



The Role of Public Works Infrastructure in Economic Stimulus

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Summary

Interest in using federal government spending to stimulate U.S. economic recovery has intensified recently in response to indicators showing significant deterioration of the economy. Policymakers at all levels of government are debating a range of options to address these problems. Some favor using traditional monetary and fiscal policies. Others, however, favor making accelerated investments in the nation's public infrastructure in order to create jobs while also meeting infrastructure needs. This report is an overview of policy issues associated with the approach of using infrastructure as a mechanism for economic stimulus.

When most people think about infrastructure, they probably have in mind systems that are publicly provided and are important to the productive capacity of the nation's economy. Today, policymakers define the term more broadly to include both publicly and privately owned systems and facilities and categories that vary considerably in the degree of historic federal investment in building or rebuilding physical structures. A relatively new dimension in today's context is the notion of coupling public works with investments in environmentally friendly systems that incorporate renewable technologies or energy efficiency—called “green infrastructure.”

Academics, economists, and policymakers debate two issues concerning the contribution of infrastructure investment to the economy. One is the effects of infrastructure investment on productivity and growth, including job creation. The second related issue is the role of infrastructure spending, which is typically a long-term activity, as a short-term mechanism to stimulate a faltering economy. Research conducted over time has resulted in a general consensus that there can be positive returns on productivity of investing in infrastructure. Many experts now argue that infrastructure spending could be an important source of stimulating labor demand and enhancing U.S. productivity through investments in roads, bridges, water systems, etc. Still, some analysts are cautious about the effectiveness of this type of fiscal stimulus because of one key issue: timing. By definition, the goal of stimulus spending is to get money into the economy swiftly. But that objective can conflict with the reality of building infrastructure projects that typically are multiyear efforts with slow initial spendout. Spending advocates counter that because the current recession is expected to be of long duration, projects with extended timeframes can still contribute to the economy's recovery, and that investments that improve long-term productivity are preferable to options that focus on consumption as a stimulus tool.

The overriding question in debating infrastructure spending as part of economic stimulus is, what will the stimulus buy? Two important considerations are, will the proposal produce stimulus quickly, and will it produce a significant amount of stimulus, relative to its budgetary cost. Because of the urgency of responding to the recession, stakeholder groups have been preparing lists of projects that are “ready to go,” but the criteria for developing these lists are largely unknown. There is tension between the goal of funding activities that will create jobs quickly and the desire to invest in projects that will have sustained value that contributes to U.S. productivity.

A critical issue for all levels of government is ensuring accountability for funds that will be spent through a stimulus program, to assure the public that decisions involving public dollars are made quickly yet with transparency, efficiency, and sufficient accountability.

This report will not track legislative developments; other CRS reports referenced here will do so.

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Introduction

Policymakers at all levels of government are debating a wide range of options for addressing the nation's faltering economic conditions. One option that is receiving attention is accelerated investments in the nation's public infrastructure—that is, highways, mass transit, airports, water supply and wastewater, dams, locks, canals, passenger rail, and other facilities—in order to create jobs while also promoting long-term economic growth.

This report presents policy issues associated with using infrastructure as a mechanism for economic stimulus. It begins with two contextual aspects of this discussion, what is the current economic condition and how to define infrastructure. The report then reviews the role of infrastructure investment in economic growth generally and in contributing to stimulating a faltering economy. It discusses key issues, such as setting priorities, resource and governance, and the possible role of "green" infrastructure as part of economic stimulus. Finally, it includes an **Appendix** with descriptions of a number of infrastructure categories that have recently been mentioned for inclusion in economic stimulus legislation in the 111th Congress.

The Context: Current Economic Conditions

Interest in government spending to stimulate economic recovery has intensified recently in response to economic indicators showing significant and continuing deterioration of the national economy. In the third quarter of 2008, real gross domestic product (GDP, the economy's total output of goods and services) fell by 0.5%, and the December 2008 Blue Chip Economic Indicators consensus forecast was for real GDP to decline by 1.1% for all of 2009 and for the unemployment rate to reach 8.1% by the end of 2009.¹ In November, the unemployment rate stood at a 15-year high of 6.7%. Further, on December 1, the nonpartisan National Bureau of Economic Research officially declared that the U.S. economy has been in recession since December 2007; a recession is defined as a broad contraction of the economy not confined to one sector. The economy reportedly lost jobs every month in 2008 for a total of 1.9 million for the year.

Fiscal problems are affecting all levels of government. In December, the National Association of State Budget Officers and the National Governors Association reported significant weakening of fiscal conditions in nearly every state and budget gaps for the current fiscal year of approximately \$30 billion, in addition to more than \$12 billion that has already been cut from state budgets. States face growing expenditure pressures as the economy deteriorates, including increased funding of public assistance programs such as Medicaid. States also face long-term issues such as funding pensions and maintaining and repairing infrastructure.²

Local governments also are dealing with fiscal pressures. A September survey by the National League of Cities found that city finance officers expect revenue from property, sales, and income taxes to decrease by 4.3% in 2008. The survey also found that 79% of cities expect their finances

¹ *Blue Chip Economic Indicators*, Aspen Publishers, vol. 33, no. 11, December 10, 2008. The Blue Chip forecast is an average of about 50 separate forecasts.

² National Governors Association and National Association of State Budget Officers, *The Fiscal Survey of States*, December 2008, pp. vii-viii, <http://www.nasbo.org/Publications/PDFs/Fall2008FiscalSurvey.pdf>.

to worsen in 2009, because of a lag between current economic conditions and effects on city revenue.³ Consequently, cities are laying off workers, raising fees, closing municipal facilities such as libraries, and cancelling or postponing projects.

Much of the public responsibility to build, operate, and maintain infrastructure resides with localities. Cities and states that normally rely on the bond market to finance long-term projects recently have found that market less accessible, as a fallout from financial turmoil on Wall Street, meaning that it is more difficult to borrow money. Municipal bonds, if they can be sold, are lately commanding higher interest rate yields, making it more costly for states and cities to borrow. These higher rates are causing officials to scale back, delay, or cancel projects.

As a result of these conditions, states, which under their constitutions are not permitted to operate in deficit, and cities are increasingly looking to the federal government for assistance on a range of policies and projects. Organizations representing states and municipalities have issued agenda documents with both policy and short-term and long-term assistance recommendations for Congress and the Administration, including infrastructure, health care reform, housing, benefit programs for individuals, budget relief and help in accessing capital, and governance.⁴

The concept of countering the effect of recessions with legislation to spur job creation through increased spending on public works infrastructure is not new. In recent decades, Congress has done so on several occasions. For example, in 1983 (P.L. 98-8) and 1993 (P.L. 103-50), Congress appropriated funds to a number of existing federal infrastructure and public works programs in hopes that projects and job creation would be stimulated quickly.⁵

At least two factors are new this time. One is the severity of the economic downturn (reportedly the worst in 50 years⁶) which is widely expected to be of long duration, not short. Another is the fact that the current debate about a job-creating stimulus program is merging with discussion among infrastructure advocates that has been ongoing for years about the need for investment to address problems of aging and deteriorating public works. These infrastructure problems have been increasingly recognized by policymakers and the public at large.⁷ It is argued that the U.S. investments in public infrastructure have declined significantly in recent decades, to the point that this country is underinvesting in its critical assets, and is failing to construct new facilities or adequately maintain existing systems. The perception that current investment levels are inadequate is in part supported by data which show that, relative to GDP, infrastructure spending has declined about 20%, from 3.06% in 1959 to 2.40% of GDP in 2004. During this same period, spending has shifted from predominantly on capital (63% in 1959, compared with 46% in 2004)

³ Michael A. Pagano and Christopher W. Hoene, *City Fiscal Conditions in 2008*, National League of Cities, Research Brief on America's Cities, September 2008,
http://66.218.181.91/ASSETS/A49C86122F0D4DBD812B91DD5777F04D/CityFiscal_Brief_08-FINAL.pdf.

⁴ National Governors Association, *Economic Recovery: A Federal-State Partnership*, November 13, 2008,
<http://www.nga.org/Files/pdf/0811ECONOMICRECOVERY.PDF>; U.S. Conference of Mayors, *Main Street Economic Recovery, A Call to Action*, December 2, 2008, <http://www.usmayors.org/mainstreeteconomicrecovery/documents/mser-plan-20081203.pdf>; National League of Cities, *An Agenda for the Nation*,
<http://www.nlc.org/ASSETS/063AF2E28AA9495CB21EFC5F8EBBA0FA/AgendaForNewAdmin.pdf>.

⁵ For information, see CRS Report 92-939, *Countercyclical Job Creation Programs*, by Linda Levine.

⁶ Dan Weil, *Roubini: Worst U.S. Recession in 50 Years*, November 20, 2008,
http://moneynews.newsmax.com/streettalk/roubini_worst_recession/2008/11/20/153349.html.

⁷ See Robert L. Reid, "The Infrastructure Crisis Special Report," *Civil Engineering*, January 2008,
http://pubs.asce.org/magazines/CEMag/2008/Issue_01-08/article1.htm.

to operation and maintenance (37% in 1959, compared with 54% in 2004).⁸ In a growing economy, infrastructure should hold its own, but other data show that spending by government at all levels has declined from a high of \$1.37 per capita in 1960 to \$0.94 per capita in 2004 (in 2006 dollars).

During the presidential campaign, candidate Barack Obama pledged to invest in rebuilding the nation's infrastructure, especially transportation systems, in order to create jobs.⁹ Since November, President-elect Obama has highlighted immediate investments in infrastructure projects as a key element of his plans to revitalize the economy:

The Obama-Biden emergency plan would make \$25 billion immediately available in a Jobs and Growth Fund to help ensure that in-progress and fast-tracked infrastructure projects are not sidelined, and to ensure that schools can meet their energy costs and undertake key repairs starting this fall. This increased investment is necessary to stem growing budget pressures on infrastructure projects. In addition, in an environment where we may face elevated unemployment levels well into 2009, making an aggressive investment in urgent, high-priority infrastructure will serve as a triple win: generating capital deployment and job creation to boost our economy in the near-term, enhancing U.S. competitiveness in the longer term, and improving the environment by adopting energy efficient school and infrastructure repairs. In total, Obama and Biden's \$25 billion investment will result in 1 million jobs created or saved, while helping to turn our economy around.¹⁰

For now, details of the new Administration's economic stimulus plan, including how much of the total will be devoted to infrastructure and to which infrastructure sectors, are unclear.

Defining Infrastructure in Today's Context

Most people probably think about roads, airports, or water supply when they refer to infrastructure, having in mind the types of systems or facilities that are publicly provided and are important to the productive capacity of the nation's economy. But some analysts argue that such a conception is too narrow. Accordingly, the term might be defined more broadly to also include spending by the private sector, such as by private utilities that provide electricity or natural gas. In addition, other types of public investment, such as public buildings, may not add directly to the productive capacity of the economy but do represent assets in the nation's capital stock.

The current discussion includes no single definition of infrastructure or list of categories or types of infrastructure that might receive assistance as part of economic stimulus, and ultimately it will be defined by those who are responsible for crafting the legislation. The lack of a definition is not unlike infrastructure discussions that have occurred in the past (see the box "What is Infrastructure?" below). Today, policymakers and stakeholder groups appear inclined to define the term broadly to include facilities and categories that vary considerably in the degree of historic federal investment in building or rebuilding physical structures (e.g., highways compared with public schools) and systems that have a long history of combined public and private ownership (water resource projects as well as electric transmission systems, some of which are

⁸ U.S. Congressional Budget Office, *Trends in Public Spending on Transportation and Water Infrastructure, 1956 to 2004*, August 2007, p. 23.

⁹ <http://www.barackobama.com/issues/economy/#jumpstart>.

¹⁰ http://change.gov/agenda/economy_agenda/.

federally owned, for example). See **Table A-1** in the Appendix for information on the level(s) of government or the private sector that typically are responsible for infrastructure. Indeed, today there is considerable blurring between public and private infrastructure, raising more frequent questions about what should be the role of government, including the federal government, in providing infrastructure services. In part, this is due to increasing reliance on the private sectors—through contract operations, full ownership and other arrangements—to provide functions and services that typically are thought of as public. Examples include prisons, passenger rail, and postal services and mail delivery. A relatively new dimension in today's context is the notion of coupling public works with investments in environmentally friendly systems that incorporate renewable technologies or energy efficiency—called “green infrastructure” (see discussion below).

The **Appendix** to this report provides descriptions of a number of infrastructure categories that have recently been mentioned for inclusion in economic stimulus legislation in the 111th Congress. The descriptions include information on conditions, performance, and funding needs; discussion of investment in each category as a mechanism for economic stimulus; and longer term issues.

What is Infrastructure?

In contrast to today's discussions about how infrastructure will be defined in economic stimulus legislation, past debate among researchers has been more conventional. There is no standard or agreed definition of the term “infrastructure,” and the concept in policy terms has been and remains fluid, including both public and private systems, services, and even amenities. Nearly 30 years ago, infrastructure was debated because of concern that the nation's public works infrastructure was believed to be suffering from severe problems of deterioration, technological obsolescence, and insufficient capacity to serve future growth. The focus of debate was on the nature, extent, and severity of poor physical condition, technological adequacy, and capacity of public works systems and about decisions by government at all levels on spending priorities to meet physical and management needs. All of these issues remain relevant and topical today.

Public and private reports at the time analyzed and critiqued the issue, and many sought to define the term “infrastructure.” One of these, issued by the Council of State Planning Agencies, defined the term as public service and production facilities, which include “a wide array of public facilities and equipment required to provide social services and support private sector economic activity,” commonly roads, bridges, water and sewer systems, airports, ports, and public buildings, and may also include schools, health facilities, jails, recreation facilities, electric power production, fire safety, solid waste disposal, and telecommunications. (Roger Vaughan and Robert Pollard, *Rebuilding America, Vol. I, Planning and Managing Public Works in the 1980s*, Council of State Planning Agencies, 1984, pp. 1-2.)

In a 1983 report to Congress about policies regarding condition of the nation's infrastructure, the Congressional Budget Office (CBO) analyzed seven categories of infrastructure: highways, public transit systems, wastewater treatment works, water resources, air traffic control, airports, and municipal water supply. These seven systems, CBO said, “share the common characteristics of capital intensiveness and high public investment at all levels of government. They are, moreover, directly critical to activity in the nation's economy.” CBO noted that “the concept of infrastructure can be applied broadly to include such social facilities as schools, hospitals, and prisons, and it often includes industrial capacity, as well.” (U.S. Congressional Budget Office, *Public Works Infrastructure: Policy Considerations for the 1980s*, April 1983, p. 1.)

Five years later, CBO utilized a similar but consolidated categorization of infrastructure (highways, aviation, mass transit, wastewater treatment, and water transportation) based on a definition that those facilities:

provide a foundation or basic framework for the national economy, and in which federal policy plays a significant role.... This definition excludes some facilities often thought of as infrastructure—such as public housing, government buildings, private rail service, and schools—and some environmental facilities (such as hazardous or toxic waste sites) where the initial onus of responsibility is on private individuals. (CBO, *New Directions for the Nation's Public Works*, September 1988, pp. xi-xii.)

CBO's current infrastructure focus is on highways and roads, mass transit, rail, aviation, water transportation, water resources such as dams and levees, and water supply and wastewater treatment—facilities that “draw heavily on

federal resources, share the economic characteristics of being relatively capital intensive and producing services under public management that facilitate private economic activity." (CBO, Trends in Public Spending on Transportation and Water Infrastructure, 1956-2004, August 2007, p. 1.)

In 1984, Congress enacted legislation that established a National Council on Public Works Improvement with a mandate to analyze and report to Congress and the President on the state of public works infrastructure systems (P.L. 98-501). The Council provided yet another definition of infrastructure and included nine categories of systems in its analyses: highways, streets, roads, and bridges; airports and airways; public transit; intermodal transportation (the interface between modes); water supply; wastewater treatment; water resources; solid waste; and hazardous waste services. These categories, the Council said, have strong links to economic development and generally have a tradition of public sector involvement. Facilities have high fixed costs and long economic lives. Taken as a whole, the services that they provide "form the underpinnings of the nation's defense, a strong economy, and our health and safety." (National Council on Public Works Improvement, *Fragile Foundations: A Report on America's Public Works*, Final Report to the President and Congress, February 1988, p. 33.)

Following the 2001 terrorist attacks in the United States, policymakers turned attention to protecting the nation's "critical infrastructure" from physical or cyber attacks. In the context of homeland security, that term is quite broadly defined to encompass certain socioeconomic activities that are vital to the day-to-day functioning and security of the country; for example, transportation of goods and people, communications, banking and finance, and the supply and distribution of electricity and water.

Infrastructure and the Economy

Academics, economists, and policymakers debate two key issues concerning the contribution of infrastructure investment to the economy. One is the general issue of the effects of infrastructure spending and investment on productivity and growth. The second related issue is the role of infrastructure spending, including short-term job creation, as a countercyclical tool in stimulating a faltering economy.

Productivity and Output

The question of whether or how the availability of public infrastructure, and investments in public infrastructure, influence productivity and growth has long interested academics. One economist describes the issue as follows:

The argument is simple. Infrastructure is a public good that produces positive externalities for production. The provision of adequate infrastructure is a necessary condition for private firms to be productive. Even if infrastructure is also provided for its amenity value (i.e. for its direct utility value to individuals) it is obvious that it plays a central role in generating external effects that fundamentally alter the capacity of the economy to produce goods and services. Just imagine an economy without roads or telephones to think about the impact that infrastructure has on productivity.¹¹

Few would argue that infrastructure isn't important to economic activity. But, important in what precise ways, and to what degree (e.g., new construction or maintenance of existing systems), are questions that have interested researchers. Thus, public roads are important, but by themselves, they don't produce anything. Yet they are linked in complex ways to economic growth.

¹¹ Francisco Rodriguez, *Have Collapses in Infrastructure Spending Led to Cross-Country Divergence in per Capita GDP?*, Wesleyan University Department of Economics, Wesleyan Economics Working Papers No. 2006-013, April 2006, p. 3.

Economically, what is important are the services that roads provide in transporting goods and people, mitigating congestion, etc.

Academic interest in the issue of economic payoff associated with public infrastructure spending was motivated in part by recognition of declines in public investment in the early 1970s and declines in economic productivity growth at about the same time. The question for researchers was whether there was linkage, or causality, between public investments and economic productivity and, consequently, whether underinvestment in infrastructure helped to explain the slowdown in productivity growth. Research reported in the late 1980s found that there are very large returns on investment from infrastructure spending and, by implication, argued that part of the U.S. productivity slump in the 1970s and 1980s was due to a shortfall of investing in infrastructure. Some of this early work found that a 10% rise in the public capital stock would raise multifactor productivity (meaning, changes in economic output resulting from the combination of labor, capital, materials, fuels, and purchased services) by almost 4%.¹² This was a very high estimate and, as such, was very controversial. Subsequent investigations by others found that the initial results were highly sensitive to numerous factors, such as minor changes in data, or time period, or sectors of the economy that were analyzed.

During the 1990s, further research on this issue modified the methodology used to analyze the economic effects of investing in public infrastructure and either affirmed or challenged the findings of the initial work. Although not all subsequent studies found a growth-enhancing effect of public capital, a general consensus has developed over time that there are positive returns on investment in public infrastructure, but that the impact is less than was first reported.¹³ Some of this research suggests that investments in energy infrastructure have the greatest impact on long-term private employment and investment, followed by mass transit, and water and sewer.

Another important conclusion of more recent research is that both the average return and range of return to the economy vary, based on the type of infrastructure and the amount of infrastructure already in place. In other words, the larger the existing stock and the better its efficient use and current quality, the lower will be the impact of new infrastructure. Also, the effect of new public investment will crucially depend on the extent to which spending aims to alleviate bottlenecks in the existing network of infrastructure systems and facilities.¹⁴

Infrastructure Job Creation

One of the ways in which Congress has tried to spur job growth and stem job losses to mitigate the impact of economic downturns is by directly raising demand for (i.e. increasing spending on) goods and services. That is to say, Congress has substituted increased federal spending for

¹² David Alan Aschauer, "Is Public Expenditure Productive?", *Journal of Monetary Economics*, vol. 23, no. 2 (March 1989), pp. 177-200. This research was reviewed and expanded in Alicia H. Munnell, "Infrastructure Investment and Economic Growth," *Journal of Economic Perspectives*, vol. 6, no. 4 (Fall 1992), pp. 189-198.

¹³ For review of the economic literature on this issue, see U.S. Congressional Budget Office, *Trends in Public Spending on Transportation and Water Infrastructure, 1956 to 2004*, August 2007, pp. 6-9; and Richard A. Krop, Charles Hernick, and Christopher Frantz, *Local Government Investment in Municipal Water and Sewer Infrastructure: Adding Value to the National Economy*, U.S. Conference of Mayors, Washington, DC, August 14, 2008, <http://www.usmayors.org/pressreleases/uploads/LocalGovtInvInMunicipalWaterandSewerInfrastructure.pdf>.

¹⁴ Ward Romp and Jakob de Haan, "Public Capital and Economic Growth: A Critical Survey," *European Investment Bank Papers*, vol. 10, no. 1 (2005), pp. 40-70.

decreased consumer purchases. Most often in the postwar period, Congress has focused its efforts at direct job creation by increasing federal expenditures on public works.¹⁵

When Congress has considered raising spending on infrastructure to help stimulate a flagging economy, “how many jobs will be created” is a commonly asked question. Although all spending increases labor demand through direct and multiplier effects, the nature and number of jobs varies in the first round. Job creation estimates often are based on input-output (I-O) models of the economy. These models show, for example, the dollar value of concrete produced by the nonmetallic mineral product manufacturing industry and the dollar value of steel produced by the primary metal manufacturing industry that are used by the construction industry to produce its various final outputs (e.g., bridges, roads). The output requirements from each intermediate and final goods industry must then be converted to employment requirements. Thus, job creation estimates reflect employment directly and indirectly dependent on/supported by demand for an industry’s products. Induced jobs, that is, the number of jobs that result from purchases of goods and services made by those in direct and indirect jobs, may be included as well. Estimates of induced jobs are considered tenuous, however.¹⁶

Job creation estimates vary from one source to another depending in part on industry definition, data sources, and time period. The Federal Highway Administration (FHWA) is the source of the most widely cited estimate of jobs supported by federal highway investments. According to the FHWA’s latest update, in 2007, an expenditure of \$1 billion on highway construction (without a state match of \$250 million) could support 27,822 direct, indirect, and induced jobs. The FHWA analysis is careful to observe that it addresses jobs supported by highway investments, not jobs created¹⁷ Alternatively, an employment requirements table that the U.S. Bureau of Labor Statistics (BLS) makes publicly available for use by researchers, which differs from that used by the FHWA (and does not include induced jobs), suggests that, in 2007, 13,860 jobs were directly and indirectly dependent on \$1 billion of spending in the construction industry (i.e., construction of buildings, heavy and civil engineering construction including highways, and specialty trade contractors).¹⁸ The 13,860 direct and indirect jobs per \$1 billion of total construction expenditures in 2007 is somewhat more than the 11,768 direct and indirect jobs estimate of the FHWA for each \$1 billion of highway expenditures in 2006.

Another example of an infrastructure job creation estimate is provided by a CRS analysis based on the U.S. Bureau of Economic Analysis’ Regional Input-Output Modeling System (RIMS II) and the BLS’ employment requirements table described above. It suggests that between 8.1217 and 12.6231 direct and indirect jobs might be created for each \$1 million spent on water reuse activities such as Title XVI projects carried out by the Department of the Interior, which provide supplemental water supplies by reclaiming and reusing wastewater and naturally impaired ground and surface water. Within the utility sector, the “water, sewage and other systems industry” is the proxy in this analysis for water reuse infrastructure activities. Unlike the BLS and FHWA models, RIMS II provides state estimates of job creation. (See **Table 1**.) Through its use of regional data,

¹⁵ For information, see CRS Report 92-939, *Countercyclical Job Creation Programs*, by Linda Levine.

¹⁶ For more methodological information, see CRS Report R40080, *Job Loss and Infrastructure Job Creation During the Recession*, by Linda Levine.

¹⁷ U.S. Department of Transportation, Federal Highway Administration, *Employment Impacts of Highway Infrastructure Investment*, <http://www.fhwa.dot.gov/policy/otps/publications.htm>.

¹⁸ For a fuller discussion of estimates from the FHWA and BLS models, see CRS Report R40080, *Job Loss and Infrastructure Job Creation During the Recession*, by Linda Levine.

RIMS II addresses one of the caveats mentioned by the FHWA, namely, the reliance of national models on average data which may differ from combinations of construction materials and labor inputs in the specific geographic areas where projects are undertaken.

Table I. Number of Direct and Indirect Jobs Per \$1 Million of Output Produced by the Water, Sewage and Other Systems Industry

State	Number of Jobs	State	Number of jobs
Alabama	9.1932	Montana	9.6492
Alaska	6.0846	Nebraska	6.6034
Arizona	7.0133	Nevada	7.5986
Arkansas	9.0811	New Hampshire	6.2295
California	6.9482	New Jersey	5.9976
Colorado	7.3899	New Mexico	8.9694
Connecticut	5.7617	New York	5.4324
Delaware	5.0235	North Carolina	8.4947
District of Columbia	0.6645	North Dakota	8.1289
Florida	7.8063	Ohio	7.2427
Georgia	7.6997	Oklahoma	9.2469
Hawaii	7.5041	Oregon	8.3032
Idaho	9.1590	Pennsylvania	6.5001
Illinois	6.9948	Rhode Island	5.4505
Indiana	7.4542	South Carolina	7.9244
Iowa	7.7909	South Dakota	8.5481
Kansas	8.7923	Tennessee	7.2497
Kentucky	8.6829	Texas	7.9209
Louisiana	9.1763	Utah	9.2335
Maine	7.3596	Vermont	7.8595
Maryland	6.7175	Virginia	7.5986
Massachusetts	5.8627	Washington	6.6501
Michigan	6.5337	West Virginia	6.7946
Minnesota	6.4996	Wisconsin	6.6528
Mississippi	9.0894	Wyoming	7.8923
Missouri	7.0257	United States	8.1217

Source: Data supplied to the Congressional Research Service by the U.S. Bureau of Economic Analysis (U.S. Department of Commerce), Regional Product Division from the Regional Input-Output Modeling System (RIMS II).

The Contribution of Infrastructure to Economic Stimulus

Since mid-2008, there have been increasing calls for Congress and the Administration to address the nation's significant economic difficulties through a variety of policy approaches.¹⁹ On the one hand, some argue that economic stabilization can best be achieved through monetary policy (i.e., the Federal Reserve's ability to adjust interest rates), coupled with automatic fiscal stabilizers.²⁰ Others support a fiscal stimulus, and policymakers are debating a range of options for doing so.

In February 2008, Congress and the Administration agreed to legislation (P.L. 110-185) that prominently included tax rebates for individuals as a means of stimulating the ailing economy. Effects of that legislation on the economy are not yet fully known.²¹ Under discussion now is a second stimulus package, and in that connection, many others now advocate using direct fiscal stimulus through a combination of short-term infrastructure investments, state fiscal relief, and expanded unemployment insurance and food stamps. A wide range of experts—including economists who generally differ in their economic policy views, such as Martin Feldstein²² and Paul Krugman²³—contend that, because neither consumers nor businesses are spending, a massive infusion of government spending is needed quickly to energize economic activity. Infrastructure investment, it is argued, will be an important source of stimulating labor demand, which is lacking in the current labor market, and enhancing U.S. productivity through long-neglected investments in roads, bridges, water systems, etc.²⁴

Somewhat ironically, the nation's economic downturn presents an opportunity, according to this view, to stimulate the economy by spending on projects to address unmet infrastructure needs. These needs are presented in the finding of the American Society of Civil Engineers (ASCE) that the condition of the nation's infrastructure merits a letter grade of "D" and that U.S. funding needs total \$1.6 trillion. ASCE reported the condition of a dozen categories of infrastructure, including roads ("Americans' personal and commercial highway travel continues to increase at a faster rate than highway capacity, and our highways cannot sufficiently support our current or projected travel needs"), dams ("the number of dams identified as unsafe is increasing at a faster rate than those being repaired"), wastewater ("the physical condition of many of the nation's 16,000 wastewater treatment systems is poor, due to a lack of investment in plant, equipment and other capital improvements over the years"), and schools ("The Federal government has not assessed the condition of America's schools since 1999, when it estimated that \$127 billion was

¹⁹ For additional information, see CRS Report R40104, *Economic Stimulus: Issues and Policies*, by Jane G. Gravelle, Thomas L. Hungerford, and Marc Labonte.

²⁰ Automatic stabilizers are built-in changes in government spending and taxation, such as income taxes and unemployment compensation that increase and decrease automatically to dampen economic cycle fluctuations. For example, in recessionary times, payment of unemployment benefits injects more money into the system and stimulates demand.

²¹ See CRS Report RL34349, *Economic Slowdown: Issues and Policies*, coordinated by Jane G. Gravelle.

²² Martin Feldstein, "The Stimulus Plan We Need Now: The President-Elect Won't Have to Wait Till January to Act," *The Washington Post*, October 30, 2008, p. A23.

²³ Paul Krugman, "Let's Get Fiscal," *The New York Times*, October 16, 2008.

²⁴ Jared Bernstein, Senior Economist, Economic Policy Institute, Testimony before the U.S. House Committee on Ways, and Means, Hearing on Economic Recovery, Job Creation and Investment in America, October 29, 2008, <http://waysandmeans.house.gov/hearings.asp?formmode=view&id=7463>.

needed to bring facilities to good condition. Other sources have since reported a need as high as \$268 billion").²⁵

While there is growing momentum for more infrastructure investment, some analysts are cautious about the effectiveness of this type of fiscal stimulus because of one key issue: timing. This concern was described in testimony by the Director of the Congressional Budget Office.

The timing of fiscal stimulus is critical. If the policies do not generate additional spending when the economy is in a phase of very slow growth or a recession, they will provide little help to the economy when it is needed.... Poorly timed policies may do harm by aggravating inflationary pressures and needlessly increasing federal debt if they stimulate the economy after it has already started to recover.

For federal purchases [of goods and services, such as infrastructure spending], the primary issue in targeting the spending is that of timing ... because many infrastructure projects may take years to complete, spending on those projects cannot easily be timed to provide stimulus during recessions, which are typically relatively short lived.²⁶

By definition, the goal of stimulus spending is to get money into the economy swiftly. But that objective conflicts with the reality of building infrastructure projects that typically are multiyear efforts with slow initial spendout. CBO notes that public works projects are likely to involve expenditures that take a long time to get underway and also are spread out over a long time. Even those that are "on the shelf" generally take time to inject money into the economy. For major infrastructure, such as highway construction and water resource projects, the initial rate of spending can be 25% or less of the funding provided in a given year.²⁷ Based on CBO information, the National Governors Association reported spendout rates for several infrastructure categories:

- About 68% of highway and 45% of transit obligations spend out over the first two years of a project.
- About 19% of airport obligations spend out in the first year and another 42% in year two.
- About 24% of drinking water and wastewater obligations are expended over two years, and 54% over three years.²⁸

Economist Mark Zandi, who favors a fiscal stimulus package that includes increased infrastructure spending, also cautions that it takes a substantial amount of time for funds to flow to builders, contractors, and the broader economy. "Even if the funds are only used to finance

²⁵ American Society of Civil Engineers, *Report Card for America's Infrastructure*, 2005, http://www.asce.org/files/pdf/reportcard/2005_Report_Card-Full_Report.pdf.

²⁶ Peter R. Orzag, Director, Congressional Budget Office, Testimony before the U.S. Senate Committee on Finance, Hearing on Options for Responding to Short-Term Economic Weakness, January 22, 2008, pp. 5, 8.

²⁷ Ibid., pp. 19, 22.

²⁸ National Governors Association, *Economic Recovery: A Federal-State Partnership*, November 13, 2008, pp. 11-12.

projects that are well along in their planning, it is very difficult to know just when the projects will get underway and the money spent.”²⁹

Advocates of infrastructure spending have two responses to this concern. First, they point out that because economists now expect the current recession to be of long duration (longer than 12 months), projects with extended timeframes can still contribute to the economy’s recovery, which is likely to be a two-year undertaking. Thus, the general concern about timing is less relevant, compared with previous shorter recessions, they say. Second, because every major infrastructure category has significant backlogs of projects that are “ready to go” except for funding, advocates are confident that large amounts of actual construction work can begin quickly (see discussion below, ““Ready to Go” Projects”).

Some economists contend that public infrastructure investments stimulate economic growth only if the impact of the infrastructure outweighs the adverse effects of higher taxes that are needed to finance the investment, or if it outweighs the adverse effects of spending cuts in other areas, such as properly maintaining existing public works systems. Higher deficits that result from stimulus spending slow economic growth in the long run, it is sometimes said, because government borrowing crowds out private investment.³⁰ Critics of this view say that this concern is valid in non-recessionary times when the economy is working at full capacity, because under those circumstances, government spending just changes the mix of jobs with no change in the overall quantity or quality of labor. According to this view, government spending in a recession affects resources and labor that are idle, and it does not fully displace private investment.

Other economists say that if federal assistance merely provides fiscal relief by paying for spending that would have occurred anyway—that is, if federal dollars merely substitute for or replace local dollars invested in the same activity—it provides no economic stimulus. In response, state and local public officials say that that is not the case in today’s economy. Because of the current recessionary pressures that they face, states and cities have been cancelling infrastructure projects. Another way of describing this situation could be to say that what is under discussion is really not entirely about stimulus, but it is better termed holding state and local governments harmless in order to encourage them to carry out projects that they couldn’t otherwise do, because of budget shortfalls.

Issues

Funding infrastructure is a long-term investment, not quick-fix spending, that should lead to something durable, useful, and financially productive. The long-term nature of such investments can be at odds with the stimulus goal of quickly injecting money into the economy. Thus, the overriding question in debating infrastructure spending as part of economic stimulus is, what will the stimulus buy? Two important considerations regarding any fiscal stimulus proposal are, will

²⁹ Mark Zandi, Chief Economist, Moody’s Economy.com, Testimony before the House Committee on Small Business, Hearing on “Economic Stimulus for Small Business: A Look Back and Assessing Need for Additional Relief,” July 24, 2008, p. 7.

³⁰ According to this argument, by issuing large amounts of debt to finance spending, government drives up interest rates. In turn, businesses are unwilling to spend on new plants and equipment. Thus, government’s actions crowd out private investment and reduce the economy’s long-run growth rate. See, for example, Ronald D. Utt, *More Transportation Spending: False Promises of Prosperity and Job Creation*, The Heritage Foundation, Backgrounder No. 2121, April 2, 2008, http://www.heritage.org/Research/budget/upload/bg_2121.pdf.

the proposal produce stimulus quickly, and will it produce a significant amount of stimulus, relative to its budgetary cost. These issues are explored in the remainder of this report.

Setting Priorities and Determining Funding Needs

Traditionally, setting priorities for infrastructure spending is based on a combination of factors. Estimates of funding needs are one factor that is commonly used as a measure of the dimension of a problem and to support spending on some activities relative to others, as in: funding needs for X are much greater than for Y, therefore, society should spend more heavily on X.

In the infrastructure context, funding needs estimates try to identify the level of investment that is required to meet a defined level of quality or service. Essentially, this depiction of need is an engineering concept. It differs from the concept of “ready to go” projects (discussed below), which is being used in connection with stimulus proposals. It also differs from economists’ conception that the appropriate level of new infrastructure investment, or, the optimal stock of public capital (infrastructure) for society, is determined by calculating the amount of infrastructure for which social marginal benefits just equal marginal costs.

The last comprehensive national infrastructure needs assessment was conducted by the National Council on Public Works Improvement that was created by the Public Works Improvement Act of 1984 (P.L. 98-501). The Council reported in 1988 that government outlays for public works capital totaled about \$45 billion in 1985 and that a commitment to improve the nation’s infrastructure “could require an increase of up to 100 percent in the amount of capital the nation invests each year.”³¹ This estimate of future needs by the Council may have been imprecise because of the inherent difficulties of needs assessments, something its report discusses in detail.³² It is worth highlighting a few of these key difficulties as a cautionary note when attempting to interpret infrastructure needs assessments discussed in the **Appendix** to this report and elsewhere.

One of the major difficulties in any needs assessment is defining what constitutes a “need,” a relative concept that is likely to generate a good deal of disagreement. For this reason, some needs assessments are anchored to a benchmark, such as current provision in terms of physical condition and/or performance. This current level of provision may be judged to be too high by some and too low by others, but nonetheless it provides a basis for comparison as future spending needs can be estimated in terms of maintaining or improving the current condition and performance of the infrastructure system. Needs estimates in highway and public transit are calculated in this way by the U.S. Department of Transportation (DOT). The Environmental Protection Agency (EPA) similarly estimates total U.S. funding needs for wastewater treatment facilities. EPA defines a “need” as a project, with associated costs, that addresses a water quality or public health problem existing as of January 1, 2004.³³

Other federal agencies estimate the funding necessary to bring the current infrastructure system to a state of good repair. The resulting funding estimate is sometimes referred to as the infrastructure

³¹ National Council on Public Works Improvement, *Fragile Foundations, A Report on America’s Public Works: Final Report to the President and the Congress*, Washington, 1988, p.2.

³² Ibid., chapter 2.

³³ U.S. Environmental Protection Agency, *Clean Watersheds Needs Survey 2004, Report to Congress*, January 2008.

“backlog.” Again, among other problems, such as inventorying the current condition of infrastructure and calculating repair costs, the needs estimate is affected by judgments about what constitutes a state of good repair. It is worth noting, too, that needs assessment are often conducted by organizations with a vested interest in the outcome. This is most obviously a concern when a needs assessment is conducted by an advocacy group, but may also occur with government agencies.

A second major difficulty with needs assessments is estimating future conditions, especially consumer demand for services that infrastructure provides. To begin with, estimating demand is difficult because it is based on a host of assumptions such as the rate of population and economic growth. Typically, the longer the time period over which conditions are forecast, the harder it is to accurately predict them. Particularly hard to predict, and, thus, the effect they have on infrastructure needs, are structural changes in the economy and technological change. In addition, however, consumer demand can vary enormously depending on how a service is financed and priced, as well as other public policy decisions including regulation and conservation. For example, highway infrastructure is primarily financed by fuels and other taxes that provide a vague signal or no signal at all about the total cost of driving, particularly the external costs such as the fuel and time wasted in congested conditions. Highway tolls, on the other hand, particularly those that fluctuate in line with congestion, provide a direct price signal for a trip on a certain facility at a certain time of the day. Pricing highway infrastructure in this way has been found to reduce travel demand, thereby affecting infrastructure need.³⁴ Consumer demand can sometimes be met without infrastructure spending. For example, water supply needs can be reduced by employing water conservation methods.

Finally, it is worth mentioning that the need for public funding to supply infrastructure, including federal support, may often be an open question because the roles of the public and private sector can and do shift over time. Even within the public sector, the roles of federal, state, and local governments change and these shifting intergovernmental relationships may even affect the assessments of infrastructure needs.

A third major difficulty with infrastructure needs assessments is that needs estimates for individual elements of public infrastructure are rarely comparable. Some assessments include only capital spending, others include both capital and operation and maintenance (O&M) spending. Some estimates of need are developed for the purposes of short-term, fiscally constrained spending plans, while others are developed to assess long-term needs based on current system condition and performance, future demand, and the effects of pursuing different policy options. Some needs assessments are for public sector spending by all levels of government, while others focus only on federal spending. Furthermore, needs estimates are rarely directly comparable because of differing underlying assumptions, such as those about economic and population growth, based on when the assessment is being done and for what purpose.

Needs surveys are likely to be conducted at different times, thus will be expressed in different years’ dollars. Comparing dollar estimates of infrastructure needs from different assessments is difficult. Many estimates are prepared in nominal dollars for the reference year, while others, particularly multi-year estimates, are sometimes prepared in constant dollars for a base year.

³⁴ See U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, 2006 *Status of the Nation’s Highways, Bridges, and Transit: Conditions and Performance*, Washington, DC, 2007, chapter 10, <http://www.fhwa.dot.gov/policy/2006cpr/index.htm>.

Because there are different ways to inflate and deflate nominal dollar estimates, it should not be assumed that dollar estimates for the same year are necessarily comparable.

Because of major differences in coverage and methodology, individual needs assessments cannot be added together to provide a single estimate of future public infrastructure needs, despite the political desire to do so. Moreover, as needs assessments are typically prepared separately, there may be instances where a need for a type of infrastructure is included in more than one estimate, resulting in double counting, and other instances of omission, resulting in undercounting. As separately estimated, these assessments also ignore competitive and complementary situations in which spending levels in one area may affect needs in another. For example, in the case of transportation infrastructure, an improved freight rail line might reduce the need to improve the highway system to accommodate truck traffic.

“Ready to Go” Projects

In September 2008 the House approved a job creation stimulus bill with \$25 billion in FY2009 supplemental funding for highway, public transit, airport, passenger rail (Amtrak), wastewater and drinking water, water resources, and public school modernization/renovation programs (H.R. 7110). Under the legislation, which failed in the Senate, most of the funding was to go to projects that could award contracts based on bids within a certain number of days of enactment, generally 120 days. Because of the urgency of responding to the economic downturn, emphasis has been on projects that could move to construction in 90 or 120 days, which are often referred to as “shovel ready” or “ready to go” projects.

In an effort to support arguments for generous spending levels in a new stimulus bill, interest groups have come forward recently with lists and estimates of “ready to go” projects. These lists are fluid and evolving.

- In November, the National Governors Association identified \$43 billion in “shovel ready” projects for roads (\$18.9 billion), transit (\$8 billion), passenger rail (\$0.5 billion), wastewater (\$9.2 billion), and drinking water projects (\$6.0 billion). This estimate was essentially a compilation of information from other organizations.³⁵
- In mid-December, the U.S. Conference of Mayors identified \$63 billion in “ready to go” projects in more than 400 cities. This list included nearly 9,000 projects for highways (\$24.6 billion), transit (\$8.8 billion), airports (\$4.5 billion), passenger rail (\$1.1 billion), wastewater and drinking water (\$18.9 billion), and schools (\$4.8 billion).³⁶ The list was 30% bigger (in dollars) than an estimate from this group released 10 days earlier.
- State and local water agencies have reportedly identified from \$9 to \$20 billion in wastewater treatment projects and \$10 billion in drinking water projects that are ““ready to go”.³⁷

³⁵ National Governors Association, *Economic Recovery: A Federal-State Partnership*, November 13, 2008, <http://www.nga.org/Files/pdf/0811ECONOMICRECOVERY.PDF>.

³⁶ U.S. Conference of Mayors, “Ready to Go” Jobs and Infrastructure Projects, December 19, 2008, <http://www.usmayors.org/mainstreeteconomicrecovery/documents/mser-plan-20081219.pdf>

³⁷ Inside EPA, “States Seek over \$9 Billion for Clean Water Projects in Stimulus Bill,” September 12, 2008; “AWWA (continued...)

- The American Association of State Highway Transportation Officials identified more than 5,100 road and highway projects totaling \$64 billion, and the Association of Public Transit Officials identified more than 700 transit projects totaling \$12.2 billion that are “shovel ready.”³⁸
- The American Public Works Association identified more than 3,600 “ready to go” projects in 43 states totaling \$15.4 billion for roads, water supply and wastewater, and other local public works.³⁹

It is difficult to know what to make of such estimates, since the criteria used to develop them are largely unknown. Generally, the term “ready to go” is being used to refer to projects that lack funding but otherwise have been designed, engineered, and have cleared environmental permitting and other requirements, such as necessary land acquisition, and are ready to proceed. But that is not a standardized definition found in law, regulation, or technical guidance. Arguably, it is in the interest of those that are developing the lists to present estimates that demonstrate significant needs. Some projects may have permits, but sponsors might lack easements to or ownership of land in question. Experts point out that, unless a project has already been bid (a time-consuming process), even with all permits in hand, it still may not be able to proceed in 90 or 120 days. Without a recognized methodology for vetting them, the true status of the projects that stakeholder groups have identified is uncertain.

Many of the “ready to go” lists include estimates of job creation that is expected to result from the identified projects. For example, the Conference of Mayors says that 790,910 jobs will be created from the infrastructure projects on its mid-December list. The methodology for deriving these estimates is often unstated, but in many cases is based on that used by the FHWA (discussed above).

Two additional issues are apparent. One is whether spending undertaken as part of a stimulus program will represent investment in long-term assets for society. Some of the lists prepared by stakeholder groups identify projects with some description (for example, the Conference of Mayors list), but others only identify state-by-state project totals. Critics contend that lists of “ready to go” projects are likely to include many with marginal value, such as projects with plans that have been backlogged for some time because they lack sufficient merit, but for which there now is an opportunity to get funding. Under a stimulus program, the majority of actual funding decisions will be made by state and local officials with responsibility for determining priorities. Proponents believe that citizens will hold public officials accountable for the quality of projects.

A second issue, related to the first, concerns the tension between funding activities that will create jobs quickly and the desire to invest in projects that will have sustained value. This also relates to the issue of timing, discussed previously. Critics worry that projects will be small and won’t solve

(...continued)

Members Asked to Contact Congress on Drinking Water Infrastructure and Stimulus Bill,”
<http://www.awwa.org/Government/Content.cfm?ItemNumber=3821&navItemNumber=1618>.

³⁸ American Association of State Highway and Transportation Officials, *AASHTO State Survey Ready to Go Highway and Bridge Infrastructure Projects*, December 5, 2008, http://www.transportation.org/sites/~/ready_to_go~/docs/Ready-to-Go%20Survey12-09.pdf; American Public Transit Association, *Legislative Update: Economic Stimulus Package Remains Under Consideration*, December 11, 2008,
http://www.apta.com/government_affairs/washrep/documents/2008december11.pdf

³⁹ American Public Works Association, *Ready to Go Local Public Works Projects*, November 2008.

long-term problems or have strategic value. One such critic of additional infrastructure spending noted, “If additional infrastructure is worthwhile, it should be constructed. Such determinations are most likely to be accurate, however, when they are made without the haste associated with an attempt to respond to economic weakness.”⁴⁰

Proponents of a new stimulus program can be expected to try to balance the dual objectives of spending money quickly and investing for the long-term. Some types of public works programs may support jobs that have little long-term impact, such as hiring workers to sweep streets or rake leaves, sometimes called “make work.” Projects that involve substantial new construction are slower to complete and to impact jobs, but often have a political appeal because of high visibility to the public. Some infrastructure, such as highway resurfacing and minor road repairs or replacement of pumps and compressors at water facilities, does benefit the value of the nation’s capital assets and can be done more quickly than new construction. Likewise, acquiring new clean fuel buses or rehabilitating transit stations can occur more rapidly than extending collector sewer lines into unsewered communities. Many public officials are hoping that there will be room in an emerging stimulus program for both short-term and long-term infrastructure projects.

Getting the Job Done: Resource and Governance Issues

Two additional issues are important in considering how infrastructure stimulus spending is done. One is whether there will be adequate labor and other resources available to supply activities on the scale that some now contemplate. The other is how policymakers will ensure accountability for federal funds that will be spent.

Currently, the state of the U.S. economy is such that there is excess capacity of both labor and materials for infrastructure projects. Large number of workers are unemployed, especially in the construction sector, which reported a 12.1% unemployment rate in November 2008.⁴¹ It is widely believed that a large number of those workers (many of whom had been employed in residential construction) could be employed on infrastructure construction projects, but how transferable those skills are to infrastructure projects is an open question. There is unlikely to be total substitutability, that is, unemployment will not disappear. It is possible, however, that some skills or expertise could become scarce, as a result of increased demand due to greater construction activity in multiple sectors.

The same is true regarding materials used in construction. Industry officials believe that supplies of materials such as concrete and steel, and equipment such as pipes and valves, are adequate to meet additional demand, or will be available when needed. As with labor, however, it is an open question whether greatly increased demand across multiple sectors will lead to some scarcities.

Resource issues also encompass the capacity of government to oversee projects that will be undertaken through a stimulus program. Some stakeholder groups advocate a stimulus program in which funds are directly disbursed by the federal government in the form of grants to project sponsors. This would differ from the current practice of most infrastructure assistance programs

⁴⁰ Alan Viard, Resident Scholar, American Enterprise Institute, Testimony before the U.S. House Committee on Ways and Means, Hearing on Economic Recovery, Job Creation and Investment in America, October 29, 2008, <http://waysandmeans.house.gov/hearings.asp?formmode=view&id=7468>.

⁴¹ U.S. Department of Labor, Bureau of Labor Statistics, “Employed and unemployed persons by occupation, not seasonally adjusted,” December 5, 2008.

in which federal funds are provided to states, and they in turn select qualified projects and distribute monies locally. Some local government groups contend that state agencies are slow to make decisions and award funds, thus frustrating the goal of stimulating economic activity quickly. Unsurprisingly, states prefer that stimulus funds be allocated and distributed according to established selection and delivery mechanisms that include criteria for project priorities and eligibilities and contain fiscal safeguards, such as auditing requirements. Altering such procedures would be highly disruptive, states say.⁴² If a stimulus program were to feature direct federal grants, federal agencies would face significant additional grants management responsibilities for which most are likely to be unprepared.

Another concern of some stakeholder groups is with programmatic and other requirements that typically apply to receipt of federal assistance. These range from program-specific planning mandates, procurement rules, and set-asides for purposes such as assisting economically disadvantaged communities, to cross-cutting requirements dealing with a variety of environmental, social, economic, and other issues, such as compliance with the Clean Air Act, Civil Rights Act of 1964, and the Davis-Bacon Act. These cross-cutting requirements promote and regulate national policy goals such as equal employment opportunity or protection of endangered species. Some groups contend that it would be appropriate to suspend these requirements in order to facilitate project spending, but not all are likely to support doing so. Waiving existing rules and policies that govern financial assistance programs could be seen as undercutting the numerous policy objectives that the requirements are intended to meet. Further, projects that are considered ““ready to go”” in terms of planning, design, etc. arguably have already complied with all or most of these requirements, so waiving them may not affect project timing.

State match requirements present a different issue, according to some groups. They propose that Congress temporarily waive requirements in some programs that states must match a percentage of the federal funds that they receive with non-federal money. For example, the federal programs that provide assistance for highways, drinking water projects, and wastewater treatment plant construction require a 20% state match to ensure that states have a fiscal investment in projects and to enlarge the available pool of funds that can be disbursed to localities.⁴³ Because state budgets already are severely pressed by the recession, many argue that they do not have the fiscal resources for this type of match, especially if a stimulus program provides a much larger amount of funds than states have recently been receiving.⁴⁴

The overriding governance issue, for all levels of government, is ensuring accountability for funds that will be spent through a stimulus program. The amounts of federal dollars committed to such a program are likely to be enormous (some advocates are proposing \$850 billion or more in total stimulus, to include as much as \$350 billion for infrastructure) and other direct spending, making it particularly important for the public to be assured that decisions involving public

⁴² “EPA, States Weigh Easing SRF Rules to Speed Stimulus Spending,” *Inside EPA*, December 19, 2008.

⁴³ The state match also benefits jobs. For example, the FHWA employment impacts estimates, discussed on page 7, indicate that if states are required to include a 20% match, then \$1 billion in federal funds supports 34,779 direct and indirect jobs, or 6,979 more jobs than if no state match is required.

⁴⁴ The Clean Water Act’s wastewater assistance program provides an example. FY2008 funding for this program totaled \$689 million; it was allocated among the states by formula. If a state was allocated \$50 million of the total, it was required to provide a \$10 million match H.R. 7110 (110th Congress) would have provided \$6.5 billion in FY2009 supplemental funds for the Clean Water Act program. The same state that received \$50 million in FY2008 would have received \$470,775,500 under H.R. 7110 and would be required to provide a 20% match totaling \$94,155,100.

dollars are made quickly yet with transparency, that investments are made in quality projects, and that projects have adequate oversight. One group, Building America's Future, recommends that states and cities should have to track and report on how the money is spent and how many jobs are created.⁴⁵ How this issue will be addressed legislatively is unknown for now.

Is There a Role for “Green Infrastructure” as Part of Economic Stimulus?

President-elect Obama’s agenda includes plans to “create millions of green jobs” through a variety of actions, such as increased use of renewable sources of electricity (i.e. wind and solar), home weatherization, and development and implementation of “next generation” vehicles.⁴⁶ The concept that he and others advocate is, broadly speaking, to couple growing the economy and creating jobs with investments that will promote clean energy and environmental protection. Several interest groups have stepped forward with proposals for inclusion in a stimulus package. Among these, the Center for American Progress (CAP), a public policy and research think tank, has recommended green investment projects totaling \$100 billion as part of “A Strategy for Green Recovery.”⁴⁷ Also, the Apollo Alliance, a coalition of labor, environmental, business, and community leaders, has proposed a 10-year, \$500 billion program to create five million “green” jobs.⁴⁸

Several questions arise concerning these proposals. First, what, exactly, is “green infrastructure?” The term is less precisely defined than is traditional infrastructure (see page 8), which some “green” advocates now refer to as “gray infrastructure.” It has been defined as “strategically planned and managed networks of natural lands, working landscapes and other open spaces that conserve ecosystem values and functions and provide associated benefits to human populations,” including natural elements such as wetlands and grasslands.⁴⁹ For example, it describes the management of stormwater runoff through the use of natural systems, or engineered systems that mimic natural systems, to treat polluted runoff before it reaches streams or lakes. But in the current context of economic stimulus, the term extends more broadly to include support for constructing the manufacturing infrastructure to develop and commercialize various technologies that are more energy efficient (e.g. advanced vehicle batteries) or more environmentally friendly (e.g. investments in renewable energy sources and the electricity grid to transmit and distribute clean energy). Particular attention has been given to mass transit projects that can decrease energy consumption and reduce global warming pollution and other projects such as retrofitting schools and public buildings to use clean energy.

⁴⁵ “Building America’s Future Applauds President-elect Obama’s Commitment to Infrastructure,” December 6, 2008, http://investininfrastructure.org/newsroom/12-6-08_response_to_obama.pdf. Building America’s Future is a coalition created by California Governor Schwarzenegger, Pennsylvania Governor Rendell, and New York City Mayor Bloomberg to advocate on infrastructure issues.

⁴⁶ <http://change.gov/agenda>.

⁴⁷ Will Straw and Michael Ettlinger, *How to Spend \$350 Billion in a First Year of Stimulus and Recovery*, Center for American Progress, December 5, 2008, pp. 12-14, http://www.americanprogress.org/issues/2008/12/pdf/second_stimulus.pdf.

⁴⁸ Apollo Alliance, *Data Points: Economic Outcomes of The Apollo Economic Recovery Act, 2008*, <http://apolloalliance.org/apollo-14/data-points-the-new-apollo-program-fact-sheet/>.

⁴⁹ <http://www.greeninfrastructure.net/content/definition-green-infrastructure>.

A second question is, can investment in “green” projects occur quickly enough to help stimulate the economy out of the current recession? That is, are there “ready to go” “green” projects? As previously discussed, the key to stimulus spending is to get funds moving quickly into the economy. However, many of the proposals by green economy proponents were not conceived for the purpose of quickly stabilizing or increasing the number of jobs in the nation, or in industries particularly hard hit by the current recession. Studies like that of CAP recommend categories of projects to create green jobs, such as full funding of federal energy-efficiency programs, which “can start stimulating the economy relatively rapidly” and others, such as new authorization for grants to states to support manufacturing plant retooling to produce clean and energy-efficient technologies, that are “less fast-acting.” Eighty percent of CAP’s recommended funding would be for “less fast-acting” programs.⁵⁰ Critics say that the types of “green” projects under discussion are pricey and would do little to stimulate the economy quickly, but proponents contend that “green” investments represent a downpayment on long-term economic growth and should be done even over a somewhat longer time period.

One environmental advocacy group, American Rivers, reportedly has identified 194 water-related green infrastructure projects totaling \$1.1 billion that are “ready to go” within six to nine months. The types of projects include installing green roofs, raingardens, and permeable pavement that can reduce the need for new wastewater treatment plants and stormwater and sewer pipes; restoring wetlands and natural floodplains; and planting urban forests.⁵¹

A final question is, what is the job creation potential of “green infrastructure” investments? Although all stimulative spending ultimately increases labor demand, the first round effects vary by the type of spending. This question is addressed in a recent CRS report. According to the CRS analysis,⁵² estimating the number of jobs dependent upon green infrastructure activities presents a greater challenge than estimates related to infrastructure projects as traditionally defined. The basis for most data collection by U.S. statistical agencies is the North American Industry Classification System (NAICS). It currently does not identify separately so-called green industries (e.g., those that utilize renewable resources to produce their outputs, or those that manufacture goods which minimize energy use). Within NAICS, the electric utility industry is disaggregated into hydroelectric, fossil fuel, nuclear, and other power generation, transmission, and distribution. Such renewable sources of energy production as wind, solar, and biomass are not uniquely recognized; they are included in the “other” category. If harnessing the wind to produce electricity and plant material to produce biofuel requires a substantially different mix of inputs than relying on coal and gasoline, for example, the conventional input-output (I-O) model does not seem well-suited as a basis for estimating the number of jobs supported by these green activities. Similarly, within NAICS, the building construction industry does not have a unique category for “green” retrofitting (e.g., installing additional insulation, fluorescent lighting, or energy-efficient heating and air-conditioning systems). Retrofitting likely requires a combination of inputs from supplier industries that differs from the mix for the top-to-bottom construction of buildings, once again making use of conventional I-O models problematic.

⁵⁰ Will Straw and Michael Ettlinger, *How to Spend \$350 Billion in a First Year of Stimulus and Recovery*, Center for American Progress, December 5, 2008, pp. 12-14, http://www.americanprogress.org/issues/2008/12/pdf/second_stimulus.pdf.

⁵¹ <http://www.wwn-online.com/articles/69929/>.

⁵² CRS Report R40080, *Job Loss and Infrastructure Job Creation During the Recession*, by Linda Levine.

This recognized difficulty generally is either not mentioned, or how it is dealt with is not described, in analyses of green job creation, according to the CRS report. The CAP study, mentioned above, does address the problem. The researchers explain that because "the U.S. government surveys and accounts that are used to construct the input-output tables do not specifically recognize wind, solar, biomass, building retrofitting, or new mass transit as industries in their own right," they created synthetic industries by combining parts of industries for which data are available. The researchers provided an example in the case of the biomass "industry:" they constructed it by combining the farming, forestry, wood products, and refining industries; then they "assigned relative weights to each of these industries in terms of their contributions to producing biomass products."⁵³

As discussed in CRS Report R40080, *Job Loss and Infrastructure Job Creation During the Recession*, further complicating the matter is the context and manner in which estimates of green jobs generally are presented. Studies often develop employment projections based on differing sets of assumptions and time horizons. For example, some attempt to estimate the number of direct and indirect jobs 10 or more years in the future that are supported by an assumed increase in the demand for energy that is met by an assumed shift during the projection period from coal to wind and geothermal power generation. Some reports also include induced employment (see "Infrastructure Job Creation" above), but this is not always made clear. In addition, some analyses relate to a particular state. Their results may not be generalizable to other areas, because state economies have different mixes of industries and may not be able to provide any or all of the inputs for a particular green output. The analyses also may express job estimates per unit of power generated by renewable resources and saved by increased demand for energy-efficient products and equipment, rather than per dollar of investment in green activities. And, the assumptions and methodologies underlying the job creation estimates often are not clearly articulated, which makes thoughtful review of the results very difficult. For these reasons, policymakers considering which if any green infrastructure programs to fund to create and preserve jobs in the near term to mitigate the recession's impact on U.S. workers may not find helpful many green economy studies.

⁵³ Robert Pollin, Heidi Garrett-Peltier, and James Heintz, et al., *Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy*, Center for American Progress, Washington, D.C., September 2008, p. 20, <http://www.americanprogress.org>.

Appendix. Infrastructure Sector Categories

This Appendix provides descriptions of a number of infrastructure categories that have recently been mentioned for inclusion in economic stimulus legislation in the 111th Congress. The sectors are highways and bridges (page 22), transit (page 23), airports (page 25), passenger rail (page 25), water resources (page 25), wastewater (page 32), drinking water (page 34), electric transmission (page 36), schools (page 39), federal public buildings (page 41), and broadband (page 42). This list is not meant to be exclusive or definitive of categories that Congress and the Administration may consider. Evolving legislative proposals may include assistance for some or all of these, and could include others, as well. The descriptions include information on conditions, performance, and funding needs of each category; recent federal assistance; discussion of investment in each category as a mechanism for economic stimulus; and identification of other key issues for the sector. **Table A-1** summarizes the level(s) of government and/or the private sector that typically are responsible for financing, policy, and standard setting for the infrastructure categories described in the Appendix.

Table A-1. Usual Lead Roles in Infrastructure Categories

Category of Public Works	Capital Financing	Ownership, Operations and O&M Financing	Public Works Policy and Standard Setting
Highways and Bridges			
- interstate	Federal/State	State	Federal
- non-interstate	State/Local/Federal/Private	State/Local/Private	State/Local
Transit	State/Local/Federal	Local/Private	Local/Federal
Airports	Local/Private/Federal	Local/Private	Local/Federal
Water Resources			
- ports (landside)	Local/Private	Local/Private	Local/Federal
- navigation/dredging	Federal/Private	Federal/Private	Federal
- major dams	Federal/Local/Private	Federal/Local/Private	Federal
- nonfederal dams	Private/Local	Private/Local	State
- levees/flood protection	Local/Private/Federal	Local/Private	Federal
Passenger Rail	Federal/Amtrak/State	Federal/Amtrak/State	Federal/State
Wastewater	Local	Local	Federal/State
Drinking Water	Local/Private	Local/Private	Federal/State
Electric Transmission	Private/Federal/Local	Private/Federal/Local	Federal/State
Schools	Local	Local	Local/State
Federal Public Buildings	Federal	Federal	Federal
Broadband	Private	Private	Federal

Source: Exhibit IV-2 in National Council on Public Works Improvement, *Fragile Foundations: A Report on America's Public Works, Final Report to the President and the Congress*, Feb. 1988, modified and updated by CRS.

Highways and Bridges⁵⁴

There are almost 4 million miles of highways in the United States.⁵⁵ The vast majority of these highways are owned and operated by state and local governments, 20.4% and 76.5% respectively. Only 3.1% of highway mileage is federally owned and almost all of this mileage is in national parks, national forests, military bases, and other federal facilities. Just over 75% of U.S. highways are in rural areas, but these highways carry only 35.9% of total traffic as measured by vehicle miles traveled (VMT), and of this rural total almost half is on rural interstate highways and other major arterial highways. Conversely, the much smaller urban highway system carries fully 64.1% of all traffic, with urban interstates alone accounting for 15.4% of the total. The U.S. highway system has almost 600,000 bridges. Again, state and local governments own and operate almost all of the bridges in the U.S. system. As is the case for the highway system, a relatively small number of bridges carry the bulk of national traffic. Interstate highway bridges and bridges on arterial highways carry almost 90% of average daily traffic (ADT), with urban interstate bridges alone carrying almost 35% of ADT.

Conditions, Performance, and Funding Needs

There is broad consensus in the transportation community that U.S. highway and bridge infrastructure is in need of considerable investment in the years ahead, largely to accommodate future growth in passenger and especially freight traffic. This need exists in spite of the fact that increased federal, state, and local spending over the last decade and a half has, according to the Department of Transportation, generally resulted in measurable improvement to the condition and performance of much of the nation's highway and bridge system. This improvement has been particularly notable for bridges, where the number of structurally deficient bridges was cut almost in half between 1990 and 2007. According to a 2007 report by a congressionally established commission, spending on surface transportation by all levels of government needs to average somewhere between \$145 billion and \$276 billion per year depending on whether the goal is to maintain the existing system at a high level or expand the system to facilitate system growth.⁵⁶ This compares with expenditure of \$68 billion on surface transportation nationwide in 2007. It should be pointed out, however, that there are other estimates of need that are considerably below the levels espoused by the Surface Commission.

Federal Assistance

The federally operated, state administered, federal-aid highway program is the major conduit for federal funding of surface transportation infrastructure. FY2009 authorizations for this program amount to almost \$42 billion. The majority of funding in the federal-aid program is provided through seven formula programs (also referred to as apportioned programs). Among these is a separate bridge program. Because of transferability and flexibility provisions in the program, states have considerable leeway in spending funds for various types of surface transportation

⁵⁴ Prepared by John W. Fischer, Specialist in Transportation Policy.

⁵⁵ U.S. Department of Transportation. Federal Highway Administration and Federal Transit Administration, 2006 *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*, Washington, DC, 2007, <http://www.fhwa.dot.gov/policy/2006cpr/>.

⁵⁶ National Surface Transportation Policy and Revenue Study Commission, *Transportation for Tomorrow*. Washington, D.C. December 2007, http://www.transportationfortomorrow.org/final_report/.

infrastructure. The existing federal-aid program was last authorized in FY2005, and this authorization expires at the end of FY2009. Legislation reauthorizing the program is likely to be considered during the 1st Session of the 111th Congress, and this issue is still expected to dominate the congressional transportation agenda during the year ahead.⁵⁷

Highways and Bridges as a Mechanism for Economic Stimulus

Building and repairing highway and bridge infrastructure is often seen as a way to put people and assets to work constructively and to create economically valuable assets during a recessionary period. The principal argument against infrastructure spending is that it tends to be counter-cyclical, meaning that the slow spending nature of many large infrastructure projects is such that the benefit to the economy does not arrive in full measure until after the recession is largely over. For example, large bridge and highway construction projects often take multiple years to plan and construct. Transportation industry groups counter this argument in part by pointing out that there is an existing backlog of projects in the states that are “ready to go” and could put people and assets to work in short order. The American Association of State Highway and Transportation Officials (AASHTO), the principal interest group for this sector, has compiled a list of over 5,200 projects that it believes could be started quickly, creating a significant number of new jobs in the process.⁵⁸ According to AASHTO and others, focusing on these projects would make a significant dent in the existing national backlog of projects that could not be constructed for many years if their funding was to rely on the current federal-aid highway program.

Issues for Highways and Bridges

There is some concern that using “ready to go” project lists will not result in building the most important infrastructure and will not necessarily build it in the places most impacted by the ongoing recession.⁵⁹ For example, Utah is identified as having the largest share of projects in the AASHTO “ready to go” list, yet unemployment is below the national average in that state. There also are concerns that there are insufficient resources, labor, management, equipment, materials, etc., to allow for speedy spending of stimulus funds. An additional concern is that many states have announced cutbacks in infrastructure spending due to their own budget problems. As a result, the extent to which stimulus spending might serve as a substitute for foregone state spending is unclear, thus raising questions about whether the stimulus will provide the levels of infrastructure improvement and jobs that are expected by proponents.

Transit⁶⁰

Public transit infrastructure includes the track, stations, vehicles, and associated facilities and equipment owned and operated by more than 6,000 transit providers in urban and rural areas. The main forms of public transit service, known as “modes,” are bus, heavy rail (subway and elevated), commuter rail, light rail, paratransit (also known as demand response), and ferryboat. About 60% of transit trips are made by bus, followed by heavy rail (29%), commuter rail (4%),

⁵⁷ For further information on the program and reauthorization, see CRS Report R40053, *Surface Transportation Program Reauthorization Issues for the 111th Congress*, coordinated by John W. Fischer.

⁵⁸ AASHTO. Press Release, “5,000 Ready-To-Go Projects Could Put Millions to Work” December 5, 2008.

⁵⁹ Leonhardt, David, “Piling up Monuments of Waste,” *The New York Times*, November 19, 2008.

⁶⁰ Prepared by William J. Mallett, Specialist in Transportation Policy.

and light rail (4%). Demand response accounts for a little more than 1% of all transit trips, and ferryboat a little less than 1%.⁶¹

Conditions, Performance, and Funding Need

As a result of increases in overall government spending over the past decade, transit service provision has grown, and the condition and performance of transit systems have generally improved. Nevertheless, in its most recent assessment of transit needs, the Department of Transportation estimated that the capital cost to maintain the current condition and operational performance of transit systems in the United States from 2005 through 2024 is 25% more annually than is currently being spent by all levels of government. In 2004, transit capital spending by all levels of government was \$12.6 billion, \$3.2 less than the \$15.8 billion that DOT estimated will be needed annually over the next 20 years.⁶²

Federal Assistance

The federal transit program administered by DOT's Federal Transit Administration (FTA) is a collection of individual programs, each with different funding distribution mechanisms and spending eligibility rules. The two major transit programs are the Urbanized Area Formula Grants Program and the Capital Investment Program. Of the \$10.4 billion authorized by SAFETEA (P.L. 109-12) for transit programs in FY2009, the Urbanized Area Formula Program accounts for about 40% of the total (\$4.2 billion), and the Capital Investment Program accounts for 43% (\$4.5 billion). The Capital Investment Program has three elements, the Bus and Bus Facilities Capital Program, the Rail Modernization Program, and the New Starts Program that are funded on a roughly 20-40-40 percentage share of program funds respectively. The remaining 17% of federal transit monies (\$1.7 billion) authorized by SAFETEA in FY2009 funds several other programs, such as the Other Than Urbanized Area Formula Program (commonly referred to as the Rural Formula Program), the Elderly Individuals and Individuals with Disabilities Formula Program, the Jobs Access and Reverse Commute Program, as well as state and metropolitan planning, research, and FTA operations. Although federal transit programs focus on supporting capital expenses, about 30% of federal funding goes for operational expenses.

Transit as a Mechanism for Economic Stimulus

There were a number of proposals in 2008 for federal transit spending in addition to funding already authorized. Early on these proposals had to do mainly with helping transit agencies cope with an increase in fuel prices that caused a jump in operating costs and demand. Later in the year, as the poor health of the economy became more apparent, proposals were geared more toward economic stimulus and job creation. In October, the American Public Transportation Association (APTA) identified 559 “ready to go” projects worth about \$8 billion, projects that could begin within 90 days of funding availability. In a second survey in mid-December, APTA

⁶¹ American Public Transportation Association, *2008 Public Transportation Fact Book*, Washington, DC, June 2008, tables 5 and 54, http://www.apta.com/research/stats/factbook/documents08/2008_fact_book_final_part_1.pdf.

⁶² U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, *2006 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*, Washington, DC, 2007, <http://www.fhwa.dot.gov/policy/2006cpr/index.htm>.

identified 736 projects worth \$12.2 billion.⁶³ In a U.S. Conference of Mayors report published in mid-December, 726 “ready to go” transit projects worth \$8.8 billion were identified.⁶⁴

A general criticism of surface transportation infrastructure funding as economic stimulus is that it tends to spend out slowly, and it is thought that transit funding generally tends to spend out more slowly than highway funding. Another issue is that many “ready to go” projects identified by APTA and the Conference of Mayors are for bus and rail vehicle purchases, manufacturing that is dominated by foreign companies. Thus, despite domestic content requirements for foreign made vehicles bought using federal funds, some transit capital spending may not create as many jobs in the United States as hoped.⁶⁵ Some might also question the historic bias in the federal transit program toward capital rather than operating expenditures, when research suggests that operating expenses tends to create more jobs, more quickly.⁶⁶ Another issue is whether federal spending will merely replace rather than supplement state and local level spending, reducing the effectiveness of stimulus spending. A final issue is whether a large increase in transit spending will improve transit service where it is most needed and encourage new ridership, or alternatively will result in little used facilities that require long-term government support.

Issues for the Transit Sector

Despite rising patronage over the past decade, government’s share of transit industry expenses has continued to rise. Fares and other operating revenue now cover only about 30% of industry costs. A long term issue for the transit industry, therefore, will be how to improve service and attract new riders without requiring substantially more support from federal, state, and local government. In terms of federal support for transit, one of the biggest challenges over the next few years will be the amount of funding available from the Highway Trust Fund. The Mass Transit Account of the Highway Trust Fund is the source of approximately 80% of federal transit program monies, with the remaining 20% drawn from the general fund of the U.S. Treasury. Although the transit account is in somewhat better financial shape than the Highway Account, it is clear that current revenue into the transit account will not sustain FTA programs and activities at current levels.

Airports⁶⁷

Civil aviation public infrastructure is composed mostly of airports and air traffic control facilities. Only airports will be discussed in this section. Overall, only about one-quarter of airports are publicly owned, typically by state and local governments, yet these airports represent the vast majority of utilized airport capacity, particularly that used for commercial aviation operations. Privately owned airports predominantly serve general aviation. According to the Federal Aviation

⁶³ American Public Transportation Association (APTA), “Public Transportation Projects Will Create Thousands of Jobs,” *Transit News*, October 29, 2008; and APTA, “Now is the Time for a Transportation Policy with a New Vision that Creates Economic Prosperity, Promotes Energy Independence, and Reduces our Nation’s Carbon Footprint,” *Transit News*, December 18, 2008.

⁶⁴ U.S. Conference of Mayors, *Mainstreet Economic Recovery*, “Ready to Go” Jobs and Infrastructure Projects, December 19, 2008, <http://www.usmayors.org/mainstreeteconomicrecovery/documents/mser-plan-20081219.pdf>.

⁶⁵ “Growing Stimulus Raises Many Questions,” *Transportation Weekly*, December 18, 2008.

⁶⁶ Brian D. Taylor and Kelly Samples, “Jobs, Jobs, Jobs: Political Perceptions, Economic Reality, and Capital Bias in U.S. Transit Subsidy Policy,” *Public Works Management and Policy*, vol. 6, no. 4 (April 2002), pp. 250-263.

⁶⁷ Prepared by John W. Fischer and Robert S. Kirk, Specialists in Transportation Policy.

Administration (FAA), there were 20,341 airports in the United States at the end of 2007.⁶⁸ Of these, 5,221 were civil public use airports, with a more limited nationally significant 3,411 airports in the FAA's current National Plan of Integrated Airport Systems (NPIAS) and therefore eligible to receive Airport Improvement Program (AIP) grants.

Conditions, Performance, and Funding Needs

According to the FAA's NPIAS, the estimated capital needs of airports from 2009 through 2013 is \$49.7 billion (in 2008 dollars), approximately \$9.9 billion a year.⁶⁹ The estimates contained in the NPIAS do not include projects that are ineligible for AIP funding. A more comprehensive accounting of airport project costs by the Government Accountability Office estimates the costs of airport capital development for the period 2007 through 2011 to be \$14 billion a year (in 2006 dollars).⁷⁰

FAA's estimate of airport infrastructure needs, as contained in the NPIAS, are obtained from airport master and state system plans and are reviewed for AIP eligibility and conformity with FAA forecasts of aviation activity. The GAO estimate is based on FAA's estimate of capital needs contained in the NPIAS, but also includes capital projects that are not included in the NPIAS, e.g. projects that are ineligible for federal grants under the AIP.

Federal Assistance

GAO calculated that public spending on airport capital improvements averaged about \$13 billion per year between 2001 and 2005 (in 2006 dollars). Of this amount, \$3.6 billion per year was funded from the federal Airport Improvement Program (AIP), \$6.5 billion from airport bonds, \$2.2 billion from the Passenger Facility Charge (PFC, a local tax levied by an airport), and \$0.7 billion from state and local contributions.⁷¹ The AIP is funded entirely from the Airport and Airway Trust Fund.

Airport and Air Traffic Control Investment as a Mechanism for Economic Stimulus

In a letter to the leadership of Congress on December 10, 2008, 12 aviation interest groups called on Congress to add \$1 billion to the AIP program for stimulus purposes. According to these groups such an additional investment would "provide needed stimulus to both cities and rural communities in all 50 states," and in the process create 35,000 high paying jobs (although it is unclear how this number was derived).⁷² In a separate letter on December 31, 2008, to Senator

⁶⁸ Federal Aviation Administration, *Administrator's Fact Book*, Washington, DC, July 2008, http://www.faa.gov/about/office_org/headquarters_offices/aba/admin_factbook/media/July_2008_Fact_Book.pdf.

⁶⁹ U.S. Department of Transportation, Federal Aviation Administration, *National Plan of Integrated Airport Systems (NPIAS), 2009-2013*, Washington, DC, 2008, http://www.faa.gov/airports_airtraffic/airports/planning_capacity/npias/reports/media/2009/npias_2009_narrative.pdf.

⁷⁰ U.S. Government Accountability Office, *Airport Finance: Observations on Planned Airport Development Costs and Funding Levels and the Administration's Proposed Changes in the Airport Improvement Program*, Washington, DC: June 2007, GAO-07-885, <http://www.gao.gov/new.items/d07885.pdf>.

⁷¹ Ibid.

⁷² http://www.aci-na.org/static/entransit/ga_joint_stimulusletter_dec08.pdf.

Harry Reid, the American Association of Airport Executives stated that “the FAA has indicated that \$1.7 billion could be used for “ready to go” projects – projects that can be bid and under contract within 180 days.”⁷³ In addition to these estimates, numerous U.S. airports have asked that projects at their airport be considered for stimulus spending.

Issues for the Air Transportation Sector

Infrastructure needs for airports are expected to increase because air traffic is expected to grow significantly over the next few decades. FAA forecasts that revenue passenger enplanements will grow from 765 million in 2007 to 1,293 million in 2025, an average annual increase of 3.0%.⁷⁴ Estimating infrastructure needs, however, presents a number of difficulties. Predicting the future is difficult and, although the FAA has a reasonably good record for accuracy in its activity forecasts, the FAA itself has pointed out that since the events of 9/11, the instability of the industry has led to larger errors in the agency’s short-term forecasts.⁷⁵ The recent unpredictability of fuel prices, a major component of aviation business costs, also brings a degree of uncertainty to aviation forecasts. In addition, the issue of quality versus quantity arises when considering airport stimulus spending. Approximately 73% of all airline enplanements takes place at the nation’s 35 busiest airports. Obviously, anything that can be done to increase capacity and decrease delays at these airports has a significantly greater impact on national aviation connectivity than is the case at non-congested airports. In recent years the FAA has tried to emphasize funding infrastructure projects at these airports as part of its Operational Evolution Plan (OEP). Public discussions of airport stimulus spending thus far make it unclear whether and/or how prioritization of funding requests from a national benefit perspective will be part of the decision-making process for the distribution of additional AIP assistance.

Passenger Rail⁷⁶

Amtrak is the nation’s only provider of intercity passenger rail service. It operates trains over a network covering around 22,000 miles, 97% of which is owned by freight rail companies. The portion of the network that Amtrak owns, the Northeast Corridor (the NEC, running from Washington, D.C. through New York City to Boston), includes some of the most heavily used sections of track in the nation, shared by Amtrak, commuter rail operations, and freight operations. Amtrak was created in 1970 by the federal government to preserve some intercity passenger rail service while allowing private railroad companies to discontinue their money-losing passenger rail service. Amtrak is structured as a private company, but virtually all of its stock is held by the federal government.

⁷³ http://www.aaae.org/_pdf/_govpdf/12-18-08%20Stimulus%20II.pdf.

⁷⁴ U.S. Department of Transportation, Federal Aviation Administration, *Aerospace Forecasts, Fiscal Years 2008-2025*, Washington, DC, 2008, http://www.faa.gov/data_statistics/aviation/aerospace_forecasts/2008-2025/media/2008%20Forecast%20Document.pdf.

⁷⁵ U.S. Department of Transportation, Federal Aviation Administration,, *Aerospace Forecast Fiscal Years 2006-2017*, Washington, DC, 2006, p. 51, http://www.faa.gov/data_statistics/aviation/aerospace_forecasts/2006-2017/media/FAA%20Aerospace%20Forecast.pdf.

⁷⁶ Prepared by John Frittelli and David Randall Peterman.

Conditions, Performance, and Funding Needs

Most of Amtrak's infrastructure was built over 100 years ago, and much of its equipment is over 30 years old. Due to perennial financial problems, Amtrak has regularly deferred investments in maintaining its infrastructure; it now has an estimated \$5-\$6 billion backlog in deferred maintenance. This estimate does not include the cost of major improvement projects.

Speed and reliability are two key features of modern intercity passenger rail service, neither of which Amtrak is able to offer. In many other countries, electrified trains run on dedicated routes offering gentle curves and no intersections where roads cross railways at the same level ("at-grade crossings"). This permits average speeds between stations of 125 miles per hour (mph) or more, with top speeds of 175 mph or more, and good on-time performance. Amtrak's only "high-speed" electrified line, the NEC, still follows the alignment laid out over a century ago, and still has curves and several at-grade crossings that restrict speeds. As a result, the average speed of Amtrak's high-speed Acela service even between Washington, D.C. and New York City, where there are no grade crossings, is around 80 mph. In the rest of the country, Amtrak operates over freight rail lines, where Amtrak's maximum speed is generally limited to no more than 79 mph. Although federal law provides that Amtrak is to be given operating priority over freight trains, Amtrak nevertheless experiences many delays due to freight rail operations, as well as breakdowns of Amtrak's aging equipment. Amtrak's system-wide on-time performance ratio was 71% in FY2008; even on its flagship Acela route, on the NEC where Amtrak controls the operations of all trains, on-time performance was only 85%.⁷⁷

Amtrak maintains a transcontinental network with service in 47 states, but it only captures a measurable share of intercity travel in a handful of relatively short corridors. About 39% of Amtrak's ridership occurs on the NEC while another 46% of ridership occurs on relatively short-distance corridors in other parts of the country. Nationally, Amtrak captures 0.8% of intercity trips over 100 miles, less than half the market share of intercity bus service (which captures 2.1%).⁷⁸ Amtrak has been successful in competing with air passenger service between two city pairs in the NEC. Slightly more people ride Amtrak than fly between Washington, D.C. and New York City (56% to 44%) while slightly fewer ride the train than fly between New York City and Boston (41% to 59%).⁷⁹ However, Amtrak captures only 5% of the air-rail travel market between Washington, D.C. and Boston. Even though Amtrak has been competitive with the airlines between many city pairs along the NEC, its real competitor is the automobile. For trips between 50 and 499 miles one way, Amtrak and the airlines combined capture only 2.4% of the market while personal vehicles capture over 95% of the market.⁸⁰

⁷⁷ Amtrak, *Monthly Performance Report for September 2008*, "On-Time Performance Report," p. E-7, <http://www.amtrak.com/pdf/0809monthly.pdf>.

⁷⁸ U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics (BTS), National Household Travel Survey, "America on the Go," May 2006, p. 6. (Survey conducted in 2001-2002.)

⁷⁹ Amtrak's FY2009 Grant and Legislative Request, p. 12. The road distance between Washington, D.C. and New York City is about 240 miles, the road distance between New York City and Boston is about 210 miles, and the road distance between Washington, D.C. and Boston is about 440 miles.

⁸⁰ BTS, National Household Travel Survey, "America on the Go," May 2006, p. 7.

Federal Assistance

Railroad companies lost money on intercity passenger rail service before Amtrak was created, and Amtrak has continued to lose money offering that service. As a result, since its creation in 1970 Amtrak has relied on federal assistance to support its operations. In recent years, Congress has provided around \$1.3 billion annually to support Amtrak. The Passenger Rail Investment and Improvement Act of 2008 (P.L. 110-432) authorized significant increases in Amtrak funding, about \$2.4 billion per year through FY2013. Congress also directed the DOT to issue a request for proposals from the private sector for the development of high-speed rail in 11 federally designated corridors. Because there is no dedicated user fee mechanism to raise revenue for rail investments, as there is for other transportation modes, Amtrak must compete with other funding priorities from the General Treasury. There is no guarantee that Congress will appropriate funding at levels close to the amount that it authorized in the recently enacted authorization bill.

Railroad Investment as a Mechanism for Economic Stimulus

While the Federal Highway Administration has attempted to evaluate road building as an economic stimulus tool by estimating resulting job creation and the timing of federal outlays, similar analysis specific to the rail sector is not available. However, some of the factors applicable to road building would appear equally applicable to the rail sector: winter weather would delay some projects in the northern half of the country, and it is likely that rail maintenance projects could get underway sooner than could new construction projects. On some routes, Amtrak receives financial support from state governments, so their approval of projects in some cases would be necessary. Since Amtrak runs on track owned by the freight railroads for most of its routes, cooperation from the host freight railroad is necessary. Regulatory approval of upgrades to freight rail infrastructure is not required, but negotiation with the freight railroad is necessary because Amtrak operates over their busiest corridors. The issue of publicly-funded improvements to private property may also arise. Railroad union work rules could be another factor affecting the jobs impact of funding rail improvements. Also, the transparency of Amtrak's account keeping has been an important issue for Congress in the past. Congress may seek to ensure that any economic stimulus funding for Amtrak is directed towards job-inducing projects rather than servicing its debt, for instance.

Issues for the Railroad Sector

Since intercity passenger rail service is likely to require operating subsidies in all but the most densely populated corridors meeting certain conditions, policymakers might consider the long-term public financial commitment that is associated with investments in intercity passenger rail. Rail can compete with the automobile for trips that are uncomfortably long to drive and where road congestion is a problem, parking is a concern at the destination city, gas prices are relatively high, and the destination city has an extensive public transit system. Thus, for most city destinations it may be difficult for passenger rail service to match the automobile's flexibility. Intercity passenger rail can be time competitive with the airlines for trips less than about 350 miles because this is not sufficient distance for the air mode to exploit its speed advantage.⁸¹ Where large cities are approximately this far apart, and there are important intermediate cities on

⁸¹ Train stations are typically located downtown while airports are located on the city fringe and security screening is more time consuming for air passengers.

the route, such as in the NEC, then there may be enough of a customer base to run trains as frequently as the airlines and to fill them, which is necessary to cover operating costs.⁸²

Water Resources⁸³

Water resources infrastructure includes locks, dams, levees, floodwalls, channels, breakwaters, hydropower facilities, canals, and related structures. A system of shared responsibilities for this infrastructure has evolved, with programs existing at all levels of government and in the private sector. While more than 25,000 publicly owned and 54,000 private dams provide the benefits of flood control, navigation, power generation, and irrigation water, they also pose safety risks and other challenges as they age. Although federal water resources agencies, principally the Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps), played a significant role in the construction of many large dams, few similar large federal facilities currently are under construction. The vast majority of U.S. dams were constructed and are maintained without federal assistance; however, most of the largest U.S. dams were built by Reclamation or the Corps.

Reclamation owns and operates more than 600 dams and reservoirs and 58 powerplants capable of producing 40 billion kilowatt hours of electricity (enough to serve six million homes). The Corps also owns and operates more than 600 dams and has 75 hydropower projects in operation generating 68 billion kilowatt hours annually. Additionally the Corps maintains through dredging and infrastructure investments the navigation conditions of 900 harbors and nearly 12,000 miles of commercially active waterways. The Corps constructed, usually with nonfederal participation, roughly 9,000 miles of the estimated 30,000 miles of the nation's levees, but only maintains 600 miles. The remaining levees are operated by nonfederal entities, often special districts of local governments, which are responsible for maintaining the level of protection they provide.

Conditions, Performance, and Funding Needs

Many federal water resources structures were built more than 50 years ago and require rehabilitation, repair, or replacement to continue to generate benefits. These structures have contributed greatly to U.S. economic development; however, they also have contributed to environmental degradation, resulting in ongoing efforts to restore aquatic ecosystems. For example, concerns about aging infrastructure have been raised for years and accompanied by calls to invest in improved hydroelectric facilities and new locks to reduce outages and improve efficiency. The federal agencies neither estimate their future infrastructure investment needs nor conduct national systematic needs assessments, instead they undertake activities pursuant to congressional direction. The backlog of active federal water resources construction projects that have been authorized by Congress but have not been completed is roughly \$70 billion, and the backlog of deferred maintenance roughly \$4 billion for Reclamation and Corps activities, Tennessee Valley Authority's dams and pumped storage facilities, and the water resource projects financed by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). Construction projects in this backlog have not been ranked on their economic or environmental merit via a competitive or formula basis.

⁸² An analysis by the DOT's Office of Inspector General estimated that reducing travel times between New York City (NYC) and Washington, D.C. and between NYC and Boston by 30 minutes would generate benefits exceeding the costs. DOT, OIG, "Analysis of the Benefits of High-Speed Rail on the Northeast Corridor," Report No. CC-2008-091, June 26, 2008.

⁸³ Prepared by Nicole T. Carter and Betsy A. Cody, Specialists in Natural Resources Policy.

Two significant categories of nonfederal water resources infrastructure are nonfederal dams and levees. The Association of State Dam Safety Officials estimated \$36.2 billion was needed to rehabilitate all nonfederal dams.⁸⁴ There are no national-level estimates of the investment needs for other nonfederal flood protection measures, such as levees and flood walls.

Federal Assistance

Recent federal appropriations have been approximately \$6.6 billion annually, not including emergency supplemental appropriations, for water resource activities of federal agencies. The vast majority of these funds are spent directly by these agencies and are not dispersed through grants or loans. The Corps typically requires local project sponsors to share construction costs and uses different cost-share formulas depending on the project purpose. Reclamation projects are generally financed up front with project users repaying the federal government for allocated proportions of construction costs. Exceptions include “ability to pay” adjustments for irrigators.

Water Resources Investment as a Mechanism for Economic Stimulus

Which water resources activities may be funded as part of a stimulus is central to the types of benefits that may be expected and whether these investments will be controversial; however, this central policy decision remains unknown. Instead more attention has been given to the potential level of investment. The American Society of Civil Engineers estimated that the Corps alone could use \$7 billion for “ready to go” projects, and another \$10 billion could be applied to critical nonfederal dams.⁸⁵ H.R. 7110 (110th Congress) included \$300 million for Reclamation, with \$126 million intended to go toward water reuse projects and the remainder directed toward capital improvements including rural water supply.

Without information on which Corps projects or project types would be in the \$7 billion portfolio, analysis of potential efficiency, equity, and long-term economic growth and environmental effects is highly constrained. The universe of Corps authorized projects is heterogeneous across purpose (i.e., the types of benefits to be produced ecosystem restoration, flood damage reduction, improved navigation), size, and economic effect. Moreover, many Corps projects are highly controversial and proceeding with these could be politically problematic. Economic stimulus of \$7 billion would represent significantly more than the roughly \$5.5 billion in annual appropriations for the agency. It is unclear whether or the degree to which the existing level of annual Corps appropriations is insufficient.⁸⁶ Of the \$7 billion, \$3.2 billion is being discussed for Corps operation and maintenance activities. In FY2006, the agency had estimated its deferred maintenance well below this amount, at \$1.8 billion.⁸⁷

⁸⁴ Task Committee of the Association of State Dam Safety Officials, *The Cost of Rehabilitating our Nation’s Dams: A Methodology, Estimate, and Proposed Funding Mechanisms* (Dec. 2002, revised Oct. 2003), p. 4, <http://www.damsafetycoalition.org/files/pdf/asdsoreport.pdf>.

⁸⁵ A. Herrmann, Testimony by the American Society of Civil Engineers before House Transportation and Infrastructure Committee on Infrastructure Investment and Economic Recovery, October 29, 2008, <http://transportation.house.gov/Media/File/Full%20Committee/20081029/Herrmann.pdf>.

⁸⁶ J.L. Floyd and W.C. Holliday, Budget Constraints and Decision Making: Development of Policy Guidelines for Planning of Civil Works Programs and Projects (Alexandria, VA: Institute for Water Resources, Army Corps of Engineers, 1997) p. 14.

⁸⁷ Department of Defense, *Performance and Accountability Report for Fiscal Year 2006*, p. 164, [http://www.defenselink.mil/comptroller/par/fy2006/Entire_Document_\(7.8_MB\).pdf](http://www.defenselink.mil/comptroller/par/fy2006/Entire_Document_(7.8_MB).pdf).

In contrast, the stimulus discussions for Reclamation funding target projects involving reclamation or reuse of wastewater or naturally impaired ground and surface water, as well as rural water supply projects. These are nontraditional roles for the agency, but have been supported through legislation and appropriations in recent Congresses.

Over the decades, Congress has enacted user pays approaches and environmental laws that apply to water resources projects. The majority of federal water resources projects that could be funded through a stimulus require nonfederal cost-sharing. Whether and how quickly the nonfederal sponsors would be able to participate given their own financial situations remains unknown; if cost-sharing waivers are provided they raise their own equity and efficiency issues. Similarly, questions arise regarding how quickly these federal activities would be able to start given environmental planning and protection requirements (e.g., seasonal or other restrictions on construction due to threatened or endangered species), as well as weather, availability of materials, and agency contracting constraints.

Issues for the Water Resources Sector

Federal water resource construction activities shrank during the last decades of the 20th century. Fiscal constraints, changes in national priorities and local needs, few remaining prime construction locations, and environmental and species impacts of construction all contributed to this shift. Although these forces are still active, there are proposals for greater federal financial and technical assistance to address growing pressures on developed water supplies and to manage regional water resources to meet demands of multiple water uses. Whether and how to adapt the federal role to current water resources demands, in particular how to select which actions to authorize and fund, is an ongoing issue for Congress. Similarly, how to systematically address the aging and operational challenges of existing facilities is a concern; rehabilitation and safety repairs have largely proceeded on a project-by-project basis.

Wastewater⁸⁸

Wastewater utilities operate facilities that clean the flow of used water from a community. Nationally, about 16,000 publicly owned wastewater treatment facilities and 24,000 collection systems provide these services. The federal government has had significant involvement with these systems, through setting standards to protect public health and the environment, and funding to assist them in meeting standards. Nearly all of these facilities are publicly owned and operated by local governments. Today, ratepayers fund both construction costs and costs associated with operating and maintaining facilities that serve their communities.

Conditions, Performance, and Funding Needs

Many wastewater systems were built more than 50 years ago and have reached the end of their useful design lives. Older systems are plagued by chronic overflows during major rain storms and heavy snowmelt and, intentionally or not, are bringing about the discharge of raw sewage into U.S. surface waters. The most recent survey of funding needed for wastewater facility projects estimates that \$202.5 billion is needed nationally for projects and activities eligible for federal

⁸⁸ Prepared by Claudia Copeland, Specialist in Resources and Environmental Policy.

assistance under the Clean Water Act (CWA).⁸⁹ This estimate includes \$134.4 billion for wastewater treatment and collection systems, \$54.8 billion to correct uncontrolled overflows from municipal sewers, and \$9 billion for stormwater management. Needs for small communities represent 9% of the total.

Federal Assistance

The largest federal program for wastewater treatment assistance is administered by the Environmental Protection Agency (EPA) under the CWA. Since 1973 Congress has appropriated \$78 billion in assistance under this act. Total FY2008 funding was \$689 million. Federal funds are used to capitalize state loan programs (State Revolving Funds, or SRFs), and project loans are made by states to communities to assist projects on priority lists that are determined by the states, but according to criteria in the CWA. Loans are repaid to the states. In addition, the U.S.

Department of Agriculture provides assistance through grant and loan programs for communities with populations of fewer than 10,000 persons. Total FY2008 funding for these USDA programs was \$534 million. Even with federal assistance, local governments are the primary investors in wastewater and sewer systems. According to the U.S. Census, local governments invested nearly \$14 billion in capital projects and nearly \$22 billion in operations and maintenance in 2004-2005.

Wastewater Investment as a Mechanism for Economic Stimulus

As interest in providing economic stimulus through infrastructure investments has grown, states, localities, and stakeholder groups have attempted to identify wastewater projects that are “ready to go,” that is, with engineering and permitting complete, but only needing financing. Totals in these several estimates vary widely. In December, the U.S. Conference of Mayors reported that cities have identified 3,343 water and sewer projects that are “shovel ready,” but that need \$18.9 billion in funding.⁹⁰ The National Governors Association estimated that \$9 billion in wastewater projects are “ready to go” throughout the country,⁹¹ while the Water Information Network estimates that nearly \$20 billion in wastewater projects are “shovel ready.”⁹² House-passed H.R. 7110 (110th Congress) included \$6.5 billion for wastewater projects, to be funded through the existing CWA SRF program. With respect to such spending, several questions arise about projects that may be funded. In terms of efficiency, will wastewater infrastructure funds deliver stimulus to the economy quickly, or will most spending occur after recovery has begun, since initial outlays for major infrastructure projects usually are 25% or less of funding provided in a given year? Also, will stimulus spending for wastewater result in additional investments, or will it displace other spending that would have gone to the same projects? In terms of equity, one question is whether stimulus funds will be equitably distributed across regions, between urban and rural areas, and with recognition of disadvantaged communities. In terms of sustainability, of

⁸⁹ U.S. Environmental Protection Agency, *Clean Watersheds Needs Survey 2004, Report to Congress*, Washington, DC, January 2008, <http://www.epa.gov/owm/mtb/cwns/2004rtc/toc.htm>.

⁹⁰ U.S. Conference of Mayors, *Mainstreet Economic Recovery, "Ready to Go" Jobs and Infrastructure Projects*, December 19, 2008, <http://www.usmayors.org/mainstreeteconomicrecovery/documents/mser-report-20081219.pdf>.

⁹¹ National Governors Association, *Economic Recovery: A Federal-State Partnership*, November 13, 2008, <http://www.nga.org/Files/pdf/0811ECONOMICRECOVERY.PDF>.

⁹² Water Infrastructure Network (WIN), letter to the Honorable Nancy Pelosi and the Honorable John Boehner, December 18, 2008, http://win-water.org/legislativecenter/2008-12-18stim_ltr.pdf. WIN is a coalition of construction, engineering, conservation, labor, municipal, and manufacturing organizations.

particular interest is how to incorporate accountability to ensure that stimulus-funded projects provide significant water quality benefits.

Issues for the Wastewater Sector

A number of long-term issues are apparent for this sector, beyond those related to short-term stimulus. First, and broadly, how will communities meet their continuing funding needs for wastewater pollution control projects, in view of the large identified needs? Communities face long-standing needs to fund projects to comply with federal standards and projects not traditionally eligible for federal aid programs, such as major repair and replacement of existing systems. Second, what is the appropriate federal role in meeting those needs, and will the federal government play a significant future role in funding capital investments? Third, how should federal support be delivered? Issues include what is the appropriate state-level mechanism to administer funding, how should aid be provided (loans versus grants, for example), and should federal assistance be available to private as well as public entities.⁹³

Drinking Water⁹⁴

Drinking water utilities have the task of constructing, operating, and maintaining treatment plants, water supply transmission lines, storage facilities and other infrastructure needed to provide potable water to communities in both the appropriate quality and quantity. Nationwide, there are nearly 53,000 community water systems, and roughly 15% of these public utilities are investor owned. The federal government has been involved in this sector primarily as a regulator, setting standards to control the quality of public water supplies, but also has provided significant technical and financial assistance for drinking water infrastructure projects through several federal programs.

Conditions, Performance, and Funding Needs

The most recent survey of capital improvement needs for drinking water systems, prepared by the Environmental Protection Agency (EPA), indicated that water utilities need to invest \$276.8 billion on infrastructure improvements over 20 years to ensure the provision of safe water and to comply with federal Safe Drinking Water Act (SDWA) regulations.⁹⁵ Of the total national need, EPA estimates that \$183.6 billion (two-thirds) is needed for the installation and rehabilitation of water supply transmission and distribution systems, and \$53.2 billion is needed for treatment facilities. A broader EPA study, the 2002 Gap Analysis,⁹⁶ estimates a potential 20-year funding gap for drinking water capital and operations and maintenance ranging from \$45 billion to \$263 billion, depending on different revenue and funding scenarios. The agency has cautioned that outdated and deteriorated water infrastructure poses a fundamental long-term threat to drinking

⁹³ For additional information, see CRS Report RL31116, *Water Infrastructure Needs and Investment: Review and Analysis of Key Issues*, by Claudia Copeland and Mary Tiemann.

⁹⁴ Prepared by Mary Tiemann, Specialist in Environmental Policy.

⁹⁵ U.S. Environmental Protection Agency, Drinking Water Infrastructure Needs Survey and Assessment: Third Report to Congress, June 2005, EPA 816-R-05-001.

⁹⁶ U.S. Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis*, EPA-816-R-02-020, September 2002.

water safety, and that in many communities, basic infrastructure costs far exceed SDWA compliance costs.

Federal Assistance

Local governments traditionally have provided the bulk of financing for drinking water projects. Notwithstanding the existence of several federal infrastructure funding programs, the U.S. Conference of Mayors reports that localities continue to provide 95% of investment in drinking water infrastructure.⁹⁷ A key federal program, the drinking water state revolving loan fund (DWSRF) program, was authorized by the SDWA Amendments of 1996 (P.L. 104-182). Paralleling the Clean Water Act SRF program, the DWSRF program helps public water systems finance infrastructure projects needed to comply with federal drinking water regulations and to protect public health. Under the DWSRF program, states receive capitalization grants to make loans to water systems for drinking water projects and other eligible activities. Each state develops a project priority list, based on statutory criteria that emphasize public health protection, compliance, and economic need. Since FY1997, Congress has provided more than \$10.3 billion for this program, including approximately \$829 million for FY2008. Also, as noted above, the U.S. Department of Agriculture (USDA) administers a loan and grant program for water and wastewater projects, with eligibility limited to communities having 10,000 or fewer people. For FY2008, this program received roughly \$534 million for drinking water, wastewater, and waste disposal projects.⁹⁸

Drinking Water Investment as a Mechanism for Economic Stimulus

How many job-stimulating projects are actually ready to go? The American Water Works Association (AWWA), an association of water utility managers and professionals, has identified \$10 billion worth of drinking water infrastructure projects that could move forward rapidly given funding. Using construction industry multipliers, the association projects that this funding level could generate 400,000 jobs and bring additional economic benefits to communities.⁹⁹ In contrast, the U.S. Conference of Mayors estimates that \$15.36 billion in identified 'ready to go' water and wastewater projects could generate 133,193 jobs.¹⁰⁰ Although much uncertainty surrounds the estimates associated with the potential benefits of a stimulus package, the backlog of water infrastructure projects is large. Water sector advocates note that stimulus funding is especially needed to assist projects pending nationwide that have been hampered by the credit crisis.

Issues for the Drinking Water Sector

Consideration of economic stimulus proposals raises a number of issues pertinent to the water sector. A key issue concerns the funds distribution mechanism. H.R. 7110 (110th Congress) anticipated using the DWSRF program as the means for delivering stimulus funds. Such an

⁹⁷ U.S. Conference of Mayors, *Mainstreet Economic Recovery, "Ready to Go" Jobs and Infrastructure Projects*, December 8, 2008, p. 5, <http://www.usmayors.org/mainstreeteconomicrecovery/documents/mser-report-200812.pdf>.

⁹⁸ For a review of these and other federal programs, see CRS Report RL30478, *Federally Supported Water Supply and Wastewater Treatment Programs*, by Betsy A. Cody et al.

⁹⁹ American Water Works Association, *Massive Stimulus Program Being Readied; Congress Needs to hear from Drinking Water Sector*, Washington D.C. Report, December 11, 2008, <http://www.awwa.org>.

¹⁰⁰ U.S. Conference of Mayors, "Ready to Go" Jobs and Infrastructure Projects , December 19, 2008, p. 1.

approach would have benefits, as it would take advantage of an established federal-state program structure that includes criteria for project priorities and eligibilities, and contains fiscal safeguards, such as auditing requirements. Yet, some local water utility representatives have noted that the distribution of funds by states under this program can be sluggish. Others have noted that federal program requirements can pose time-consuming hurdles for projects, slow down project starts, and ultimately could reduce the effectiveness of economic recovery efforts. Also, how well do projects identified as “ready to go” complement state funding priorities? Similarly, some projects viewed as priorities by cities may be outside program eligibility or priority criteria. One policy question is whether such projects might be made eligible for stimulus funding. Similarly, should some federal requirements be relaxed, and if so, what might be the public health, environmental or other trade-offs in doing so? As an alternative or complement to the EPA program, the National Rural Water Association advocates using the USDA program which has an estimated \$3 billion backlog of water and wastewater projects, and which the association argues distributes funds more quickly. However, this program is limited to small communities. Regardless of distribution mechanism, many questions arise. For example, how will priorities be set: in view of multiple considerations, including speed and efficiency in creating jobs, public health need, economic need, or ensuring urban/rural or state equity? A broader question concerns the long-term federal role in water infrastructure financing and how stimulus efforts might affect it. For example, how might stimulus funding impact congressional efforts to develop a sustainable funding source to replace or supplement federal appropriations, such as a water infrastructure trust fund?

Electric Transmission¹⁰¹

The electric power transmission grid for the lower 48 states consists of approximately 160,000 miles of high voltage lines used to move electricity from power plants to load centers. The system is owned primarily by investor-owned utilities (IOUs); other owners include municipal and other public power entities (including federal entities), rural cooperatives, and independent transmission companies. In the West, where solar and wind potential are greatest, two federal Power Marketing Administrations (PMAs) own and operate a significant portion of the transmission system. The Bonneville Power Administration (BPA) maintains approximately 75% of the high-voltage transmission lines in the Northwest, a system of over 15,000 miles of transmission line in approximately 300 substations. The service area of the Western Area Power Administration (WAPA) covers 1.3 million square miles and WAPA maintains 17,000 miles of high-voltage transmission. The nation’s electric generating capacity currently totals about 1,000,000 megawatts; These plants are owned and operated by IOUs, public power, cooperatives, and independent power producers.

The degree of federal regulatory involvement of the electric power system varies; in general, the regulatory system for electric power is fragmented and inconsistent. In brief, *for transmission*, the Federal Energy Regulatory Commission (FERC) approves transmission rates for IOUs, independent transmission companies, and provides oversight for the PMAs but generally not for utilities in most of Texas. The Energy Policy Act of 2005 (P.L. 109-58, § 1241) allows for incentive rate making for new transmission in an attempt to encourage investment in transmission. FERC, under Order 679, has approved incentive rate making for many new

¹⁰¹ Prepared by Stan Mark Kaplan, Specialist in Energy and Environmental Policy, and Amy Abel, Section Research Manager.

projects.¹⁰² New transmission lines must be approved by every state the line crosses and, in many cases, FERC. For generation, state regulation over power prices varies with the degree of power market deregulation in the state. Plant siting regulations also vary by state, but siting decisions are also influenced by federal environmental regulations and access to the transmission system.

Conditions, Performance, and Funding Needs

The transmission grid was developed in patchwork fashion over decades and interconnected to support system reliability and a limited volume of bulk power sales. The role of the grid has changed with the partial deregulation of the power market over the past 30 years. The grid is now being used to carry a large volume of wholesale power sales and serves as a key element in maintaining competitive power prices in many parts of the nation. This new role for the grid, combined with low investment since the 1970s, has led to concerns that the grid is overstressed, and will ultimately fail to operate reliably and serve its new market-enabling function. In addition to the stress of traditional generators connecting to the grid, expanding the grid to reach remote areas suitable for developing wind and solar power is an emerging issue both for reliability concerns and concerns over who will construct the needed transmission.

An overriding issue for both generation and transmission is how the nation may respond to climate change policies. The future emphasis on renewables and other “green” generating technologies or carbon sequestration would require large investment in the transmission system. The demand centers for electricity are in some cases relatively far from renewable resources or areas that would be geologically favorable for carbon sequestration. Renewable power is currently more costly than coal and natural gas-fired generation, so incentives or mandates would be required to meet a Department of Energy’s July 2008 proposed goal of generating 20% electricity from wind by 2030.¹⁰³ In general, electric generation capacity will have to expand to meet future growth. The current financial crisis will probably slow demand growth, but it will also reduce investment in new power plants and create additional uncertainty about the future balance of electricity supply and demand.

The two issues of transmission capacity adequacy and reliability, and expansion of generating capacity generally and renewable power in particular, impact proposals for an extensive grid modernization program. These modernization proposals take two forms. One is the “smart grid,” an umbrella term for a series of technologies that would create “an intelligent, auto-balancing [of supply and demand], self-monitoring grid, that integrates a variety of energy sources with minimal human intervention.”¹⁰⁴ In addition to upgrading the existing grid, a second proposal is to expand the existing grid with a new ultra-high voltage backbone system, that would allow renewable power in remote locations to be efficiently moved across the continent to demand centers.

¹⁰² <http://www.ferc.gov/industries/electric/indus-act/trans-invest/orders.asp#skipnavsub>.

¹⁰³ Department of Energy, *20% Wind by 2030: Increasing Wind Energy’s Contribution to the U.S. Electricity Supply*, DOE/GO-101008-2567, Washington, DC, July 2008, <http://www1.eere.energy.gov/windandhydro/pdfs/41869.pdf>.

¹⁰⁴ Scott W. Gawlicki, “Demonstrating the Smart Grid,” *Public Utilities Fortnightly*, June 2008, p. 56.

Investments required for the power system could be very large. One recent analysis, performed for the investor-owned electric power industry, suggests a total of \$1.5 to \$2.0 trillion by 2030 would be required to maintain reliability.¹⁰⁵

Federal Assistance

The federal government has numerous incentive programs intended to spur particular electric power investments in the private sector. These include production tax credits, currently scheduled to expire at the end of 2009, for wind and some other renewable power sources; tax credits for certain renewable and clean coal technologies; loan guarantees for nuclear and other low carbon technologies; and incentive rates for new transmission projects that meet certain criteria. The current and future effectiveness of these programs has been debated. For example, although the loan guarantee program was created by the Energy Policy Act of 2005, three years later the Department of Energy has still issued no guarantees. The production tax credits have often been used in complex financial transactions to develop new wind farms, but in a recession the opportunities to conduct these transactions may contract.¹⁰⁶

Power Sector Investment as a Mechanism for Economic Stimulus

As noted above, the potential investment requirements for the power sector may range into the trillions of dollars. Most of these private-sector investments would go into complex, long-lived privately owned and operated infrastructure, which requires significant up-front planning.

Accordingly, there may be a question of how much short-term stimulus versus long-term benefits would result from power sector investments. Some larger concepts will require much more development before specific facilities can be built, such as the ultra-high voltage backbone grid. Certain smart grid technologies are perhaps ready for wide scale deployment, such as advanced electric meters, but there is currently no smart grid template ready for a national roll-out.¹⁰⁷ Utilities do have many transmission projects planned, and these could perhaps be accelerated or expanded with federal incentives.¹⁰⁸ In the West, additional federal investment for BPA and WAPA transmission expansion could provide a means for spurring wind and solar generation development. However, most of these transmission projects would still require lengthy (several year) siting approval from each state in which the transmission line would be built.

Issues for the Electric Power Sector

Two fundamental and related issues raised by the potential for greater federal intervention in the power sector are the role of national planning of a system owned primarily by the private-sector and federal preemption of state regulation. Certain initiatives, such as a concerted push to install

¹⁰⁵ The Brattle Group, *Transforming America's Power Industry: The Investment Challenge 2010-2030*, prepared for The Edison Foundation, November 2008, p. vi.

¹⁰⁶ For information on PMA financing and general issues see, CRS Report RS22564, *Power Marketing Administrations: Background and Current Issues*, by Nic Lane.

¹⁰⁷ Scott W. Gawlicki, "Demonstrating the Smart Grid," *Public Utilities Fortnightly*, June 2008, p. 51. ("But for all [the] progress, the smart-grid vision still remains fuzzy for many executives and regulators. Every ...[utility]...faces a different operational and strategic situation, so the smart grid means something different for each utility."

¹⁰⁸ For information on currently planned transmission projects, see North American Electric Reliability Corp., *2007 Long-Term Reliability Assessment*, October 2007 (particularly the regional discussions beginning on page 105).

renewable power or construction of a ultra-high voltage backbone transmission grid, could require additional federal control over power sector investment decisions. The PMAs could be used, especially in the West, to create a larger federal presence in the transmission system, thus allowing greater influence to implement climate change policies. Timely enhancements to the grid to accommodate new, remote renewable power and smart grid technology may require federal authority to override what have historically been state decisions. Another crucial issue is deciding what improvements are necessary to enhance the grid for increased reliability and the ability to accommodate increased intermittent resources such as wind and solar. While many concerns have been raised over the reliability of the existing transmission network, actual data is scarce and a new transmission reliability data gathering system has just started.¹⁰⁹ Decisions must be made whether to promote nuclear power, clean coal, or natural gas-fired plants. Natural gas has been the main fuel for new power plants since the 1990s, but expanded use of gas raises the risk of reliance on another fossil fuel for which the nation may ultimately have to rely on large imports.

Schools¹¹⁰

U.S. Department of Education (ED) data indicate that an estimated 50 million students were enrolled in public elementary and secondary schools (grades preK-12) in 2008.¹¹¹ Safe, healthy, up-to-date school facilities are considered essential for successful educational programs.¹¹² School infrastructure has traditionally been considered largely a state and local responsibility. The federal government has played a relatively small role in financing school construction and renovation.

Conditions, Performance, and Funding Needs

Data on school infrastructure needs are extremely limited and difficult to assess in part because of the wide variation of potential assumptions and definitions regarding both conditions and needs. At present there is no ongoing federal collection of data on the conditions of schools. However, in response to concerns about the physical condition of schools and a Congressional mandate, in 2000, ED issued a one-time study with estimates of the costs of needed modernization, renovation, and repair to school buildings and/or building features.¹¹³ It remains the latest reliable estimate of these needs. This study is based on 1999 survey data collected by ED of 903 public elementary and secondary schools, weighted to provide a national estimate. These data are based on surveys of school officials rather than on direct, independent data collection. ED estimated the costs to bring school facilities into good condition in 1999 at \$127 billion.

¹⁰⁹ Information on the Transmission Availability System being developed by the North American Electric Reliability Corp. is available at <http://www.nerc.com/page.php?cid=4|62>. Also see Energy Information Administration, *Electric Transmission in a Restructured Industry: Data Needs for Public Policy Analysis*, December 2004.

¹¹⁰ Prepared by Gail McCallion, Specialist in Social Legislation.

¹¹¹ U.S. Department of Education, National Center for Education Statistics, *The Condition of Education 2008*, June 2008, <http://nces.ed.gov/pubs2008/2008031.pdf>.

¹¹² Planty, M., and DeVoe, J.F., *An Examination of the Conditions of School Facilities Attended by 10th-Grade Students in 2002*. U.S. Department of Education, National Center for Education Statistics, Washington, DC., 2005

¹¹³ Lewis, L., Snow, K., Farris, E., Smerdon, B., Cronen, S., and Kaplan, J. Project Officer: B. Greene. *Condition of America's Public School Facilities: 1999*, U.S. Department of Education, Washington, D.C. (Hereafter referred to as Condition of America's Public School Facilities.) ED defined good condition to mean that only routine maintenance or minor repair was required.

ED found that although most public schools in 1999 were in adequate or better condition, a significant number were not. The ED survey found that approximately 25% of schools indicated that at least one type of onsite building was in less than adequate condition. Fifty percent indicated that one or more building feature(s) was not in adequate condition,¹¹⁴ and 40% indicated that one or more environmental condition(s) was unsatisfactory.¹¹⁵

Federal Assistance

As noted above, the federal government plays a relatively small role in school infrastructure. It does, however, provide some indirect support for school construction (mainly by exempting the interest on state and local governmental bonds used for school construction and renovation from federal income taxation), and some direct support through federal education programs such as Impact Aid. The largest federal contribution to school infrastructure occurs via indirect support, i.e., the foregone revenue attributable to the exemption of interest.

School Infrastructure Investment as a Mechanism for Economic Stimulus

Many school modernization, renovation, and repair projects will require start up time. This will potentially limit their effectiveness as a quick economic stimulus. However, because many states and localities face budget shortfalls and may not have funds available for needed school modernization, renovation, and repair projects, federal investment in these projects would provide an important alternative source of funding. According to Education Daily, not only are school districts “increasingly faced with difficult financial choices and must meet daily operating expenses, like payroll, while delaying higher-priced construction of schools and libraries,” but they also must confront the unavailability of affordable credit for capital improvements to schools.¹¹⁶

In a letter to the Speaker of the U.S. House of Representatives, the Committee for Education Funding argued that “\$20 billion spread over a five-year period, has the potential to support an estimated 50,000 jobs a year. If all new school construction and renovation used the ‘green’ approach energy savings alone would total \$20 billion over the next 10 years, while also creating new and innovative jobs.”¹¹⁷

Issues Regarding School Construction, Modernization, Repair and Renovation

As noted above, school infrastructure needs are significant¹¹⁸ and are affected by a variety of complicated variables. Not only are the age and physical condition of a school important, but a variety of other factors are important as well, e.g., shifts in the student population, changes in

¹¹⁴ Building features include roofs, framing, floors, and foundations; exterior walls, finishes, windows, and doors; interior finishes and trim; plumbing; heating, ventilation and air conditioning; electric power; electrical lighting; and life safety features. *Condition of America's Public School Facilities*.

¹¹⁵ Environmental conditions include lighting, heating, ventilation, indoor air quality, acoustics or noise control, and physical security of buildings. *Condition of America's Public School Facilities*.

¹¹⁶ Frank Wolfe, *Credit crisis impairs school funding streams.*, Education Daily, Vol. 41, No. 183, October 3, 2008.

¹¹⁷ Committee for Education Funding, Letter to The Honorable Nancy Pelosi, Speaker, U.S. House of Representatives, December 2, 2008. The Committee for Education Funding is a nonpartisan coalition of education groups.

¹¹⁸ ED estimated the costs to bring school facilities into good condition in 1999 at \$127 billion.

school policies (such as implementing smaller class size), changes in technology, changes in school instructional practices, energy efficiency requirements, and retrofitting schools to meet requirements of legislation such as the Americans with Disabilities Act (P.L. 101-336). Currently there is no regular federal collection of data on the condition of schools. This lack of data makes accurate projections of school infrastructure needs difficult.

In addition, although there is currently a backlog in needed school infrastructure projects, the ability of states and localities to finance these projects is particularly strained under current economic conditions. This raises questions regarding whether or not a greater role for the federal government in financing school infrastructure should be considered, and if so, what form federal assistance should take.

Federal Public Buildings¹¹⁹

The Public Building Service (PBS), a component of the General Services Administration (GSA), is responsible for meeting the space needs of more than 100 federal departments and agencies. In support of its mission, PBS constructs new buildings, renovates existing ones, and leases space. When new construction is required, PBS contracts with private sector architects, construction managers, and engineers to design and build the structure. New construction projects are tailored for a range of government activities, and may include courthouses, land ports of entry, federal office buildings, laboratories, and data processing centers. PBS also repairs, alters, and renovates the 1,500 buildings already in its inventory.¹²⁰

Conditions, Performance, and Funding Needs

Each year the Public Building Service surveys the housing needs of its client agencies and determines whether it has space in its existing inventory to meet those needs. In its budget justification, PBS identifies the construction and renovation projects it believes are needed to meet the most critical workspace needs, and ranks them in order of priority. In FY2008 and FY2009, PBS has ranked homeland security projects among its top capital investment priorities, including the consolidation of homeland security headquarters workspace, and the modernization of several existing land ports of entry, which it describes as outdated and unable to accommodate current workloads and technology. PBS also ranked federal courthouses as priorities for capital investment in FY2008 and FY2009, citing the need for additional space, building systems modernization – such as replacing failing pipes and obsolete fire alarms – and enhanced security.

Federal Assistance

Construction and renovation projects, as well as other PBS property management activities, are funded through the Federal Buildings Fund (FBF). The FBF is a revolving fund that is financed by income from rent charged to occupants of GSA-controlled space, and by additional funds appropriated by Congress. Funds in the FBF are subject to enactment of new obligational authority each year, which is referred to as a limitation on the use of revenue. For FY2008,

¹¹⁹ Prepared by Garrett Hatch, Analyst in American National Government.

¹²⁰ U.S. General Services Administration, *FY2008 Congressional Justification*, Feb. 12, 2007, http://www.gsa.gov/gsa/cm_attachments/GSA_BASIC/FY2008_Congressional_Justification_R2EH7_0Z5RDZ-i34K-pR.pdf.

Congress provided just over \$1.25 billion for new construction projects (\$531 million) and renovation of existing facilities (\$722 million).¹²¹ For FY2009, GSA's budget justification included a request for \$1.31 billion for new construction (\$620 million) and renovation (\$692 million).¹²²

Federal Building Construction and Renovation as Mechanisms for Economic Stimulus

The FBF provides capital for construction and renovation projects that typically range from several million to hundreds of millions of dollars. When viewed as potential mechanisms for economic stimulus, it may be noted that construction and renovation projects may not be distributed widely or equitably across states and localities. In recent years, FBF funding has been concentrated in a relatively small number of projects. In FY2008, for example, \$722 million was appropriated for six renovation projects, and \$531 million was appropriated for 11 new construction projects.¹²³ FBF funding may be geographically concentrated as well. The geographic concentration of construction funds is a consequence of Congressional infrastructure priorities: eight of the 11 new construction projects funded in FY2008 were land ports of entry, all of which were necessarily located in states that bordered Mexico or Canada.¹²⁴ The geographic concentration of FBF funds also occurs because cities with the largest existing federal presence are more likely to receive funding for workspace renovation, expansion, or consolidation. Three of the six FBF renovation projects that Congress funded in FY2008, for example, were in the District of Columbia.¹²⁵

Issues for the Federal Building Construction and Renovation Sector

An ongoing challenge for the federal building construction and renovation sector is to secure adequate funding to meet homeland security needs, improve space and security at federal courthouses, and reduce the backlog of federal buildings in need of repair. The FBF does not now have the resources to meet all of those needs, and there may be discussions in the future about restructuring the FBF to increase its available capital.

Broadband¹²⁶

Broadband infrastructure refers to networks of deployed telecommunications equipment and technologies necessary to provide high-speed Internet access and other advanced telecommunications services for private homes, businesses, commercial establishments, schools, and public institutions. In the United States, broadband infrastructure is constructed, operated, and maintained primarily by the private sector, including telephone, cable, satellite, wireless, and other information technology companies. Although broadband is deployed by private sector

¹²¹ *Congressional Record*, daily edition, vol. 153, December 17, 2008, p. H16054.

¹²² U.S. General Services Administration, *FY2009 Congressional Justification*, Feb. 1, 2008, http://www.gsa.gov/graphics/staffoffices/FY2009_Congressional_justifications.pdf.

¹²³ *Congressional Record*, daily edition, vol. 153, December 17, 2008, p. H16054.

¹²⁴ Ibid.

¹²⁵ Ibid.

¹²⁶ Prepared by Lennard G. Kruger, Specialist in Science and Technology Policy.

providers, federal and state regulation of the telecommunications industry as well as government financial assistance programs can have a significant impact on private sector decisions to invest in and deploy broadband infrastructure.

Conditions, Performance, and Funding Needs

The latest data from the Federal Communications Commission (FCC) indicate that broadband adoption stands at roughly 58% of U.S. households,¹²⁷ while less than 10% of households have no access to any broadband provider whatsoever (not including satellite).¹²⁸ Data from the FCC,¹²⁹ the Pew Internet and American Life Project,¹³⁰ and the U.S. Government Accountability Office (GAO)¹³¹ indicate that broadband infrastructure is most lacking in rural and lower-income areas in which there is less economic incentive for companies to invest in such infrastructure. Even in areas where broadband infrastructure is present, demand for those services may lag because of factors such as a household's inability to afford computers or broadband service.

It is difficult to estimate with any degree of precision the amount of funding that would be necessary to deploy a ubiquitous broadband infrastructure throughout the United States. "Broadband" can refer to a complex array of technologies, speeds, and capacities, each with its own set of costs and benefits. Additionally, the state of broadband data in the United States is incomplete, and policymakers do not yet have a clear or complete picture of where broadband is and is not deployed, nor is there agreement on what criteria determine whether an area is considered "underserved," and the extent to which it may require federal assistance.

Federal Assistance

The Rural Broadband Access Loan and Loan Guarantee Program and the Community Connect Grant Program – both housed in the Rural Utilities Service (RUS) of the U.S. Department of Agriculture – are the only federal programs *exclusively* focused on financing broadband infrastructure in unserved and underserved areas.¹³² Since inception, these programs have provided \$1.8 billion in loans (since FY2003) and \$83.7 million in grants (since FY2002), and in FY2009 will make available \$594 million in loans and \$13.4 million in grants. Additionally, there exist other federal programs that provide financial assistance for various aspects of telecommunications development that have been or could be used for financing broadband infrastructure.¹³³ These include programs under the FCC's Universal Service Fund (USF), RUS rural telephone loans and distance learning and telemedicine loans and grants, and potential

¹²⁷ Percentage assumes one high speed line per household, 65.9 million residential high speed lines (per June 30, 2007 FCC data) and 114 million households in the United States (2006 Census data).

¹²⁸ S. Derek Turner, Free Press, *Down Payment on Our Digital Future*, December 2008, p. 8.

¹²⁹ FCC, High Speed Services for Internet Access: Status as of June 30, 2007, March 2008, 27 pp.

¹³⁰ Horrigan, John B., Pew Internet & American Life Project, *Home Broadband Adoption 2008*, July 2008.

¹³¹ U.S. Government Accountability Office, *Broadband Deployment is Extensive Throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas*, GAO-06-426, May 2006.

¹³² For additional information, see CRS Report RL33816, *Broadband Loan and Grant Programs in the USDA's Rural Utilities Service*, by Lennard G. Kruger.

¹³³ For more information, see CRS Report RL30719, *Broadband Internet Access and the Digital Divide: Federal Assistance Programs*, by Lennard G. Kruger and Angele A. Gilroy.

Department of Commerce grants to states for broadband data collection and mapping as directed by the recently enacted Broadband Data Improvement Act (P.L. 110-385).

Broadband Investment as a Mechanism for Economic Stimulus

To be effective for economic recovery, any federal broadband infrastructure program must induce incremental broadband investment beyond that which would be undertaken absent the program. It is difficult to estimate precisely the impact of broadband infrastructure spending on employment. According to the Communications Workers of America, every \$5 billion invested in broadband deployment would create 97,500 direct jobs in the telecommunications, information technology, and computer sectors, and indirectly lead to 2.5 million new jobs throughout the economy.¹³⁴ A June 2007 report from the Brookings Institution found that for every one percentage point increase in broadband penetration in a state, employment is projected to increase by 0.2 to 0.3% per year.¹³⁵ Additionally, many point to successful broadband deployments in other nations, and argue that a comparable broadband infrastructure is essential for future U.S. economic competitiveness.

Issues for the Broadband Sector

The overarching issue is how to strike a balance between providing federal assistance for unserved and underserved areas where the private sector may not be providing acceptable levels of broadband service, while at the same time minimizing any deleterious effects that government intervention in the marketplace may have on competition and private sector investment. In addition to loans, loan guarantees, and grants for broadband infrastructure deployment, a wide array of policy instruments are available to policymakers including tax incentives to encourage private sector deployment, demand-side incentives (such as assistance to low income families for purchasing computers), government-backed “broadband bonds,” regulatory and deregulatory measures, and spectrum policy to spur roll-out of wireless broadband services. In assessing stimulus incentives for broadband deployment, Congress will likely consider the appropriate mix of broadband deployment incentives to create jobs in the short and long term, the extent to which incentives should target next-generation broadband technologies, and how broadband stimulus measures might fit into the context of overall goals for a national broadband policy.

¹³⁴ Communications Workers of America Letter to House and Senate Leadership Urging Proposals to Stimulate Broadband Investment, December 9, 2008, reprinted in Bureau of National Affairs, *Daily Report for Executives*, December 15, 2008.

¹³⁵ Crandall, Robert, William Lehr, and Robert Litan, The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data, June 2007, 20 pp.

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