corridors in the United States. High speed rail has the potential to link the American people together in a way that would not be possible under the current infrastructure system. Reducing intercity travel times, with trains reaching top speeds of 220 mph, could transform how and where Americans live and work, revitalizing regions and supporting new jobs.

The Gallup World Poll indicates that compared to other OECD countries, Americans are relatively dissatisfied with their local public infrastructure systems (see Figures 3 and 4). Americans' satisfaction with public transit ranks 25th out of 32 OECD nations. We rank only slightly better with respect to satisfaction with our roads and highways: 17th out of 32 countries. The relatively higher satisfaction with roads and highways is consistent with the observation that our nation's historic investment pattern favored highways and roads over public transit.

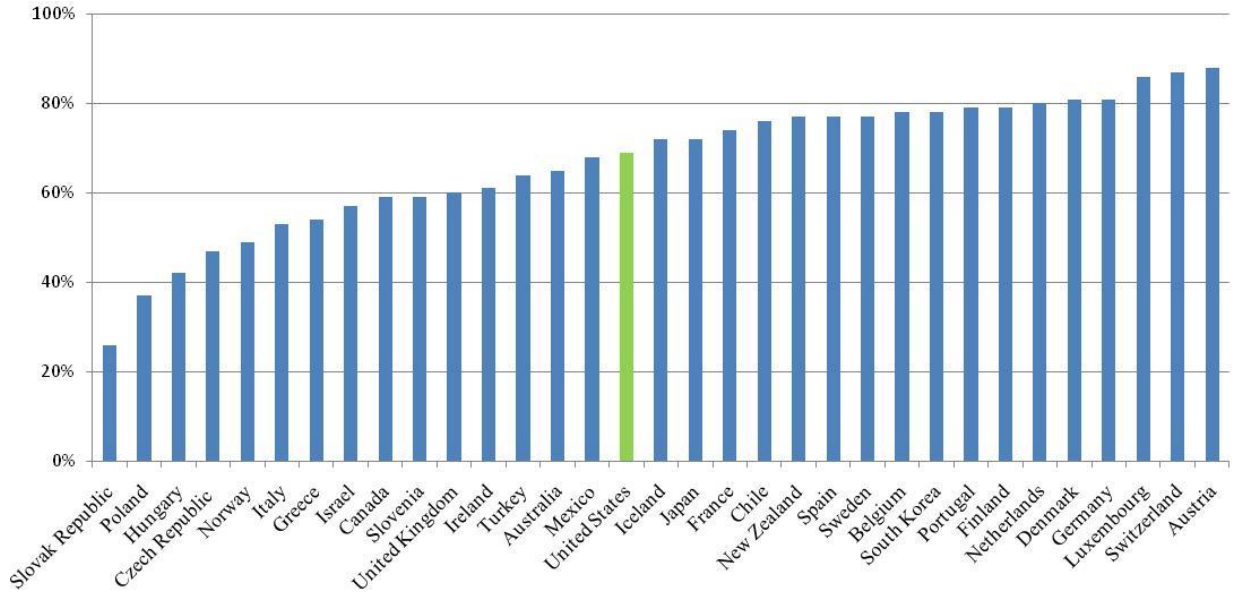
[39] "A Look at China's High-Speed Rail Investments." Solar Feeds News and Commentary, 2010. <http://www.solarfeeds.com/the-green-leap-forward-/12404-a-look-at-chinas-high-speed-rail-investments>

Figure 3: Percent Satisfied with the Public Transportation in their Area



Source: Gallup World View data, 2009, OECD countries. Percent responding "satisfied" to the following question: "In the city or area in which you live, are satisfied or dissatisfied with the public transportation system?"

Figure 4: Percent Satisfied with the Roads or Highways in their Area



Source: Gallup World View data, 2009, OECD countries. Percent responding "satisfied" to the following question: "In the city or area in which you live, are satisfied or dissatisfied with the roads and highways?"

The Costs of Not Investing in Infrastructure

Although infrastructure investments are expensive, it is even more expensive for the nation if we skimp on infrastructure. There are real costs to not investing in infrastructure, including increased congestion and foregone productivity and jobs. Already, Americans are wasting too much time, money and fuel stuck in traffic. The Texas Transportation Institute (TTI) recently estimated that Americans in 439 urban areas spent some 4.2 billion hours sitting in traffic in 2007, equivalent to nearly one full work week for the average commuter. TTI's calculations suggest that "congestion (based on wasted time and fuel) cost about $87.2 billion in the 439 urban areas."[40]

Although TTI's estimate is a good benchmark when evaluating congestion costs, it is important to remember that it is not always clear that time spent in congestion should be valued at the wage rate. The Department of Transportation recommends using a variety of values of time, depending on whether the travel takes place as part of paid business travel, local commuting travel, or long-distance leisure travel. The value of time in freight transportation is even more complex, varying with the value and perishability of the cargo that is being transported. Additionally, there are costs of congestion beyond lost time and wasted fuel. For example, a recent survey by Gallup found that those with long commutes are more likely to experience back and neck pain.[41] Moreover, congestion leads to more rapid road erosion and higher maintenance costs, a higher frequency of accidents and associated need for emergency services, higher pollution per car, and productivity losses from traffic delays. All of these potential costs of congestion – and corresponding benefits of alleviating congestion – should be factored into any cost-benefit analysis of infrastructure alternatives that would relieve congestion.

[40] "What Does Congestion Cost Us?" Texas Transportation Institute. <http://mobility.tamu.edu/ums/report/congestion_cost.pdf>

[41] "Wellbeing Lower Among Workers with Long Commutes." Gallup, 13 August 2010. <http://www.gallup.com/poll/142142/wellbeing-lower-among-workers-long-commutes.aspx>

The Charlotte Light Rail System: An Infrastructure Success Story

If improved infrastructure changed the way Americans live and work, there would be significant benefits to health and wellness. For example, MacDonald et al. find that improving neighborhood environments and increasing the public's use of light rail transit would benefit health to the extent it causes increased physical activity, reduction in the incidence of obesity (body mass index greater than 30), and reduction in the odds of becoming obese.[42]

Using data on individuals before (July 2006 to February 2007) and after (March 2008 to July 2008) the completion of a light rail system in Charlotte, North Carolina, they find that the use of light rail to commute to work is associated with a nearly 1.2 point reduction in body mass index as well as an 81 percent reduction in the odds of becoming obese over time. Moreover, improved perceptions of neighborhoods as a result of the availability of light rail were associated with 15 percent lower odds of obesity as well as higher odds of meeting weekly recommended physical activity levels for walking and vigorous exercise (of 9 percent and 11 percent, respectively).

In addition to all of the personal benefits associated with a healthier life style, overall costs on our health care system are substantially reduced when obesity rates are lowered, given that health care costs for the obese are almost twice the rate for normal weight individuals. Finkelstein et al. find that between 1998 and 2006, the prevalence of obesity in the U.S. increased by 37 percent, adding $40 billion dollars to health care costs.[43]

A separate study by Stokes et al. estimates that health care savings in Charlotte from the creation of the first segment of their light rail system could reach a cumulative $12.6 million by 2015. [44] These facts also suggest that targeted investment in creating new public transportation systems could translate into large-scale savings in health care costs over time. Furthermore, many other academic studies show that proximity to public transportation and more rationally-designed neighborhoods tend to be associated with increased walking and other physical activity for the general population, working or otherwise.

[42] MacDonald JM, Stokes R. Cohen D. Kofner A. Ridgeway G. The Effect of Light Rail on Body Mass Index and Physical Activity. American Journal of Preventive Medicine 2010; 39(2):105-112.
[43] Finkelstein EA, Trogdon JG Cohen JW Dietz W. Annual Medical Spending Attributable to Obesity: Payer- And Service-Specific Estimates. Health Affairs 28, no. 5 (2009): w822-w831.
[44] Stokes RJ, MacDonald J. Ridgeway G. Estimating the effects of light rail transit on health care costs. Heath Place 2008;14(1):45–58.

Congestion is not limited to our roads. Each year, Americans lose more than $9 billion in productivity from flight delays.[45] Adopting a NextGen air traffic control system could significantly reduce these delays and their associated costs. NextGen will help both the Federal Aviation Administration and airlines to install new technologies and, among other improvements, move from a national ground-based radar surveillance system to a more accurate satellite-based surveillance system – the backbone of a broader effort to reduce delays for passengers, increase fuel efficiency for carriers, and cut airport noise for those who live and work near airports.

Failure to maintain our infrastructure network properly has significant consequences. For example, in August 2010, three major transportation systems in the Northeast corridor region (Amtrak, the Long Island Railroad, and New Jersey Transit) all experienced problems due to fire, power failure, and outdated equipment. Particularly illustrative of the need for upgrades of America's infrastructure was the fire in the Long Island Railroad's track switching system. Constructed in 1913, the system's break down forced rail personnel to switch tracks manually with mallets and spikes, an outdated and hazardous practice.

Building a Safer and More Reliable Infrastructure System

The American people deserve safe and reliable infrastructure. Recent bridge collapses in Minnesota and Oklahoma remind us of the risk of neglecting our infrastructure and of unsafe designs.

In 2005, motor vehicle traffic crashes were the leading cause of death for every age 3 through 6 and 8 through 34. Though 2009 saw the lowest fatality and injury rates ever recorded, it is clear that we can still do better, as nearly 100 people die on our roadways every day.[46,47] Aging transportation infrastructure – whether it is our roadways, transit systems, or railways – increase safety risks because they lack proven countermeasures that are installed on newer systems and equipment. Devoting resources to raising existing transportation infrastructure to a state of good repair in a "fix-it-first" approach is a sound strategy to help address critical safety challenges. The Federal Government, along with State, local, and private owners and operators of transportation infrastructure, must work together to target resources to risks before they become safety hazards.

[45] "Flight Delay Task Force Report." The Port Authority of NY & NJ, 2007. <http://www.planebusiness.com/buzz/flightdelay.pdf>

[46] "U.S. Transportation Secretary LaHood Announces Lowest Traffic Fatalities in Six Decades." National Highway Traffic Safety Administration, 9 September 2010. <http://www.nhtsa.gov/PR/DOT-165-10>.

[47] "Motor Vehicle Traffic Crashes As a Leading Cause of Death in the United States, 2005." National Highway Traffic Safety Administration, April 2008. <http://www-nrd.nhtsa.dot.gov/Pubs/810936.PDF>.

III. The Role of a National Infrastructure Bank

President Obama has proposed a National Infrastructure Bank to help finance infrastructure projects. A well designed infrastructure bank could:

- increase overall investment in infrastructure by attracting private capital to co-invest in specific infrastructure projects;
- improve the efficiency of our infrastructure investment by having a merit-based selection process for projects; and
- fill the gaps in our infrastructure funding system, which currently disadvantage investments in multi-modal and multi-jurisdictional infrastructure projects.

One way to address the need for more infrastructure investment is to attract more private capital for direct investment in transportation infrastructure. There is currently very little direct private investment in our nation's highway and transit systems. The lack of private investment in infrastructure is in large part due to the current method of funding infrastructure, which lacks effective mechanisms to attract and repay direct private investment in specific infrastructure projects. In addition, the private benefit for investors is less than the benefit for society as a whole, because of positive externalities from infrastructure. A National Infrastructure Bank could address these problems by directly funding selected projects through a variety of means. The establishment of a National Infrastructure Bank would create the conditions for greater private sector co-investment in infrastructure projects.

Additionally, with a few notable exceptions, federal funding for infrastructure investments is not distributed on the basis of a competition between projects using rigorous economic analysis or cost-benefit comparisons. The current system virtually ensures that the distribution of investment in infrastructure is suboptimal from the standpoint of raising the productive capacity of the economy.

To address the lack of merit-based funding, a National Infrastructure Bank would develop a framework to analytically examine potential infrastructure projects using cost-benefit analysis, and would evaluate the distributional impact of both the costs and benefits of each project. Of course, not all costs and benefits from infrastructure projects can be quantified, but an effort should be made to quantify those that can be quantified and to take account of any additional benefits and costs to society. A rigorous analytic process would result in support for projects that yield the greatest returns to society, and would avoid investing taxpayer dollars in projects where total costs exceed total societal benefits. A National Infrastructure Bank would select projects along a sliding scale of support that most effectively utilizes the bank's limited resources, targeting the most effective and efficient investments.

IV. Supply-Side Considerations

The previous section analyzed the demand for public capital and demonstrated that additional, carefully selected infrastructure investment will yield substantial benefits to the U.S. economy in the future. This section looks at the supply side of infrastructure investment. The main conclusion is that now is a particularly opportune time to invest in infrastructure, because the availability of underutilized resources (especially labor) implies that the opportunity cost of infrastructure investment is currently well below its normal level.

There is currently a large pool of unemployed and underemployed labor available to improve our infrastructure. Building more roads, bridges, and rail tracks would especially help the segment of workers that was most disproportionately affected by the economic crisis – construction and manufacturing workers. The recession that started in late 2007 had an exceptionally large impact on the labor market. The U.S. lost over 8 million jobs between December 2007 and December 2009. Fully 21 percent of those who lost jobs were in the construction industry.

Due to the collapse of the real estate market, the contraction of employment in the construction industry was especially acute. Since December 2007, the construction industry has lost 25 percent of its total payroll jobs, dropping from 7.5 million to 5.6 million employees. In August 2010, the unemployment rate for construction workers stood at 17 percent. This is over three times the rate from three years ago, and almost double the overall unemployment rate. Accelerated infrastructure investment would provide an opportunity for construction workers to productively apply their skills and experience. Moreover, hiring currently unemployed construction workers would impose lower training costs on firms than would be incurred by hiring workers during normal times, because these workers already have the requisite skills and experience in construction.

The excess supply of construction workers is one of many factors making current construction costs low. This is translating to lower project costs. For example, the Federal Aviation Administration received $1.1 billion in Recovery Act funds for airport improvements. The money was designated for 300 projects. The winning bids for those projects came in over $200 million below the engineers' estimates. A second round of projects was selected, which also received lower bids than anticipated. As a result of these cost savings, 367 runway and airport improvement projects were funded with the money that was originally intended to support 300 projects.

The states and transit authorities that selected most of the highway ($26.6 billion) and transit ($8 billion) projects supported by the Recovery Act reported similar experiences, and similar bid savings. Overall, the Department of Transportation estimates that more than 2,000 additional

airport, highway, bridge and transit projects were funded because of low bids, or projects being completed under budget.

Another critical question is whether there are worthwhile infrastructure projects available for investment. While well-targeted infrastructure investment can be tremendously beneficial, experience has also shown that poorly targeted infrastructure investments have limited, or even negative effects in the long run. The Recovery Act established the Transportation Investment Generating Economic Recovery (TIGER) program to spur a national competition for innovative, multi-modal and multi-jurisdictional transportation projects that promise significant economic and environmental benefits to an entire metropolitan area, region, or the nation. TIGER was allocated $1.5 billion in the Recovery Act to select projects including improvements to roads, bridges, rail, ports, public transit and inter-modal facilities.

As part of the open competition for this investment, the Department of Transportation (DOT) conducted a solicitation for projects meeting the TIGER criteria, providing a test case to determine the supply of these kinds of infrastructure projects. This solicitation yielded 1,457 project applications from all 50 states, the District of Columbia and three territories. Combined, these projects requested over $59 billion in federal funding, with many projects also supported by state, local and sometimes private capital. These projects were both big and small, with 546 requesting less than $20 million from the federal government while 82 projects requested more than $100 million. Given its limited initial funding, DOT was only able to fund 50 projects.

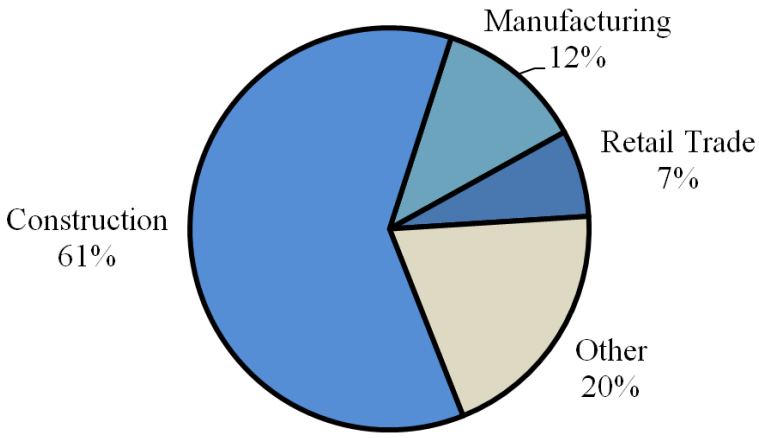
Infrastructure Investment Creates Middle Class Jobs

Spending on infrastructure generates demand for products and services from a variety of industries. For example, road building not only requires construction workers, but also grading and paving equipment, gasoline or diesel to run the machines, smaller hand tools of all sorts, raw inputs of cement, gravel, and asphalt, surveyors to map the site, engineers and site managers, and even accountants to keep track of costs.

Data from the Commerce Department's Bureau of Economic Analysis (BEA) provide insight into how a dollar's worth of demand for some broad categories of spending is divided among the supplying industries. Analysis of data from the BEA 2007 annual input-output table and related data from the Bureau of Labor Statistics (BLS) on the composition of industry employment suggest that 61 percent of the jobs created by investing in infrastructure would be in the construction sector, 12 percent would be in the manufacturing sector, and 7 percent would be in retail trade, for a total of 80 percent in these three sectors.[48] Using BLS data on the structure of occupations in those industries, and the distribution of wages for those occupations by industry, nearly 90 percent of the jobs in the three sectors most affected by infrastructure spending would be middle class jobs, defined as those between the 25th and 75th percentile in national distribution of wages.

Further analysis suggests that the jobs created by investing in infrastructure are not only middle class jobs, but also are concentrated in occupations and industries that have been disproportionately affected by the economic downturn. Overall, the average unemployment rate among those who would be put to work by additional investment in infrastructure is over 15 percent, more than one and one-half times the national unemployment rate.

Figure 5: Jobs Created by Infrastructure Investment



Source: Estimates based on BEA and BLS input-output tables.

[48] These estimates do not include multiplier effects.

Enhancing the efficiency of existing infrastructure is also a critical component of the President's plan. As noted earlier, research has shown that investment that improves existing infrastructure networks can have significant returns. The Recovery Act also created the Transit Investments in Greenhouse Gas and Energy Reduction (TIGGER) program to support such improvements by providing public transit agencies with one-time grants to improve the energy efficiency of their operations. Increasing energy efficiency for transportation is particularly important since the transportation system accounts for one-third of all carbon dioxide emissions from fossil fuel combustion, the largest share of any economic sector in the United States according to the Environmental Protection Agency.[49] The cost of energy is a significant factor in the cost of providing public transportation; one study found that the cost of providing public transportation rises by $7.6 million for every penny increase in the price of gasoline.[50]

The TIGGER program received $100 million in Recovery Act funding. The Federal Transit Administration (FTA) announced the selection criteria on March 24, 2009, inviting transit agencies to submit proposals within 59 days (May 22). Despite the short time frame, FTA received applications for 561 projects with a total value of over $2 billion, twenty times larger than the amount of funding available.

During recessions it is common for state and local governments to cut back on capital projects – such as building schools, roads and parks – in order meet balanced budget requirements. Past research has found that expenditures on capital projects are more than four times as sensitive to year-to-year fluctuations in state income than is state spending in general.[51] However, the need for improved and expanded infrastructure is just as great during a downturn as it is during a boom. Tax receipts at the state and local level contracted for four straight quarters at the beginning of this recession and are still below pre-recession levels. The Recovery Act provided crucial support for infrastructure during the recession, but further strategic investments from the federal government are needed to make up for the shortfall in state and local funds. Providing immediate additional federal support for transportation infrastructure investment would be prudent given the likely response from state and local governments to the current economic environment, the upcoming reduction in federal infrastructure investment as projects using Recovery Act funds are completed and the strong benefits associated with public investment.

[49] "Frequent Questions – Emissions." U.S. Environmental Protection Agency, 2010. <http://epa.gov/climatchange/fq/emissions.html>

[50] "Impact of Rising Fuel Costs on Transit Services." American Public Transportation Association, May 2008. <http://www.apta.com/resources/reportsandpublications/Documents/fuel_survey.pdf>.

[51] James R. Hines, Hilary Hoynes, and Alan Krueger, "Another Look at Whether a Rising Tide Lifts All Boats," in *The Roaring `90s: Can Full Employment Be Sustained?*, edited by Alan B. Krueger and Robert Solow, Russell Sage and Century Fund, 2001.

V. Conclusion

An analysis of the economic impact of transportation investment indicates that now is an optimal time to increase the nation's investment in transportation infrastructure. This conclusion follows from both supply- and demand-side factors. Investing in transportation infrastructure would generate jobs to employ workers who were displaced because of the housing bubble. We estimate that the average unemployment rate among those who would gain employment in the jobs created by additional infrastructure investment is currently more than 15 percent. There is also accumulating evidence that construction costs are currently low because of underutilized resources, so it would be especially cost-effective to seize the opportunity to build many of the quality infrastructure projects that are ready to be built. Historically, we also know that state and local governments are more prone to cut back on infrastructure spending during tough economic times, despite the growing need and demand for these projects. Americans overwhelmingly support increasing our infrastructure investment, as evidenced by consistent support for local investments on ballot initiatives. This is hardly surprising given that our report documents that the American public is less satisfied with our transportation infrastructure than residents of most other OECD nations.

Merely increasing the amount that we invest, however, must not be our only goal. Selecting projects that have the highest payoff is critically important, as is providing opportunities for the private sector to invest in public infrastructure. Given the significant needs for greater investment, the federal government cannot, and should not, be expected to be the sole source of additional investment funds. More effectively leveraging federal investment by pairing it with state, local and private investment is necessary to meet the challenges we face in expanding our transportation network.

Evidence shows that well functioning infrastructure systems not only generate large rates of return for the people who travel on the systems every day, but also for those in the region and nation more generally. Investment in infrastructure today will employ resources when they are underutilized and raise the nation's productivity and economic potential in the future. By contrast, poorly planned, non-strategic investment is not only a waste of resources, but it can also lead to lower economic growth and production in the future. That is why any increase in investment should be coupled with broad-based reform to select infrastructure projects more wisely. The President's proposal to increase our nation's investment in transportation infrastructure, coupled with broad-based reform of our transportation funding system, would have a significant and positive economic impact in both the short and long term, raising our nation's economic output, creating quality middle-class jobs and enhancing America's global economic competitiveness.

Appendix

The twenty urban regions with at least 500,000 people (includes the city and its surrounding suburbs), where motorists pay the most annually in additional vehicle maintenance because of roads in poor condition:

Appendix Table 1: Annual Vehicle Operating Cost in Selected Urban Areas

Rank	Urban Area	Annual Vehicle Operating Cost
1	San Jose, California	$756
2	Los Angeles, California	$746
3	San Francisco – Oakland, California	$706
4	Honolulu, Hawaii	$701
5	Concord, California	$692
6	New Orleans, Louisiana	$681
7	Oklahoma City, Oklahoma	$662
8	San Diego, California	$654
9	New York – Newark, NY/NJ	$640
10	Riverside-San Bernardino, California	$632
11	Sacramento, California	$611
12	Tulsa, Oklahoma	$610
13	Indio-Palm Springs, California	$609
14	Baltimore, Maryland	$603
15	Omaha, Nebraska	$587
16	Kansas City, Missouri / Kansas	$587
17	San Antonio, Texas	$549
18	Dallas-Ft. Worth, Texas	$539
19	Detroit, Michigan	$536
20	Albuquerque, New Mexico	$527

Source: America's Roughest Rides and Strategies to Make Our Roads Smoother, Sept. 2010, www.tripnet.org/urban_roads_report_Sep_2010.pdf.

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