Vision for the future

U.S. intercity passenger rail network through 2050

Prepared by the Passenger Rail Working Group
December 6, 2007

VISION FOR THE FUTURE

U.S. INTERCITY PASSENGER RAIL NETWORK THROUGH 2050

Prepared for Commissioner Frank Busalacchi
National Surface Transportation Policy and Revenue Study Commission

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Chapter

1

Background and overview

1.1. BACKGROUND

The National Surface Transportation Policy and Revenue Study Commission (the Commission) was created by the 109th Congress in Section 1909 of the current transportation authorization, the Safe, Accountable, Flexible, Efficient, Transportation Equity Act – A Legacy for Users (SAFETEA-LU). The Commission was charged with providing to Congress a national surface transportation vision, with supporting funding and policy recommendations to preserve and enhance the surface transportation system of the United States for the next 50 years.

In working toward its goal, the Commission is considering all modes of surface transportation, including intercity passenger rail. The Commissioners have found that less data is available for intercity passenger rail than for other surface transportation modes. Therefore, in the absence of staff resources and robust information on intercity passenger rail needs, Commissioner Frank Busalacchi established the Passenger Rail Working Group (PRWG).

The PRWG is comprised of intercity passenger rail experts and transportation professionals and is charged with providing to the Commission:

- recommendations on a national vision for intercity passenger rail through 2050,
- a cost estimate for that vision,
- a federal funding program for passenger rail, and
- a governance structure for program development.[1]

Representatives of the freight rail industry provided valuable perspectives at different stages of the group's work.

[1] As the scope of the PRWG does not include commuter or light rail, subsequent references to passenger rail refer to intercity passenger rail exclusively.

1.2. APPROACH TO ANALYSIS

To develop an estimate of passenger rail needs through 2050, the PRWG developed a vision map for a national intercity passenger rail system. The map serves as both a vision of the potential level of intercity passenger rail in this country and a basis for determining an estimate of the investment required for passenger rail needs throughout the period. The nature of a long-term timeframe does not permit the map to be all-inclusive. The 2050 vision plan is not a static vision but rather an evolving vision of future routing and service level decisions that will be made as part of the network design, development and funding process. It represents one vision of what the U.S. intercity passenger rail system could look like in 2050.

The PRWG vision map was created using an overlay approach with a base layer consisting of current intercity passenger rail routes, both corridor and long distance, with successive layers added to develop the final vision map.

Existing Intercity Passenger Rail Network

Background map based on "America 2050: A Prospectus", www.ameri ca2050.org, Regional Plan Association

The second layer consists of federally designated rail corridors. The third layer consists of corridors in the planning or development stages provided by states and regions. This includes corridors with fairly high levels of planning completed, such as the Midwest Regional Rail Initiative and the Southeast and California High Speed Rail Corridor Initiatives; corridors in the study phase; and corridors in long-range and regional transportation plans.

The final layer consists of potential future routes. Some of these routes are in early discussion stages. Others are included because they would provide links among major urban areas that are not currently served by passenger rail. The PRWG believes a national passenger rail network requires connections to major population centers, with service to rural areas along the way, much like the Interstate Highway System.

The PRWG is sensitive to the Commission's interest in the ten emerging mega-regions of the U.S. developed by the Regional Plan Association and described in Appendix A.[2] The PRWG's vision map from the base through the third layer (corridors in planning or development stages) is a near perfect fit as it relates to the passenger rail connections between major cities in the mega-regions and between the mega-regions themselves.

The final layer of potential future routes augments both the intra- and inter-mega-region connections. It provides connections between the mega-regions and major metropolitan areas not included in the mega-regions (e.g., Denver, Kansas City and others) and between the mega-regions and other Metropolitan Statistical Areas.[3] This vision map would ultimately provide intercity passenger rail service to all 48 contiguous states.

[2] Regional Plan Association, "America 2050: A Prospectus," New York: September 2006.

[3] A Metropolitan Statistical Area (MSA) is a Core Based Statistical Area (CBSA) associated with at least one urbanized area that has a population of at least 50,000. The MSA comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county as measured through commuting. Federal Register, Vol. 65, No. 249, Part IX Office of Management and Budget (2000), "Standards for Defining Metropolitan and Micropolitan Statistical Areas," December 27, 2000.

Chapter

2

The analytical framework

2.1. THE HISTORICAL ROLE OF INTERCITY PASSENGER RAIL IN THE UNITED STATES

Intercity passenger rail was crucial to the settlement and economic development of the United States. It was the primary means of transportation from the mid-1800s into the early 1950s, providing a vital connection between the east and west coasts and opening the west and central United States for settlement. It was also important for transporting troops and military supplies.

Most rail lines in this early time period carried both passengers and freight. Trains provided faster, more reliable, and safer transportation than other modes; they allowed for heavier goods and more people to be transported longer distances; and they contributed to the nation's economic and military strength.

Many large and small cities were served at one time by more than one railroad, each with its own station. Some cities developed union stations, bringing two or more railroads under one roof and efficiently serving multiple passenger train routings. Since the mid-20th century, rail infrastructure has been slowly vanishing under the pressures of urban development, increased highway and aviation network expansion and federal funding policies, and reductions in passenger train service. In many parts of the country today, people have no mobility option other than driving.

2.2. INTERCITY PASSENGER RAIL NETWORK TODAY

Amtrak operates a national rail network of long-distance and corridor trains, serving 504 stations in 46 states on more than 21,000 route miles. Amtrak's ridership and revenue has grown nearly 20 percent over the last five years, with FFY 2007 totals of 25.8 million riders and $1.52 billion in revenue. Among the factors contributing to growth are corridor service reliability improvements, state support for enhanced and improved passenger rail corridor service, lack of capacity for highway improvements, highway and aviation congestion, and higher fuel costs.

Corridor service can be defined as frequent service operated between major city pairs up to 500 miles apart. Corridor services are usually provided in U.S. intercity travel markets where over 80 percent of all trips exceeding 100 miles in length are less than

500 miles. With increased frequencies, rail provides a competitive alternative to both auto and air in terms of travel time, convenience, and comfort.

Fourteen states support corridor services by providing financial support to partially offset operating losses.[4] Some trains operating on eight corridors receive no state support and are fully funded by Amtrak. On these eight corridors, some trains are 100 percent Amtrak-funded, some are state-funded, and some are primarily Amtrak-funded with the exception of a few service frequencies.[5] State-supported services account for 35 percent of Amtrak's daily ridership and about half of all passenger trains in the system. At least 35 states have developed intercity passenger rail plans for future service. The states have made and will continue to make significant investments in infrastructure and equipment. They have also completed environmental analyses and engineering studies for expanded service. The state plans together identify an estimated $10.4 billion in state corridor needs over six years ($12.7 billion adjusted to 2007 dollars).[6]

Corridor services are among the fastest growing intercity passenger rail services in the Amtrak network. For example, ridership on the Hiawatha service between Milwaukee and Chicago, which is sponsored by the states of Wisconsin and Illinois, has increased in each of the last five years and set annual ridership records for the past three state fiscal years. Many trains are filled to capacity, requiring one additional car on each train-set in state fiscal year 2008.

Another successful state corridor is California's Capitol Corridor, a 170-mile rail corridor serving 16 stations between the Sierra Foothills, Sacramento, the San Francisco Bay area, and Silicon Valley/San Jose. In 1998, the Capitol Corridor had eight daily trains, 463,000 riders, and a 30 percent farebox recovery ratio. Today, the Capitol Corridor service includes 32 daily trains between Sacramento and San Francisco and 14 direct daily trains to San Jose, with nearly 1.5 million riders annually and a farebox recovery ratio of 48 percent in FFY 2007.

The service has experienced nine consecutive years of substantial growth. Ridership in federal fiscal year (FFY) 2007 was up 15 percent and revenues 21 percent compared with 2006. In October 2007, the first month of FFY 2008, the farebox recovery ratio was 51 percent.

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[4] Fourteen states contract with Amtrak to operate trains supplementing the national Amtrak network by extending the reach of passenger rail services or providing additional frequencies on Amtrak routes: California, Illinois, Maine, Michigan, Missouri, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, Texas, Vermont, Washington and Wisconsin.

[5] The eight corridors are: NY/Albany/Buffalo/Niagara Falls; New Haven/Hartford/ Springfield; Philadelphia/Harrisburg /Pittsburgh; Washington DC/Richmond/Newport News; Chicago/Detroit/ Pontiac; Chicago/St. Louis; LA/San Diego; Seattle/Portland.

[6] AASHTO, Standing Committee on Rail Transportation, *Intercity Passenger Rail Transportation 2002, Corridor Profiles*, pp. 62-148.

According to California DOT Director Will Kempton, together, the Capitol Corridor, San Joaquin, and Pacific Surfliner routes reduced congestion on the highway system by more than 500 million passenger-miles of travel.[7]

On the Acela Express in the Northeast, ridership increased more than 20 percent in FFY 2007. While the airlines are experiencing more delays than ever, the Acela's on-time performance is improving (88 percent on-time this year, up from 84 percent one year ago).[8]

2.3. INTERCITY PASSENGER RAIL BENEFITS

The resurgence of intercity passenger rail development in the United States reflects the increasing recognition of the user and non-user benefits of this emerging transportation mode. User benefits are those benefits that can only be enjoyed by passengers, such as shorter journey times or improved personal comfort while traveling. Intercity passenger rail fits a particular niche in the travel market, providing corridor travel for trips up to 500 miles in length and longer distance travel for a select set of travelers.

While automobiles will likely remain the dominant mode of choice for shorter trips and air for longer trips, intercity passenger rail can provide added service to these markets. Rail can provide improved service levels (frequency and travel time), reducing the adverse impacts and need for expenditures in other modes – creating non-user benefits.

Non-user benefits include decreased congestion on competing transportation systems, accident savings in other modes, and environmental benefits such as air quality improvement. Traditionally, the generators of non-user benefits have been classified as public services, the costs of which are borne collectively by society through public sector spending.[9]

User and non-user benefits that are best described as qualitative rather than quantitative can be measured in cost-benefit analyses if they are assigned monetary values that include both the associated costs and benefits. These benefits should be included in the evaluation of the costs and benefits of expanded intercity passenger rail in the U.S. along with financial considerations:

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[7] Kempton, Will, Testimony on the Benefits of Intercity Passenger Rail before the Subcommittee on Railroads, Pipelines and Hazardous Materials of the House Committee on Transportation and Infrastructure, June 26, 2007, p. 4.

[8] Machalaba, Daniel, *The Wall Street Journal*, "Crowds Heed Amtrak's 'All Aboard,' Improved Service, Air Woes Lure Travelers in Northeast; Long Hauls Still Suffer," August 23, 2007, p. B1.

[9] Schwartz, Peter. "Financially Internalizing Passenger Rail-General Non-user Benefits," Transportation Research Record 1785, Paper No. 02-4136, 2002.

- The diversion of auto and air traffic to intercity passenger rail can improve public safety and air quality by reducing congestion and greenhouse gas emissions, which affect climate change and health.
- Expanded intercity passenger rail could help reduce the negative impacts to individuals and the economy of short or prolonged energy supply disruptions and/or energy price increases.
- Land use and travel pattern changes can improve air quality, water quality, and aesthetic appeal.
- Intercity passenger rail can provide mobility and economic development opportunities to smaller communities with little or no other access to public transport.
- The availability of intercity passenger rail can assure a redundant transportation mode for use in emergency situations.
- Passenger rail can provide a mobility option for individuals who cannot or choose not to drive or fly.

The last three items above are particularly, but not exclusively, relevant to long-distance trains. These trains accounted for 44 percent of Amtrak's passenger miles in FFY 2007. This reflects a slight decline over the past decade, as state-sponsored corridor services have expanded while long-distance service has been reduced, both in terms of fleet size and train miles operated. Nonetheless, revenues from long-distance trains have been strong, with FFY 2007 revenues up 12 percent from FFY 2005.

2.3.1. Safety benefits

The National Highway Traffic Safety Administration (NHTSA) reports that 42,642 people were killed on our highways in FFY 2006 and estimates that 2,575,000 people were injured.[10] Highway traffic crashes produce tragedy and hardship for individuals as well as harsh economic consequences for the nation. The economic cost of traffic crashes in 2000 was $230.6 billion, or 2.3 percent of the U.S. gross domestic product. The economic cost included $32.6 billion in medical expenses alone, with only 25 percent of overall crash costs paid by those involved in the crash.[11]

Intercity passenger rail is an exceptionally safe mode of transportation per mile traveled. In general, buses, trains and airlines have much lower death rates than automobiles per passenger mile traveled. The expansion of intercity passenger rail can provide a safer travel option for those who choose trains over autos.

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[10] National Highway Traffic Safety Administration, National Center for Statistics and Analysis, "Motor Vehicle Traffic Crash Fatality Counts and Estimates of People Injured for 2006," September 2007.

[11] Jeffrey W. Runge, M.D., Administrator, National Highway Traffic Safety Administration, testimony before the Subcommittee on Transportation, Treasury and Independent Agencies of the U.S. House Committee on Appropriations, March 25, 2004.

Safety of Various Transportation Modes (2000)[12]

Death Rate	Death Rate per 100 Million Passenger Miles
Automobile	0.80 deaths
Intercity Bus	0.05 deaths
Passenger Rail	0.03 deaths
U.S. Air Travel	0.02 deaths

2.3.2. Energy benefits

Encouraging the use of rail transport and enhancing the availability of this mode could potentially increase the energy efficiency of personal travel. 2005 national data indicate that intercity passenger rail (Amtrak) consumes 17 percent less energy per passenger mile than airlines and 21 percent less energy per passenger mile than autos.[13] The inherent differences between the transportation modes in nature of services, routes available, and other factors make it impossible to obtain truly comparable national energy intensities among modes. The data that are available show intercity passenger rail to be more energy efficient than either air or automobile transportation.[14]

Energy Intensity (2005)

Mode	Energy Consumption per Passenger Mile
Automobile	3,445 BTUs
U.S. Air Travel	3,264 BTUs
Passenger Rail	2,709 BTUs
Intercity Bus	932 BTUs[15]

Energy savings from public transportation already contribute to our national and economic security by making America less dependent on foreign oil or on new sources of drilling.[16] Regardless of these savings, in July 2007 alone, the U.S. imported 9.3 million barrels of crude oil (390 million gallons). The top sources were:

[12] National Safety Council, *Injury Facts*, 2002, p. 128.

[13] Oak Ridge National Laboratory, Transportation Energy Data Book, Edition 26, 2007.

[14] Ibid.

[15] The most recent intercity bus data is from 2000. It has ranged from 870 to 964 BTUs since 1984.

[16] Shapiro, Hassett and Arnold. "Conserving Energy and Preserving the Environment: The Role of Public Transportation," July 2002, p. 1.

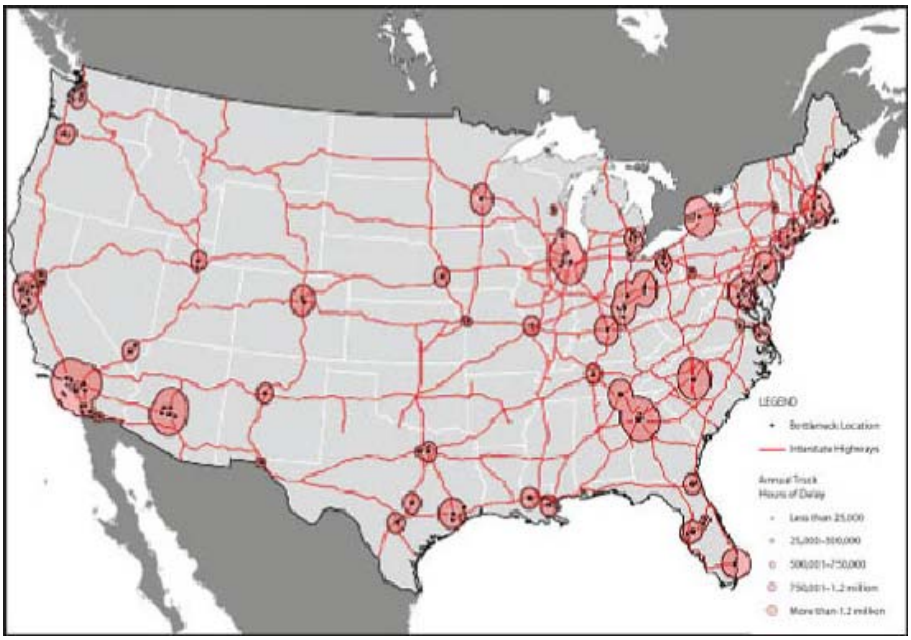
U.S. Crude Oil Imports (July 2007)[17]

Source	Barrels per day
Canada	1.8 million
Mexico	1.5 million
Saudi Arabia	1.4 million
Venezuela	1.2 million

2.3.3. Highway congestion relief

Intercity passenger rail can provide a mobility alternative for travelers on our congested highway system. Severe bottlenecks in metropolitan areas are impeding the flow of commerce and delaying travelers, while longer distance interstate and interregional traffic is delayed by metropolitan area traffic congestion. Significant congestion is occurring at major interchanges that were never designed to carry the volumes of traffic that currently use them, and the traffic volumes projected for the future will further exacerbate these problems.[18]

Interstate Bottlenecks[19]



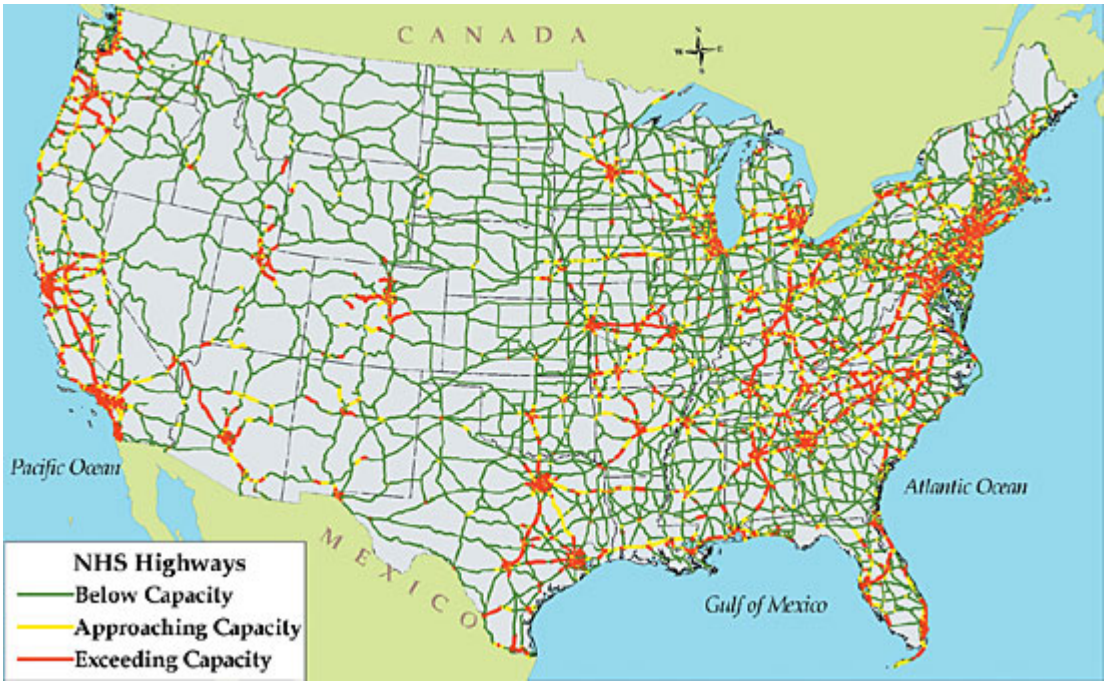
[17] Energy Information Administration, Official Energy Statistics from the U.S. government, Crude Oil and Total Petroleum Imports, Top 15 Countries, 2007.

[18] American Association of State Highway and Transportation Officials, Transportation Invest in Our Future, "AASHTO's Recommendations for the Interstate System of the Future," July 2007 [http://www.transportation1.org/tif1report/highway_01.html].

[19] Ibid.

The public demand for fast and efficient passenger rail service is strongest in congested intercity corridors connecting major urban areas where travelers face both highway and airway congestion. Intercity passenger rail corridors proposed for improved service by state transportation agencies correspond with US DOT's forecast for congested routes on the National Highway System (NHS) in 2020.

National Highway System Estimated Peak Period Congestion: 2020[20]



2.3.4. Airway congestion relief

For short- to medium-distance trips of 100 to 500 miles, enhanced passenger rail service can offer travel-time advantages over air and highway transportation. Air travelers are required to check in at airports at least one hour before departure time, and major airports can be 30 to 45 minutes from downtown destinations. Rail generally offers service from city center to city center, with downtown stations in most cities and without check-in delays. Air travelers must also deal with late arrivals and departures. In March 2007, only 72 percent of all U.S. flights had on-time arrivals.[21]

The dominant mode in most regional travel markets is still the auto, with air dominant in most long-distance markets. However, Amtrak recently reported the following

[20] US DOT, Federal Highway Administration, Freight Management and Operations, Key Freight Transportation Challenges [http://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/congest.htm].

[21] Machalaba, Daniel, *The Wall Street Journal*, "Crowds Heed Amtrak's 'All Aboard,' Improved Service, Air Woes Lure Travelers in Northeast; Long Hauls Still Suffer," August 23, 2007, page B1.

intercity passenger rail shares for select air-rail markets in the northeast corridor and on the west coast:

Amtrak's Share of Air-Rail Travel Market

Los Angeles/San Diego – 95%
Washington/Philadelphia – 94%
New York/Albany – 93%
New York/Philadelphia – 93%
New York/Providence – 77%
Seattle/Portland – 66%
New York/Washington – 55%
New York/Boston – 36%
Boston/Philadelphia – 7%
Washington/Boston – 5%

Congestion in the high-density east and west coast corridors will likely continue to increase. The following map shows 8 metropolitan areas and 14 airports that will require non-aviation support (i.e., increased and/or new passenger rail service) even after additional capacity is gained from planned aviation improvements expected through 2025.[22]

Capacity Problems Still Unaddressed After Planned FAA Improvement Through 2025

[22] The MITRE Corporation, Center for Advanced Aviation System Development, "Capacity Needs in the National Airspace System (2007-2025), an Analysis of Airports and Metropolitan Area Demand and Operational Capacity in the Future," May 2007, pp. 16-17 and 22.

The Center for Advanced Aviation System Development's analysis, from which the 2025 map was taken, is a best-case scenario. It shows one reason why multi-modal solutions, including intercity passenger rail, are so important.

Intercity rail connections to airports such as Baltimore-Washington, Newark, Burbank, and Milwaukee could reduce airport congestion at major hubs. Some countries have intentionally diverted passengers to trains from the airlines. For example, in Germany, building high-speed trains rather than expanding airport capacity for short distance flights (350 miles or less) has been the national cross-modal policy since the 1990's, representing a cost-effective overall transportation system investment strategy.

In addition to capacity problems at major airports, the U.S. does not have efficient, convenient transportation links from its international airports to city-center destinations. A trip from JFK into downtown Manhattan involves light rail and subway travel of an hour or more, and LaGuardia has no rail transit at all. In Chicago, the CTA trains make 15 stops during the 45-minute ride between O-Hare and the downtown Loop. The Los Angeles, Dallas-Fort Worth, Miami, Dulles, and Denver airports can be reached only by road. In contrast, from Heathrow terminals, nonstop rail runs under 20 minutes into London. The primary Asian airports have convenient high-speed rail connections to central business districts. In Zurich, it takes riders only 12 minutes to get from baggage claim to the city center on high-speed trains.[23]

The U.S. is beginning to locate intercity passenger rail stations at its airports. This has happened at Burbank, Oakland, Milwaukee, Baltimore-Washington, and Newark; Newark has a people-mover link but bus transfers are required at the others. Passenger rail is planned for O'Hare, Harrisburg and Providence. Several airports, including O'Hare, are directly served by local rail transit. Major extensions of transit systems are underway or planned for many cities. In Wisconsin, the Milwaukee Airport-Rail Station (MARS) at General Mitchell International Airport (GMIA) opened in 2005 and is served by seven daily round trips between Milwaukee and Chicago.

2.3.5. Environmental benefits

The impact of greenhouse gas (GHG) emissions on human health and global climate change is one reason to support the expansion of transportation modes that generate lower levels of GHG emissions. Carbon dioxide (CO_2) emissions contribute to global warming. The nitrogen oxides (NOx) emitted in vehicle exhaust are known to exacerbate asthma and may increase susceptibility to infections. Of the volatile organic compounds (VOCs) present in exhaust and emitted in the distribution of gasoline, benzene is a cancer-causing agent and may cause leukemia.[24] Combined with sunlight, VOC and NOx emissions produce ozone or smog. Ozone can irritate respiratory systems and eyes, damage lungs, and exacerbate respiratory conditions. Carbon monoxide (CO), present in gasoline vehicle exhaust, is lethal at high doses; it hampers

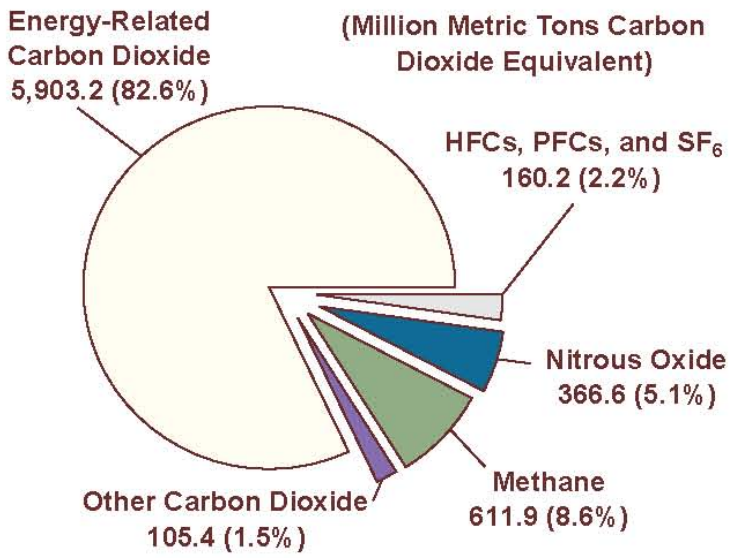
[23] Miller, Jonathan D., ULI-the Urban Land Institute and Ernst & Young, Infrastructure 2007: A Global Perspective, 2007, p. 18.

[24] McKnight, James. Stephenson, George. "Transportation in the 21st Century, Our Challenges and Opportunities," Institution of Mechanical Engineers, United Kingdom, 1999, p. 30.

the body's ability to transfer oxygen to organs and tissues and can impair concentration and neuro-behavioral function.[25]

Of the GHG emissions generated from energy use in the U.S. residential, commercial, industrial and transportation sectors in 2005, 83 percent consisted of carbon dioxide from the combustion of fossil fuels such as coal, petroleum, and natural gas. Every gallon of gasoline burned produces about 20 pounds of CO_2 emissions.[26] U.S. carbon dioxide emissions have grown by an average of 1.2 percent annually since 1990. The transportation sector contributes about one-third of these emissions. [27] This share has increased from 31 percent in 1990 to 33 percent currently.[28] It is hard to envision a solution to the global warming crisis that does not involve attempts to reduce the growth of transportation CO_2 emissions in the U.S.

2005 U.S. Greenhouse Gas Emission Estimates, by gas[29]
(measured in million metric tons of native gas)



[25] Shapiro, Hassett and Arnold, "Conserving Energy and Preserving the Environment: The Role of Public Transportation," July 2002, p. 20.

[26] Davis, Todd and Hale, Monica. "Public Transportation's Contribution to U.S. Greenhouse Gas Reduction," Science Applications International Corporation, September 2007.

[27] Energy Information Administration, Department of Energy, "Emissions of Greenhouse Gases in the United States 2005," Executive Summary.

[28] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters and Don Chen, Urban Land Institute, *Growing Cooler: The Evidence on Urban Development and Climate Change*, 2007.

[29] Ibid.

Traveling by public transportation is less carbon intensive than traveling in a single occupant vehicle.[30] Partially or fully loaded rail coaches are more environmentally friendly than lower occupancy single vehicles. The average intercity passenger train produces 60 percent fewer CO_2 emissions per passenger-mile than the average auto and half the GHG emissions of an airplane.[31] Moreover, high altitude GHG emissions have about three times the warming effect as ground-level emissions.[32] Intercity passenger rail also generates fewer emissions of other pollutants than other modes. Finally, emissions-per-passenger-mile data likely understate benefits of intercity passenger rail (and rail transit in general) because they do not reflect rail's ability to stimulate energy-efficient, pedestrian-friendly real estate development.

The alternatives proposed for intercity passenger rail service improvements between Charlotte and Washington, D.C., are all shown to reduce nitrogen oxides as a result of auto diversion to rail. The alternative selected will reduce nitrogen oxides by 530,000 pounds annually.[33]

Energy and climate policies at the federal and state levels primarily focus on vehicle fuel efficiency (corporate average fuel economy or CAFE standards) and the carbon content of the fuel itself. However, the most significant factor in the growth of CO_2 emissions is vehicle miles traveled (VMT).

Since 1980, the number of miles Americans drive has grown three times faster than the U.S. population and almost twice as fast as vehicle registrations. The U.S. Department of Energy forecasts a VMT increase of 59 percent between 2005 and 2030, while the population is projected to grow by 23 percent. This projected increase actually represents a slowdown relative to historic VMT growth rates.[34] Data show that some of the largest metropolitan areas saw VMT declines between 2000 and 2002. During the 1970s, 1980s and 1990s, VMT increased by 4.3, 3.2 and 2.5 percent, respectively. Since 2000, the average annual increase has been 1.8 percent.[35] A large share of the

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[30] Davis, Todd and Hale, Monica. "Public Transportation's Contribution to U.S. Greenhouse Gas Reduction," Science Applications International Corporation, September 2007.

[31] Ryan, John C. NW Environment Watch, "Over Our Heads–A Local Look at Global Climate," 1997, p. 43.

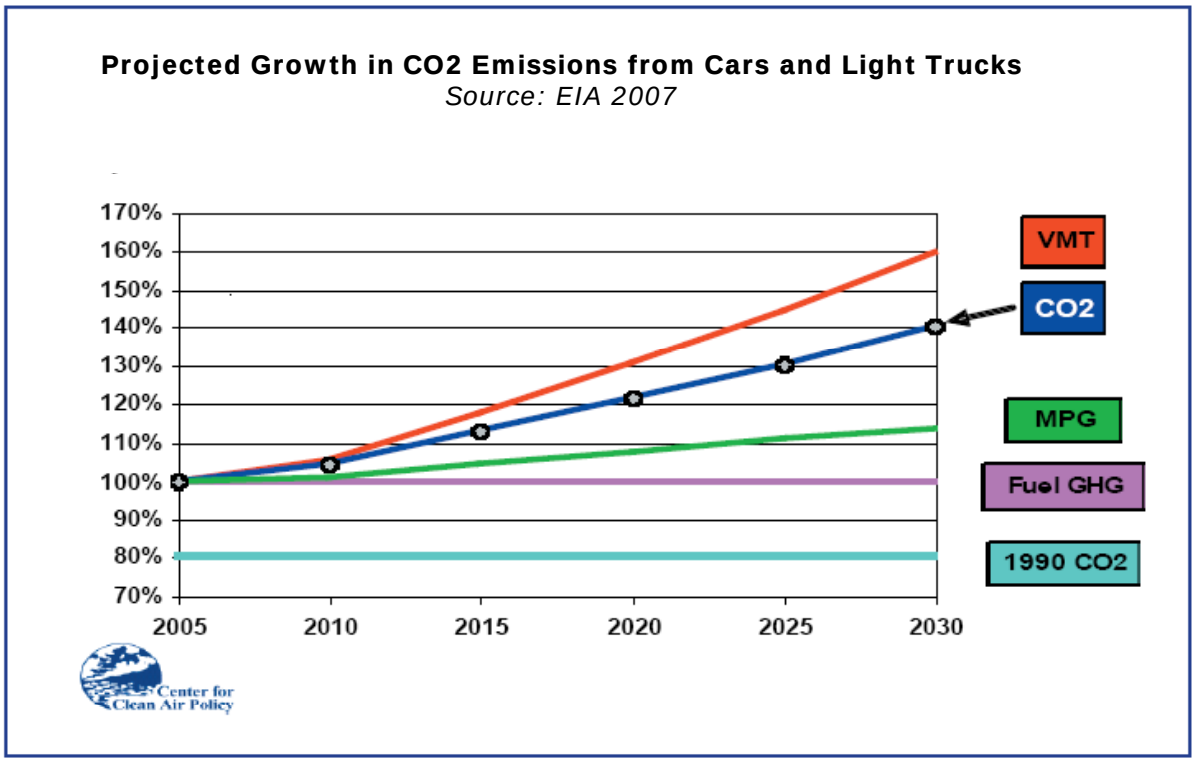
[32] Carbonfund.org uses a multiplier of 2.7. This results in altitude-adjusted aviation emissions ranging from 0.49 kilograms per passenger-mile for long flights to 0.65 for short flights, compared with just 0.20 for Amtrak [diesel 0.196; electric 0.20-0.215].

[33] Record of Decision for the "Tier I Southeast High Speed Rail Project," North Carolina Department of Transportation, October 2002.

[34] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters and Don Chen, Urban Land Institute, *Growing Cooler: The Evidence on Urban Development and Climate Change*, 2007.

[35] Robert Puentes, a Fellow in the Metropolitan Policy Program at The Brookings Institution, written testimony before the House Budget Committee, October 25, 2007 [http://budget.house.gov/hearings/2007/10.25Puentes_testimony.pdf].

VMT increase can be directly traced to the effects of the urban/suburban environment where trips are longer, more numerous, and are single-occupancy trips. Over the same 25-year timeframe, fleet-wide fuel economy is expected to improve by 12 percent, but CO_2 emissions are expected to increase by 41 percent.[36] If VMT continues to increase as projected, the transportation share of GHG will not decline. See graph showing projected CO_2 emissions in the U.S. below:[37]



California is the 12th largest source of GHG emissions in the world. The transportation sector generates 41 percent of the state's emissions. State legislation in California requires the return of GHG emissions to 1990 levels. Preliminary calculations by the Center for Clean Air Policy indicate that, by 2030, the California high-speed rail system could reduce GHG emissions by more than 8.7 million metric tons annually, compared with providing a similar amount of new capacity through road and airport expansions.[38]

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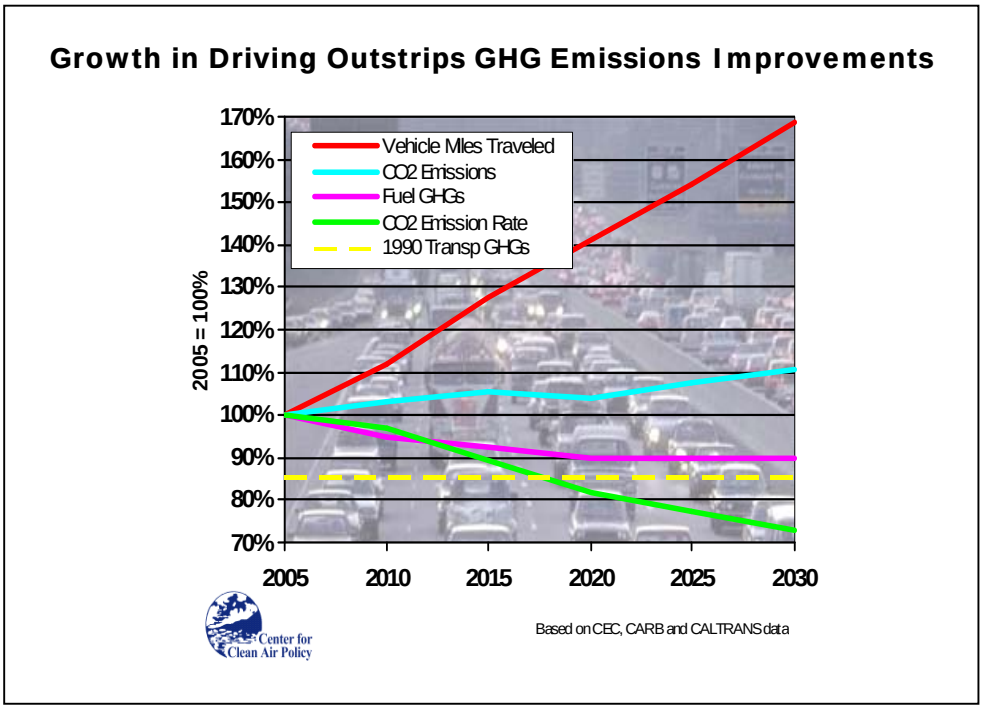
[36] "Emissions of Greenhouse Gases in the United States 2000." Energy Information Administration, U.S. Department of Energy.

[37] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters and Don Chen, Urban Land Institute, *Growing Cooler: The Evidence on Urban Development and Climate Change*, 2007.

[38] Transportation and Land Use Coalition (Oakland, CA) website: www.transcoalition.org/c/sus_hsr/index.html.

According to the Center, this effort will require a reduction in VMT in addition to the use of cleaner fuels and more efficient vehicles. Accommodating California's projected population growth while protecting agricultural and open space will require a state-of-the-art transportation system integrated with regional land-use planning. A high-speed train system has the potential to focus this growth in existing downtowns and meet the state's growing travel needs while reducing its greenhouse gas emissions.[39] The graph below depicts projected GHG emissions in California:



On November 17, 2007, the United Nations' Intergovernmental Panel on Climate Change (IPCC) released the fourth and final draft report in its "Climate Change 2007" series. The fourth report synthesizes the work contained in previous reports into a set of recommendations for policy makers. The report includes several points relevant to the work of the PRWG, including:

- Governments must adopt policies that will mitigate or reverse the impact of GHG emissions on our climate.
- It is critical to align land-use policies and infrastructure planning to reduce transport-related emissions.
- Various transportation policies, including "modal shifts from road transport to rail and public transport systems …" will offset the projected growth of global emissions or reduce emissions below current levels.[40]

[39] Ibid.

[40] Intergovernmental Panel on Climate Change, "Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report," Draft Copy, November 16, 2007.

Rajendra Pachauri, Chairman of the IPCC, told *The New York Times*, "If there's no action before 2012, that's too late. What we do in the next two to three years will determine our future. This is the defining moment."[41]

2.3.6. Economic development benefits

The improved mobility and access associated with enhanced passenger rail service can have significant economic development benefits for communities, states, and the nation. An economic impact analysis of the 3,000-mile Midwest Regional Rail System (MWRRS) proposed by nine Midwestern states identified 58,000 new permanent jobs, $1.1 billion in increased household income, and $4.9 billion in increased property values around 102 stations served by the system.[42]

In Milwaukee, enhanced passenger rail service could generate up to 3,075 permanent jobs, $56 million in annual household income, and $227 million in increased property values around the downtown station. St. Louis could expect an increase of up to 2,800 jobs, $57 million in household income, and $250 million in property value increases. Similar benefits are shown for all 102 communities with stations served by the proposed Midwest Regional Rail System. For the region, the system would provide 15,200 construction-related jobs annually, on average, during its 10-year build-out period.

2.3.7. Emergency preparedness benefits

Modal redundancy should be a basic tenet of the nation's homeland security policy. An effective intermodal transportation system, including intercity passenger rail, can help keep natural disasters from becoming human disasters.

Consider the problems with evacuating residents from New Orleans and other locations during Hurricanes Katrina and Rita. Recall that Amtrak was a crucial mobility alternative for thousands after the 9-11 attacks. Rail was the only mode of transportation in and out of Manhattan while highway bridges and tunnels were closed. Passenger rail is an underutilized resource in terms of disaster preparedness. It can facilitate efficient evacuations as part of an integrated transportation strategy in response to emergency situations.

2.3.8. Land use and travel pattern benefits

Land use and transportation are inextricably linked. Factors impacting both land use and transportation include public policy, financial constraints, the marketplace, and regional and national economies. Development patterns considered environmentally sound are generally thought of as following a local plan, proceeding at a reasonable rate of population growth,

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[41] *The New York Times,* "U.N. Chief Seeks More Climate Change Leadership," November 18, 2007.

[42] Benefit-Cost and Economic Impact Analysis, Midwest Regional Rail Initiative Project Notebook, Chapter 11, November 2006.

incorporating natural resource preservation with considerations of location, and providing opportunities for alternative transport modes other than autos.[43]

Land-use benefits from rail are considered societal benefits, increasing benefits for both rail users and non-users. Transit-oriented development is often associated with improving urban areas by reinforcing mixed use housing, higher densities, and integrated modes of transport near rail stations. On a per-capita basis, suburban sprawl development is more costly and generates travel patterns that consume more energy on a per-unit basis than compact, well-planned urban development. Rail stations are magnets for urban development in downtown areas, and suburban rail stops actually make intercity passenger rail more accessible to more locations than air service.

A region's commitment to energy-efficient growth patterns and its changes in population – both the number and the mix – drive land-use changes. Development and population growth have associated costs – the provision of more schools, public services, and new or expanded roads. Dwindling natural resources and agricultural land, longer commute times, increasing traffic congestion, health issues, and air and water pollution are some of the issues associated with development and growth patterns. Passenger rail promotes economic development opportunities and supports compact, well-planned land use patterns.

2.4. CRITICAL SUCCESS FACTORS IN TODAY'S ENVIRONMENT

The U.S. passenger rail system faces uncertainty each year with regard to operating and capital financing. Amtrak's backlog of deferred maintenance and its heavy debt load add to existing pressures on performance and finances.

Unlike highways and aviation, intercity passenger rail has no specific dedicated federal revenue source, forcing it to compete for funding from the federal general fund with other programs such as national defense, homeland security, health care, and education. States and metropolitan areas must combine funding from a variety of sources such as:

- regional coalitions supporting service between metropolitan areas;
- state contributions to Amtrak for increased service; and
- federal, state or regional contributions to the freight rail infrastructure improvements, over which most passenger rail service operates.

The variability among states in their ability and desire to fund intercity passenger rail does not readily promote development of an integrated national network.

Freight-rail demand is projected to increase in the future, yet it is well documented that funding required just to maintain freight rail's existing market share significantly

[43] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters and Don Chen, Urban Land Institute, *Growing Cooler: The Evidence on Urban Development and Climate Change*, 2007.

exceeds what the private sector will be able to generate.[44] Freight railroads have access to capital, but their investment in capacity improvements is limited by their obligation to consider return-on-investment consistent with their fiduciary responsibility to shareholders. Passenger rail demand is also increasing, with investments needed in network capacity to avoid problems of service reliability, which already exist on some routes. However, public-sector capital funding to support public benefits is currently very limited.

The challenge for expanding freight and passenger rail capacity includes the generation of adequate funding for public and private investments that will support added capacity on existing and/or new rights-of-way with coordination between the two types of service. The efficiency of the private sector business model, with its inherent limitations on capital availability, and the necessity of public investment in intercity passenger rail must both be recognized. By combining the strength of private sector capital formation and prioritization with the potential for public funding to address societal needs, it will be possible to produce a strong rail system that benefits all parties.

2.4.1. Need for a national approach

Intercity passenger rail is recognized as important in certain corridors, where it is highly competitive with highway and air travel, but given the lack of a national vision, long-range planning, and access to reliable funding, its future role in the U.S. transportation system is unclear. Its future will depend on the policy and investment choices made by federal, state, and regional governments.

As indicated in Section 2.3.4 of this report, the high-density corridors of the east and west coasts have significant impacts on the national transportation system. Even with planned aviation system upgrades through 2025, capacity issues will not be fully addressed at our nation's airports or in our major metropolitan areas. Some in the airline industry support Amtrak by calling for the U.S. to build high-speed train lines for short-distance travelers and reallocate runway capacity for long-distance flights.[45] Only the federal government, working with state, regional, and local governments, can make the policy decisions necessary to address national priorities and needs.

"You have to begin to put the infrastructure in place to put in high-speed trains," said Gordon Bethune, a retired chief executive of Continental Airlines, "It should be a national priority." Robert Crandall, former CEO of American Airlines parent AMR Corp., described improvements to Amtrak's Northeast Corridor as one of the best ways to reduce aviation gridlock.[46]

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[44] Cambridge Systematics, Inc., "National Rail Freight Infrastructure Capacity and Investment Study, September 2007.

[45] Machalaba, Daniel, *The Wall Street Journal*, "Crowds Heed Amtrak's 'All Aboard,' Improved Service, Air Woes Lure Travelers in Northeast; Long Hauls Still Suffer," August 23, 2007, p.B1.

[46] Ibid.

2.4.2. Public investment perspective

In the case of public transportation, the federal government should adopt a national goal of developing and supporting an integrated transportation system that includes intercity passenger rail. It may also be appropriate for the public sector to financially support improvements on the nation's freight rail network if solving the capacity problem on rail costs less than solving it on other modes. It will be necessary to develop analytical approaches and data to make meaningful intermodal comparisons.

Federal, state, and local governments all provide general fund money and user fees to support highways, transit, and aviation. The amount of federal government support available for a particular mode provides a powerful incentive to states and local governments to choose other transportation solutions over a passenger rail solution, disregarding the public sector benefits of passenger rail. Despite this funding handicap, several states have determined that passenger rail investments are worthwhile from a broader public benefit perspective. Many states are making substantial investments and advancing planning efforts in recognition of a broader range of benefits. These states continue to advocate that the federal government become a funding partner for the intercity passenger rail mode as it has been for other modes of transportation.

2.4.3. Passenger rail's relationship with freight railroads

The future of U.S. passenger rail development lies in the effective use of available rail corridor capacity and the creation of new capacity for growing rail needs along corridors with strong demand potential. Maximizing public and private benefits will require strong working relationships between freight railroads and intercity passenger rail supporters.

Amtrak or commuter railroads own the Northeast Corridor and some line segments in the Boston, New York-New Jersey, Philadelphia, Chicago, and Los Angeles areas; elsewhere, intercity passenger service operates on corridors owned or controlled by freight railroads. Of the more than 21,000 miles over which Amtrak operates, about 97 percent are owned by freight railroads. Freight railroads also operate over approximately 600 route miles owned or controlled by Amtrak.

Freight rail and passenger rail both use steel wheels running on steel tracks to provide efficient service. Since they use the same gauge, they can often share tracks, but differences in their characteristics introduce challenges. First, the joint operation of passenger and freight service on shared tracks creates liability issues. Second, passenger trains typically operate at higher speeds than freight trains and accelerate and stop more rapidly and more often. These differences create scheduling and track capacity challenges. As freight rail volumes have increased relative to rail system capacity, overall rail congestion has increased.

Prior to 1971, U.S. railroads provided both freight and passenger service over their lines. The Rail Passenger Service Act of 1970 (RPSA) created Amtrak to preserve an intercity passenger rail system and eliminate the financial burden on freight railroads to provide passenger services on their lines. Under the RPSA and the contracts between Amtrak and freight railroads implementing its provisions, Amtrak has access rights to track owned by other railroads for the purpose of operating intercity passenger trains.

In consideration for a donation of equipment and cash, the freight railroads were relieved of the responsibility for operation of passenger rail service. Amtrak's payments to its host railroads are based upon the incremental costs the host freight railroad incurs as a result of Amtrak's operations. Any payments in excess of incremental costs must take into account the quality of service that the host railroad provides to Amtrak (e.g., on-time performance). If new or expanded Amtrak services would unreasonably impair the host's operations, capacity improvements (funded by some party other than the host railroad) would be required before Amtrak services could begin operating.

State plans for future passenger rail service propose increased frequencies and maximum speeds of 79-110 mph, assuming operations at least in part on shared-use freight corridors, with Amtrak as the "default" operator. (However, states may choose operators other than Amtrak subject to the approval of the host railroads.) As mandated by the RPSA, a successful partnership would need to provide adequate infrastructure improvements to assure that increased speeds are safe and practicable and that additional passenger trains do not unreasonably impair freight operations.[47]

Freight railroads are suppliers to Amtrak and potentially to other passenger rail providers, as are manufacturers of rolling stock. Establishing agreement on the proper level of reimbursement to the railroads for access and maintenance costs can involve lengthy negotiations. While states need to show that public investment provides a net public benefit, freight railroads expect reasonable compensation for the use and maintenance of their shared-use tracks, signals, and facilities. Initial incremental shared-use capital investments to support passenger rail services should also accommodate agreed-upon levels of growth for freight services, in order to allow both passenger and freight services to operate reliably and efficiently.

A successful agreement must include service plans that can be executed reliably, capital investment plans that assure reliability and future growth, and complete coverage of operating performance requirements. Proper planning, adequate funding, local support, and available capacity can enable the parties to reach a mutually satisfactory agreement for new or expanded rail passenger operations.

Providing adequate track capacity to address expanding passenger and freight needs is among the largest challenges in creating the future passenger rail network.

[47] Current policy of the Association of American Railroads (AAR) requires separate track for passenger rail at speeds of 90 mph and greater, subject to the availability of capacity for both freight and passenger needs. [See "Passenger Service on Tracks Owned by Freight Railroads," http://www.aar.org/ViewContent.asp?Content_ID=475.] Trains operating at maximum speeds of 79-110 mph could potentially operate on shared tracks with positive train control (PTC). (FRA describes PTC systems as integrated command, control, communications, and information systems for controlling train movements with safety, security, precision, and efficiency.)

2.4.4. Impacts of population growth

The alternatives for future passenger rail service in the U.S. must be considered in view of expectations for demographic changes resulting from U.S. population growth. While some European countries face future population losses, the U.S. expects considerable growth. The U.S. population grew 13 percent from 1990 to 2000 (from 248 to 281 million); the 2007 population is 300 million; and the U.S. Census Bureau projects a U.S. population of 420 million by 2050.

Demographic changes will have implications for the way we plan our cities, metropolitan regions, and transportation systems. The U.S. population will continue to age; the number of Americans age 75 and older is projected to grow from 17 million or 6 percent of the 2000 population to 46 million or 11 percent of the 2050 population. Public transportation must expand to support the needs of this growing population segment, and intercity passenger rail can play an important role for those who cannot or choose not to drive.

From a historical perspective, the South and the West have led the nation in population growth. Projections show an increasingly uneven distribution of population growth among the states. Texas, Florida, California, Arizona, Georgia, and North Carolina are expected to account for 63 percent of the additional vehicle miles traveled (VMT) by 2030.[48] The nation may soon be divided into states struggling with population growth and states struggling to maintain current levels of population. Both scenarios have implications for transportation planning and the allocation of resources. In addition, climate change and water supply issues could have significant impacts on demographic patterns.

America 2050: A Prospectus[49] lays out emerging mega-regions in which U.S. population growth and economic expansion will likely occur. The mega-regions consist of large networks of metropolitan regions, each covering thousands of square miles and located throughout the country. Mega-regions are defined by relationships with a common interest, which, in turn, form the basis for policy decisions. The five major categories of relationships are environmental systems and topography; infrastructure systems; economic linkages; settlement patterns and land use; and a shared culture and history. As stated in Section 1.2 of this report, the PRWG is sensitive to the Commission's interest in the ten emerging mega-regions and has incorporated them into its analysis. *America 2050* describes the impact of future transportation investment to the mega-regions as follows:

> "The recognition of the mega-region as an emerging geographical unit also presents an opportunity to reshape large federal systems of infrastructure and funding, such as future surface transportation bills, the reorganization of Amtrak, housing and urban development authorizations, and farm policy. Just as the

[48] Highway Performance Monitoring System (a database maintained by FHWA), Total VMT and Census Projections by State, 2000.

[49] Regional Plan Association, "America 2050: A Prospectus," New York: September 2006.

> Interstate Highway System enabled the growth of metropolitan regions during the second half of the 20th century, emerging mega-regions will require new transportation modes that work for places 200-500 miles across."[50]

Research and public policy forums have shown that providing an alternative, high capacity transportation mode provides a framework for both improved, more compact land development patterns and more efficient travel patterns. A more compact land use pattern, in general, could reduce automobile use nationwide by around 30 percent, cutting emissions that contribute to global warming.[51] Improving environmental efficiency through increased transit and intercity passenger rail use would be a positive step for communities and regions.

2.5. INTERCITY PASSENGER RAIL – A GLOBAL PERSPECTIVE

As we look to the future of intercity passenger rail in the U.S. and its role in the nation's overall transportation strategy, we can learn from the ways in which other countries invest in intercity passenger rail. As part of this report, we have scanned the intercity passenger rail investments made by several other countries. Appendix B provides a general overview of a variety of rail systems and approaches for funding them; it is by no means an exhaustive study and should be viewed as a starting point in the review of intercity passenger rail investment by other countries.

The 2005 estimated land area, population, population density, and Gross Domestic Product (GDP) per capita[52] for the countries listed in Appendix B should help provide a context for comparing systems and investment levels. It should be noted that population density varies widely within some countries, including the U.S.

More comprehensive and comparable financial information on this subject may be available from the Government Accountability Office in the coming year. In the 2007 Senate debate on S-294, the Passenger Rail Investment and Improvement Act of 2007, the Senate approved an amendment, offered by Senator Jim DeMint (R-S.C.) that directs GAO to conduct a study comparing passenger rail systems in certain developed countries.[53] S-294 will likely be taken up again by the House in early 2008.

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[50] Ibid.

[51] Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters and Don Chen, Urban Land Institute, *Growing Cooler: The Evidence on Urban Development and Climate Change*, 2007.

[52] GDP represents the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports.

[53] Transportation Watch. "Senate Debate on Amtrak Authorization Slowed by Sununu Internet Tax Amendment," October 25, 2007.

Country	Land Area (sq. km.)	Population (millions)	Population Density	GDP per Capita ($)
Russia	17,098,242	143.2	8.4	12,096
Canada	9,970,000	32.3	3.2	35,494
United States	9,630,000	298.2	31	43,444
China	9,600,000	1,300.0	137	7,598
Australia	7,740,000	20.2	2.6	32,938
India	3,290,000	1,100.0	336	3,737
France	552,000	60.5	110	30,693
Spain	506,000	45.1	88	27,522
Japan	378,000	128.1	339	32,647
Germany	357,000	82.7	232	31,095
Italy	301,000	58.1	193	30,732
United Kingdom	243,000	59.7	246	35,051
South Korea	100,000	48.8	480	23,926
Taiwan	36,000	22.9	636	30,084

Russia launched a major transportation plan in 2001, transforming its national railway from a government department into a decentralized commercial operation, attracting investment. Its plan includes significant investment in high-speed rail.

The **United States** budgets 0.93 percent of GDP or $112.9 billion for infrastructure annually. The U.S. investment in transportation infrastructure has been steady at about 0.9 percent of GDP since 1981. Amtrak, the national rail carrier, connects 504 communities in 46 states and receives about $1.3 billion annually in federal funds. Also, Amtrak oversees Northeast Corridor operations and directs capital projects. The Northeast Corridor service generates sufficient revenues to cover operating costs, but not major capital costs. Fourteen states provide operating and/or capital support for corridor routes, which provide 35 percent of Amtrak's daily ridership and half of all passenger trains in the system. Amtrak fully funds its 14 long-distance routes as well as some or all of the trains on eight corridors.

In **Canada**, a single national passenger rail operator, VIA Rail Canada, links 450 communities. Since 1998, Parliament has provided an annual operating subsidy of about $170 million. In 2000, the government committed to $358 million over five years for locomotives and rolling stock and to perform work on a major rail line. On October 11, 2007, the Canadian ministers of transport and of finance announced a $692 million, five-year commitment to VIA. This was in addition to joint federal/provincial funding for track projects that would benefit VIA in Quebec and Manitoba, announced June 28 and October 5, respectively.

China invests 9 percent of GDP ($160 billion annually) for new infrastructure projects. Its first priority is intercity high-speed passenger transport; 620 miles of high-speed track have been constructed annually for the past 10 years. Over four years starting in 2006, China plans to build about 3,300 miles of high-speed lines. China's plan calls for the government to nearly quadruple its investment in the nation's railroads to almost $200 billion by 2010. The aim is to create 10,500 new route miles. A $4.2 billion rail line between Beijing and

Tibet has been completed. In addition to government spending, rail funds come from bank loans, railway construction bonds, and government loans from Japan and Germany.

Australia's infrastructure investment is 3.6 percent of GDP, including $1 billion for rail over five years. Sixteen operators provide passenger rail service. Other than the national railway system and commission, funding of state-owned railways has been a state responsibility. Funding for an 880-mile rail line completed in 2004 was financed 37 percent by governments, 57 percent by the private sector and 6 percent by commercial loans. After 50 years of private sector operation, the infrastructure and trains will revert back to the government in 2054.

India budgets 3.5 percent of GDP ($25.5 billion) for infrastructure. It has the world's second largest railway network under single management. While its rail system is in disrepair, it is beginning to make improvements.

France is number one in the world in terms of high-speed train use. Its intercity passenger rail operator is a public company with state-owned assets. France provides $2.5 billion for regional operating subsidies, $1 billion for debt service, and $1.1 billion for infrastructure renewal each year. An increase in access fees assessed to pay for track maintenance has allowed the public subsidy for infrastructure to be reduced recently.

From 2005-06, **Spain** budgeted 1.7 percent of GDP for infrastructure, 12.6 percent of which was for rail. Its rail passenger operator is state-owned and primarily funded by the central government. Regional governments provide some additional funds and participate in planning. Since 2000, Spain has budgeted over $120 billion for all modes; another $200 billion is committed through 2020. Spain offers high-speed service in the Mediterranean Corridor. High-speed lines to link all provincial capitals to Madrid are under construction.

Japan budgets more than 10 percent of spending on infrastructure, but both its infrastructure budget and its population are declining. Six passenger rail companies own their tracks. High-speed rail lines connect highly populated cities. Bullet trains transport passengers distances too far to commute by car and too short to travel by plane.

Germany's railway system reaches almost every part of the country. Any of 300 rail operators can bid on contracts, though a state-owned company (DB) is the primary operator in most markets. The government provides $8.9 billion in regional operating subsidies annually to its 15 Lander (states); the source of the federal subsidy is the transportation fund, which is supported by a motor vehicle fuel tax. The government also provides $5.1 billion annually to DB for infrastructure development and maintenance.

Italy's intercity train network connects its cities and towns, with over 372 railway miles under construction. The government is budgeting $5.1 billion to expand bullet train

lines and freight capacity. In 2004, capital funding for the rail sector was about $2.9 billion for a network of high-speed rail lines that could reach 625 miles by 2008.

The **United Kingdom**'s intercity rail system covers 10,000 miles in Great Britain and 189 miles in Northern Ireland. Urban rail networks are well developed. High-speed trains run through the Channel Tunnel between the U.K. and the Continent. The U.K.'s railway system is privatized, but the government sets strategic direction for the railways and provides operating subsidies of about 50 percent of all costs.

South Korea's state-owned rail system covers 2,100 miles. A high-speed train from Seoul to Busan was recently completed and another is under construction from Seoul to Mokpo. $10.6 billion in Phase I KTX (Korean Train Express) funds came from loans, the government, and the Korea High Speed Rail Construction Authority. Phase II funds of $15.3 billion for the Mokpo line are not finalized; the line may be constructed under a build-operate-transfer agreement.

Taiwan's conventional railway network of 1,635 miles and 216 stations connects small and remote towns and cities; its high-speed line connects major cities. Easy transfers between high-speed and conventional lines are possible at several stations. The new 214-mile high-speed rail line from Taipei to Kaohsiung is one of the world's largest privately funded rail construction projects. It is valued at $13 billion and funded by Taiwan High Speed Rail Corporation under a 35-year concession agreement signed in 1998.

Chapter

3

Intercity passenger rail needs through 2050

3.1. INTERCITY PASSENGER RAIL NETWORK COST ESTIMATES

The PRWG assumed continuation of all existing intercity passenger rail services, but the PRWG vision maps for 2015, 2030, and 2050 gradually increase the scope of service. The PRWG added several origin-destination corridors to the 2050 map. These corridors include US DOT-designated corridors, and corridors in which states have initiated planning or are interested in developing service. The PRWG-envisioned national intercity passenger rail network was designed to address current passenger rail capacity issues, estimated future demand, increased market share, and diversion of passenger travel from highways and airways. It was also designed to provide mobility options and connections where few, if any, currently exist.

After developing a national intercity passenger rail system vision map through 2050, the PRWG developed cost estimates for the system in 2007 dollars, which will allow comparisons with other modes. The cost estimates were segmented by time with immediate needs from 2007-2015, mid-term needs from 2016-2030, and long-term needs from 2031-2050. The estimates include the costs and timeframes of establishing new service as well as those for upgrading service (higher speeds, more frequencies) and for bringing the current system to a state of good repair. The estimated costs are reported by time period in the aggregate and as annualized numbers.

The costs included in this report are, of necessity, broad planning estimates. Only through more detailed analysis at the corridor and line levels can operating plans be developed and infrastructure requirements more accurately estimated. These infrastructure requirements and costs will need to serve expanding passenger and freight railroad needs, particularly for shared-corridor environments.

Through the creation of this model, the PRWG seeks to provide the Commission with a better sense of potential national system costs, more so than any other data set developed to date. The model provides a broad perspective and should not be relied upon to provide specific, detailed information about any one corridor.

3.1.1. Analytical framework

As with development of the vision map, the PRWG began its needs analysis with the existing national system and evaluated expansion needs and opportunities. The PRWG did not expand on the current system's operations, but instead evaluated existing operations for additional needs. The PRWG worked with Amtrak staff to determine the capital costs for the additional needs and to reach a state of good repair on its existing system for each of the specific timeframes.

The PRWG then reviewed updated capital needs figures provided by individual states to the American Association of State Highway and Transportation Officials (AASHTO) for corridor routes with developed studies and reliable estimates within each state. AASHTO summarized capital costs from the states in 2006 dollars for the years 2012 and 2027. The PRWG increased those baseline costs using a 3 percent per year inflation factor to bring the numbers in line with the 2015 and 2030 timeframes.

To calculate the needed capital costs for each corridor, the PRWG needed rolling stock figures, station costs, recapitalization costs, and the frequency of corridor operations. The inclusion of this information in the AASHTO data was inconsistent. Further, the AASHTO data did not include estimates beyond 2027. Therefore, costs for these corridors were also determined using a cost-estimation model.

3.1.2. Cost-estimation model

The PRWG developed a model to provide a capital cost estimate for U.S. intercity passenger rail needs as defined by the PRWG vision of the national intercity passenger rail network. The model estimates capital costs for the various intercity passenger rail corridors by timeframe and for the corridor overall. The model also estimates the diversion from highways and fuel consumption benefits of the defined corridor routes and levels of service.

The model creates the estimates based on the route miles for each corridor and two user inputs. The first user input is a set of parameters. The PRWG developed specific level-of-service parameters based on system characteristics, including:

- round trip frequency;
- cost per mile; and
- speed for each route.

The average cost-per-mile parameter is a function of route frequency and speed and the resulting need to:

- operate on joint-use track;
- construct additional track within a freight right-of-way; or
- develop new right-of-way for higher speed operations.

No route segment suggested to be added is longer than 500 miles between major stations. The following table describes each level of service contained in the model and the rate per mile used for estimating capital costs for that level of service.

Passenger rail level of service characteristics	
Level of service	**Average cost per mile (millions)**
Long distance	$2
Low (shared right-of-way, speed up to 79 mph)	$4
Medium (separate track/shared right-of-way,[54] speed 79-110 mph)	$7
High (dedicated right-of-way, speed > 110 mph)	$35

Other model parameters include:

- station and recapitalization costs;
- unit costs of locomotives and passenger cars; and
- passenger capacity.

The second user input is the selection of an estimated level of service for each corridor in each timeframe within the scope of the group's charge (through 2015, 2016-2030, and 2031-2050). This input allows for the start-up of initial service as well as service upgrades in subsequent timeframes where applicable.

With these two sets of inputs, the model determines a cost estimate for each time period and an overall cost estimate through 2050, in 2007 dollars. The cost estimates are based on the:

- rate per mile for each level of service;
- calculation of other capital costs (station and recapitalization costs); and
- estimated rolling stock costs, based on a calculated number of train sets needed.

These cost estimates are then added to the cost estimates for needs and the "state of good repair" status of existing Amtrak service, for a total cost need by each time period for the national intercity passenger rail network as determined by the PRWG vision map.

Due to the unique nature of the proposed California high-speed rail corridor, the model was not used to calculate its cost. Instead, cost estimates based on the approved Environmental Impact Statement (EIS) for the corridor were included in the PRWG's national totals. The California system is currently estimated to cost $70 billion ($20

[54] Current policy of the Association of American Railroads (AAR) requires separate track for passenger rail at speeds of 90 mph and greater, subject to the availability of capacity for both freight and passenger needs. [See "Passenger Service on Tracks Owned by Freight Railroads," http://www.aar.org/ViewContent.asp?Content_ID=475.] Trains operating at maximum speeds of 79-110 mph could potentially operate on shared tracks with positive train control (PTC). (FRA describes PTC systems as integrated command, control, communications, and information systems for controlling train movements with safety, security, precision, and efficiency.)

billion in the 2007-2015 timeframe and $50 billion in the 2016-2030 timeframe). These costs are included in the timeframe and aggregate cost totals.

The parameters of the model are set at levels to provide a conservative cost estimate, meaning that the estimated costs from the model are likely higher than actual costs. This has been verified by comparing costs in the model with those in the AASHTO data for routes with approved environmental documents, approved state plans, and data submitted for the corridors by states. Actual capital costs will be determined by location-specific analyses of proposed operating plans, track configuration, yard and station plans, environmental impact remediation requirements, and partnership agreements with freight railroads.

The model was not used to develop operating revenues and costs as the information for estimating ridership and revenue is, in most circumstances, simply not available. As part of a mature intercity planning process, the operating characteristics and associated funding requirements will need to be estimated.

Finally, it should be noted that Commissioner Tom Skancke asked Commission staff to analyze a potential western U.S. high-speed network. The PRWG did not have adequate time to analyze the network, but Commissioner Skancke asked that the western high-speed network map be included in this report. A map of the western high-speed network, as envisioned by Commissioner Skancke, is included in Appendix D.

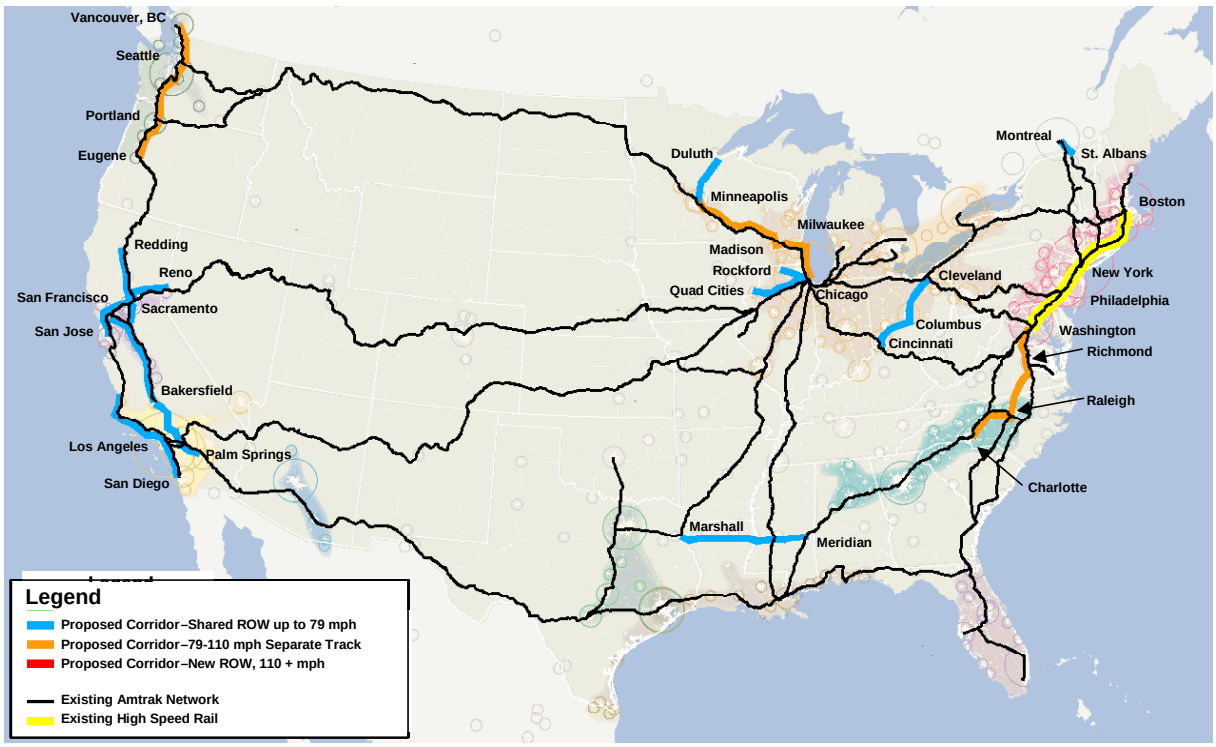
3.1.3. Cost/needs estimate

The immediate timeframe, 2007-2015, is envisioned as the beginning of re-building and re-establishing a national intercity passenger rail network. During this time period, it is proposed that existing service remain in place. In addition, we would:

- bring some existing service to a state of good repair;
- upgrade existing service where demand is greatest; and
- add new service where environmental and engineering work are complete, including the California high-speed rail corridor.

The 2015 map below is for illustrative purposes only and does not constitute the exact routes that would be included in the passenger rail network by 2015. States may determine that some of these routes should not be included and that others should be added during this time period.

2015 PRWG Proposed Intercity Passenger Rail Network



Background map based on "America 2050: A Prospectus ", www.america2050.org, Regional Plan Association

The estimated cost for the immediate timeframe is $66.3 billion, for an annualized total capital cost[55] of $7.4 billion per year. This $66.3 billion estimated cost includes:

- $50.2 billion for infrastructure,
- $2.7 billion for station and recapitalization costs, and
- $13.4 billion for rolling stock.

$20 billion for the California high-speed rail corridor is included in the $66.3 billion.

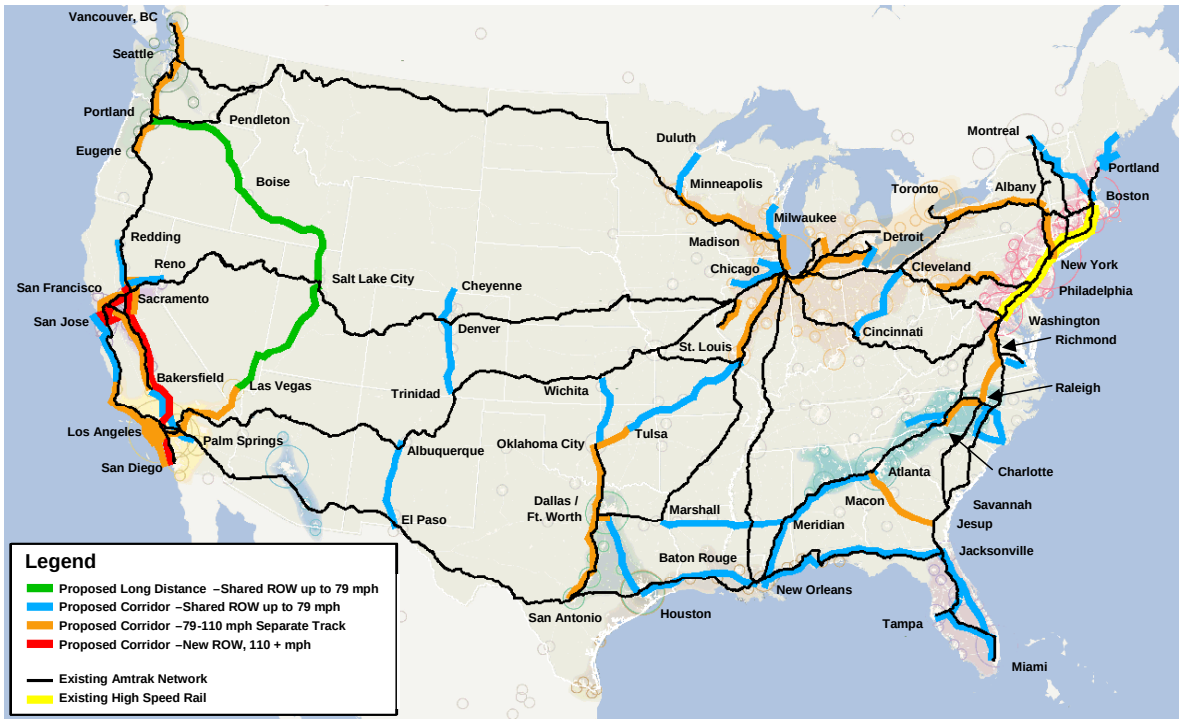
For a list of the specific corridors suggested to be added and upgraded by timeframe, see Appendix C.

[55] Total capital costs are calculated for all units of government and the private sector, as may be appropriate.

The mid-term 2016-2030 time period is envisioned as a period of significant growth for intercity passenger rail. The majority of new intercity regional corridor routes would be added or re-established during this time period. The California high-speed rail corridor would be completed, the majority of the current system would achieve a state of good repair, and most, if not all, service would be upgraded to better meet demand.

The 2030 map below is for illustrative purposes only and does not constitute the exact routes that would be included in the passenger rail network by 2030.

2030 PRWG Proposed Intercity Passenger Rail Network



Background map based on "America 2050: A Prospectus", www.america2050.org, Regional Plan Association

The estimated total capital cost of the network for the 2016-2030 time period is $158.6 billion for an annualized cost of $10.6 billion per year. The $158.6 billion total includes:

- $115.4 billion for infrastructure costs,
- $5.3 billion for station and recapitalization costs, and
- $37.9 billion for rolling stock costs.

The $158.6 billion includes $50 billion to complete the California HSR corridor.

For a list of the specific corridors suggested to be added and upgraded by timeframe, see Appendix C.

The last phase of the proposed network would be completed in the 2031-2050 time period. Corridor routes connecting regions and population centers would be added or reestablished. Intercity passenger rail service would be available in all of the 48 contiguous states. Without these routes, the rail systems in several regions would be isolated or have to rely on inefficient routes to travel to other regions by rail. These routes would also provide mobility options for certain areas of the country where intercity and interstate travel is currently limited to automobile only. It is in many of these areas that modal choices are most important, yet least available.

The 2050 map below is for illustrative purposes only and does not constitute the exact routes that would be included in the passenger rail network by 2050.

2050 PRWG Proposed Intercity Passenger Rail Network

Background map based on "America 2050: A Prospectus", www.america2050.org, Regional Plan Association

Also during this time period, corridor routes (mostly in the East and the Midwest) would be added and re-established to connect major population centers with mid-size population centers and to extend corridor routes to additional communities. Many of the corridors added and re-established during previous time periods may be upgraded to higher levels of service. Finally, it is anticipated that the entire network would achieve a state of good repair by 2050.

The estimated total capital cost of the network for the 2031-2050 time period is $132.3 billion for an annualized cost of $6.6 billion per year. The $132.3 billion total includes:

- $78.2 billion for infrastructure costs,
- $6.6 billion for station and recapitalization costs, and
- $47.5 billion for rolling stock costs.

For a list of the specific corridors suggested to be added and upgraded by timeframe, see Appendix C.

The total capital cost estimate for re-establishing the national intercity passenger rail network between now and 2050 is $357.2 billion in 2007 dollars, for an annualized cost of $8.1 billion. The estimated timeframe, aggregate costs, and annualized costs for the network are shown in the table below:

Intercity Passenger Rail Needs (2007-2050) (2007 dollars in $ billions)					
	Infrastructure costs	**Other capital cost (stations and recapitalization)**	**Rolling stock**	**Total capital cost**	**Annualized cost**
Immediate (2007-2015)	$50.2	$2.7	$13.4	$66.3	**$7.4**
Mid-term (2016-2030)	115.4	5.3	37.9	158.6	**10.6**
Long-term (2031-2050)	78.2	6.6	47.5	132.3	**6.6**
Total	**$243.8**	**$14.6**	**$98.8**	**$357.2**	**$8.1**

3.2. QUANTITATIVE BENEFITS OF A NATIONAL INTERCITY PASSENGER RAIL NETWORK

The model developed by the PRWG to estimate costs was also used to estimate benefits of a national intercity passenger rail network as defined by the PRWG vision map. The model estimated benefits based on a set of parameters obtained from the US Department of Energy, the US DOT, and other sources and the selected levels of service of each route in each timeframe. The model shows some benefits with an expanded intercity passenger rail system. Those preliminary benefits are discussed in Section 3.2.1.

However, any national benefits analysis is extremely complex. As with other modes, benefits of rail are generally assessed on a corridor basis. Analyses of intercity rail corridor projects currently underway have included assessments of the benefits mentioned in this report – congestion mitigation, emission reductions and environmental and economic

benefits. The PRWG believes that additional information and research could be undertaken to further quantify the benefits of passenger rail. Section 3.2.2 recommends a research approach.

3.2.1. Benefit estimates

The model showed promising results for diverted passenger miles and fuel consumption. For each corridor analyzed, the PRWG determined the number of passenger rail miles per year based on the frequency of intercity passenger rail operations. The model used a 45 percent average load factor for filled passenger seats during operations and assumed that train passengers would be primarily diverted from highways. It valued travel-time-saved at $11.20 per hour; this amount comes from US DOT's Transit Economic Requirements Model (TERM). Based on this, the model showed annual benefits as follows:

	2007 – 2015	2016 – 2030	2031 – 2050
Annual vehicle miles diverted	3.9 billion	13.0 billion	22.5 billion
Annual passenger miles diverted	8.2 billion	26.9 billion	46.7 billion
Annual value of time saved	$0.7 billion	$3.1 billion	$6.6 billion

The model also provided a preliminary perspective on fuel consumption.

	2007 – 2015	2016 – 2030	2031 – 2050
Annual value of net fuel savings	$0.4 billion	$1.3 billion	$2.2 billion

It should be noted that these estimates are based on current dollar values for gasoline and diesel fuel and do not attempt to ascertain how engine and fuel technology may change over the next 40 years.

3.2.2. Recommended additional research

The PRWG tried to assess the value of congestion and emissions mitigation created by a national intercity passenger rail network. However, understanding the benefits of enhancing rail nationally will require specific and comprehensive research, outside the traditional emission savings numbers and corridor-specific cost/benefit analyses. Technological advances can only be imagined for the next 40 years into the year 2050. A national examination of environmental benefits would be inaccurate without accounting for significant variations among rail corridors. Energy consumption, for example, differs depending on geography – it takes more fuel to climb a mountain or to stop and start between stations. Rail users and non-users also vary regionally. The purpose each corridor serves depends on the population it serves.

Following is a list of considerations for additional research:

User benefits:

- time and cost savings to rail travelers;
- reduced congestion on highways and airways; and
- corridor-specific factors impacting benefits – pent-up demand, ridership, and diversion.

Non-user societal benefits:

- climate change mitigation;
- land use impacts – encouragement of multi-modal developments and higher densities near those developments;
- economic development;
- safety benefits associated with diversion of highway travelers to rail;
- potential health benefits;
- reduced energy consumption;
- improved air quality;
- decreased water pollution; and
- market valuations of non-user types of benefits.

Ridership and diversion:

- the public's preferences for train travel, based on the bundle of services offered on the train compared with other modes.

Chapter

4

Conclusions and recommendations of the PRWG

4.1. CONCLUSIONS

The Commission's vision is to "create the preeminent transportation system in the world." In the late 1800s/early 1900s, the U.S. saw the rise of the transcontinental railroad. In the 1940s and 1950s, transportation planners and policy makers came to consensus on a plan and funding to build the Interstate highway system. At that time, the nation's passenger rail system was preeminent in the world. For the last 50 years, however, the nation has had no vision for intercity passenger rail. In many parts of the nation, rail lines have been abandoned. Our federal funding policy emphasis has been on the highway and aviation systems, which are now congested.

The Commission is now taking stock of what needs to occur over the next 50 years. The PRWG believes it is time to rebuild a vibrant, national intercity passenger rail network. The network should include intercity corridor trains supported by the national framework of long-distance trains (the current Amtrak system). The basis for this conclusion is outlined in the report:

- Intercity passenger rail is among the safest modes of transportation. Each year, more than 40,000 people die on our highways. To the extent that people have the option to travel by other modes, such as intercity passenger rail, we can improve the safety of our transportation system. (Section 2.3.1.)

- The sheer size of our nation makes transportation infrastructure planning and construction a complex and expensive process. While intercity passenger rail will be capital-intensive, it will also be a sound investment in our future. It will support an expansion of transportation system capacity that will, in turn, support environmental and energy efficiency objectives while providing increased mobility options to intercity travelers. Linking passenger rail network expansions with freight railroad capacity enhancements also provides the opportunity for resource efficiencies supporting both freight and passenger mobility objectives. (Sections 2.3 and 3.2)

- Rail travel is more energy efficient than both highway and air travel. If the system envisioned by the PRWG is implemented, rail has the capacity to:
  - divert passenger miles from highways to rail;
  - divert passenger miles from airlines to rail;
  - reduce fossil fuel usage;
  - mitigate highway and airway congestion impacts on remaining users; and
  - reduce greenhouse gas emissions. (Sections 2.3 and 3.2)

- In the near future, U.S. population growth will create even worse highway and aviation congestion in the nation's ten emerging mega-regions, resulting in the need for a more balanced, multi-modal system. Highway and airway congestion will continue to increase in densely populated areas, even with planned improvements. The passenger rail system can improve mobility and reduce congestion, particularly in intercity corridors for trips of 100 to 500 miles in length. (Section 2.3.4, 2.3.5 and 2.4.4)

- A balanced transportation system is a critical element of the nation's security system. Whether responding to an isolated catastrophic event or another emergency, intercity passenger rail can be used to help evacuate groups of people who have no other means of evacuation. Intercity passenger rail also serves as a back-up transportation mode in the event that another mode is temporarily unavailable. (Section 2.3.7)

- The population will continue to age. The number of Americans age 75 and older is projected to grow from about 16.6 million or 6 percent of the U.S. population in 2000 to 46 million or 11.4% of the population in 2050. Public transportation must expand to support the needs of this growing population segment. Intercity passenger rail can provide an important mobility option for those who cannot or choose not to drive. (Section 2.4.4)

- Other nations and trading blocks recognize the importance of intercity passenger to travelers, economic development, and the environment. France, Spain, Russia, China and other countries are investing significant public dollars in their intercity passenger rail and high-speed rail systems. (Section 2.5, Appendix B)

4.2 POLICY RECOMMENDATIONS OF THE PRWG

Recommendation #1:
Identify the national passenger rail network
The Commission should clearly articulate its vision for the passenger rail network. The PRWG has identified its vision of the network through 2050, including visions for different timeframes.

The passenger rail network envisioned would include the current national system, planned state corridors, and additional segments connecting medium-sized cities and high-speed corridors in densely congested areas. The key performance measure for the system would be the delivery of reliable, on-time passenger service that is travel-time competitive with auto travel. Among the other performance measures that should be considered are congestion mitigation, safety and environmental benefits, and reduced energy use.

Recommendation #2:
Fund construction of the passenger rail system
The implementation of the PRWG's intercity passenger rail vision will require a funding and financing plan, specifically the creation of a new federal program: an Intercity Passenger Rail Program. This program, along with more flexibility in existing modal programs, will be required to advance balanced transportation improvements—both from an infrastructure and a management approach.

To implement the national and regional corridor vision, the PRWG recommends initial funding of $5 billion annually for intercity passenger rail, including Amtrak funding and grants to states.

The report has outlined different levels of financial support for the network in different time frames. The PRWG recommends the following elements be part of the federal role in financing intercity passenger rail:

- Finance the system on a cost-to-complete basis.
- Provide a federal-state/local cost share of 80% federal/20% state/local for state-sponsored corridors.
- In financing state corridor projects, focus on capital expenses.

Funding options could include:

- Passenger Facility Charge (PFC) and/or passenger ticket charge.
- Highway Trust Fund (HTF) funding, with a specific portion of any gas tax increase directed to intercity passenger rail. This option could be accomplished by creating a specific Intercity Passenger Rail Account, similar to the highway and mass transit accounts of the HTF. This approach assumes a **significant increase** in the gas tax and recognizes that highway and transit needs are substantial.
- Federal General Fund (GF) financing, in recognition of the larger public benefits of intercity passenger rail, including economic, environmental, and energy conservation impacts. GF financing is provided to public transportation, aviation programs, and Amtrak today.

- Tax credit bonds issued by the federal government, with the federal government paying both the sinking fund costs and the tax expenditure costs. Under this approach, Congress would need to establish a federal entity to manage the program.
- Federally financed GHG emissions programs are needed to fund strategies to cut traffic growth and help local governments promote better land use. As intercity passenger rail can contribute to achieving both of these goals, any GHG program should make stations, equipment, signalization, and other infrastructure eligible for funding.

Recommendation #3:
Implement the passenger rail network
The passenger rail network will promote national intercity travel and, as such, it should be a partnership among federal, state, and local governments. Clearly define the institutional roles of different levels of government to assure that passenger rail is implemented. A more detailed discussion of the group's recommendations on an implementation approach can be found in Sections 4.2.1 and 4.2.2.

Recommendation #4:
Create a national rail strategy
The PRWG has outlined its vision for a future passenger rail system. The Association of American Railroads (AAR) has provided the Commission with its analysis of freight rail issues. The passenger system relies on the freight system for access to rail infrastructure; therefore, it is important to consider a process in which freight and passenger rail providers and other stakeholders can work to create the broad principles of the nation's rail strategy.

There may be corridors in the PRWG's vision that will be difficult to implement because of freight rail capacity constraints. In addition, commuter rail needs must be considered. Policy options should enable passenger trains to achieve their full potential and freight trains to grow with demand and generate sufficient revenue to expand rail capacity.

The first step in resolving the rail infrastructure capacity crunch is to take steps to analyze the problem and create solutions to address problems occurring in specific corridors. The public and private sectors must come together in bilateral negotiations to create these solutions. We have seen some successes. The Alameda Corridor in California, the CREATE project in Illinois, and the Mid-Atlantic Rail Operations Plan in the Northeast are examples of how the public and private sectors can address extremely complex transportation problems working together.

Recommendation #5:
Invest in data collection to support multi-modal transportation planning
This nation must recommit to investing in data collection to support transportation decision-making. The PRWG considers it critical that the federal government collect more detailed information about intercity travel patterns. This could include restarting and adding more intercity-focused questions to the National Household Travel Survey and Census Bureau reports, including the Vehicle Inventory and Use Survey. Policy makers and planners need better tools to assess modal trade-offs as they evaluate the user and non-user benefits of transportation projects in the future.

4.2.1. Supporting detail for implementing the passenger rail network

The PRWG's intercity passenger rail vision will be a significant challenge to implement. Passenger rail must find capacity on freight rail lines; infrastructure is extremely expensive; and added to this challenge is the inclusion of commuter rail in the mix. Significant changes will be needed at the institutional levels of government to support a broad-based, multi-modal, balanced process for meeting the nation's mobility challenges.

The PRWG recommends the Commission consider the following guiding principles regarding the decision-making process and governance associated with the management and distribution of funds for the Intercity Passenger Rail Program:

- Decision-making for improving transportation mobility should be resolved at the local, regional, multi-state, or state level under planning processes established by the states and incorporated into their State Transportation Improvement Plans.
- Infrastructure investments and management approaches toward achieving transportation mobility goals should allow for consideration of all modes and management approaches.
- Funding provided for existing modal programs—including intercity passenger rail—should be consistent at the federal level. Federal funding programs should not bias states against particular transportation solutions.
- Bilateral negotiations and collaboration between private and public sector interests will be critical to achieving workable agreements for passenger rail access to freight rail lines.

4.2.2. Government roles and responsibilities for implementing the passenger rail network

Ultimately, the United States Congress will need to establish the parameters for governance of the intercity passenger rail program in a comprehensive transportation authorization bill. The primary federal role for an Intercity Passenger Rail Program should be rebuilding the passenger rail system and funding the majority of capital costs associated with expanding the network. It should establish planning standards and define the framework for cooperation among the stakeholders.

An effort to rebuild the intercity passenger rail system and manage the federal Intercity Passenger Rail Program will require a federal partner comparable to the Federal Highway Administration's role in the implementation of the Interstate highway system. Congress would need to give a federal entity the authority to:

- define consistent engineering standards;
- establish planning process guidelines;
- propose management requirements to support the federal grant process; and
- identify performance measures for the system.

One approach could be to expand the role of the Federal Railroad Administration (FRA) to support passenger rail planning and manage federal grants from the Intercity Passenger

Rail Account. The FRA could also support the joint development of corridor passenger and freight investment plans as part of a collaborative process. However, this would be a significant institutional change in FRA's current mission.

States would be the key providers of corridor services and recipients of federal Intercity Passenger Rail Program grants. Some states would accomplish this through their state departments of transportation; other states would create special authorities or enter into multi-state compacts. States would provide the non-federal match for federal dollars, would be responsible for stewardship of the federal funds, and would support the ongoing operating costs associated with the service. Finally, as envisioned for other modes, performance measures, such as on-time performance, could be created for intercity passenger rail.

Private-sector involvement in the passenger rail network planning, development, and operation should be the prerogative of the states. States might consider public private partnerships for elements of their passenger rail service, such as the provision of rolling stock, construction, engineering, and other services. As noted in Section 2.5 of this report, the private sector is investing in the passenger rail systems of other countries. However, since farebox receipts are not adequate to fully fund operating and capital costs, the public sector must provide funding for infrastructure investments.

The following chart outlines the potential key roles and responsibilities of the different levels of government:

Institutional Responsibilities for the Implementation of the Passenger Rail Network	
ROLE	**ACTIONS**
CONGRESS – Broad vision – Federal funding – Broad rail program parameters – Statutory empowerment to a federal passenger rail agency	– Approve vision – outlined in map of system – Provide capital funding – Establish broad parameters for system network – Establish benchmarks/timelines for states and the federal government – Define statutory duties to a federal government entity to carry out the congressional vision
STATES, REGIONAL AUTHORITIES AND SERVICE OPERATORS – Negotiate with freight railroads – Specify network segments and service levels – Develop state/regional rail plans	– Enter into regional compacts as appropriate – Outline rail network plans and intermediate stages – Assess and identify private-sector involvement in plan implementation – Negotiate agreements with freight railroads – Identify network segment costs – Perform feasibility studies – Provide required non-federal match for capital funding – Provide operating and capital financial support – Identify passenger rail operators – Manage program/project implementation
FEDERAL PASSENGER RAIL ADMINISTRATION – Oversight – Program management support – Compilation of state plans – Report to Congress	– Assure state adherence to congressional requirements – Assure network segments comply with congressional network vision – Facilitate stakeholder involvement in process – Support environmental assessments – Review feasibility studies

4.3. CLOSING COMMENTS

The PRWG would like to thank Commissioner Frank Busalacchi for the opportunity to provide the Commission its passenger rail perspective. We would also like to thank the Commissioners for their willingness to include passenger rail in their study of the surface transportation system. Intercity passenger rail is a critical component of our transportation system. According to architectural historian Sarah Williams Goldhagen, "When infrastructure needs large and small have been addressed in the past 20 years, it has been because leaders decided to take action and then refused to eat or sleep until their pet project was completed."[56]

It will take commitment to create a bold transportation vision for the country, and it will certainly take commitment to "create the preeminent transportation system in the world." We hope that our report has provided an important perspective to their work.

[56] Goldhagen, Sarah Williams, The New Republic, "American Collapse," August 27, 2007.

Appendix A

Emerging U.S. Mega-Regions

Arizona Sun Corridor

The Sun Corridor is equivalent to Indiana in size and population but will add another Indiana's worth of residents by 2040. Located in a desert environment, Phoenix and Tucson – the mega-region's biggest metropolitan regions – have instituted water conservation requirements and are promoting the use of desert landscaping. These efforts provide the two metros with enough water for perhaps up to twenty million people, preparing the Sun Corridor for current and future growth.

Cascadia

The vision for Cascadia links Seattle, Portland, and Vancouver, British Columbia, with high-speed rail, while protecting the area's unique and pristine environment. Other strategies highlight these cities' shared high-tech competencies, commitment to environmental sustainability, and creative clusters in film, music, and green building.

Florida

The Florida mega-region is one of the fastest growing in the nation and possesses a wealth of diversity, with six of every ten new residents in the last decade coming from foreign countries. It is both dense and populous, with the major international city of Miami acting as a gateway to Latin America. Regional strategies to protect the Everglades have preserved the natural heritage of the state.

Great Lakes

The Great Lakes mega-region is exploring ways to grow its economy in the face of the shrinking role of the manufacturing sector. The region's assets include the environmental resources and amenities of the Great Lakes and a strong research and cultural tradition tied to its leading public universities.

Gulf Coast

The devastation of Hurricanes Katrina and Rita and the displacement of victims along the I-10 corridor highlighted the environmental, transportation, and economic links of the Gulf Coast. Despite the recent destruction, the region is expected to grow due to the continued in-migration of retirees from the Midwest.

Northeast
The Northeast is a powerhouse of density and economic output, producing 20 percent of the nation's Gross Domestic Product with 18 percent of the population and only 2 percent of the nation's land area. Over the next generation, the Northeast will add 18 million new residents. This population growth will demand infrastructure investments and economic growth to accommodate these new residents while preserving quality of life.

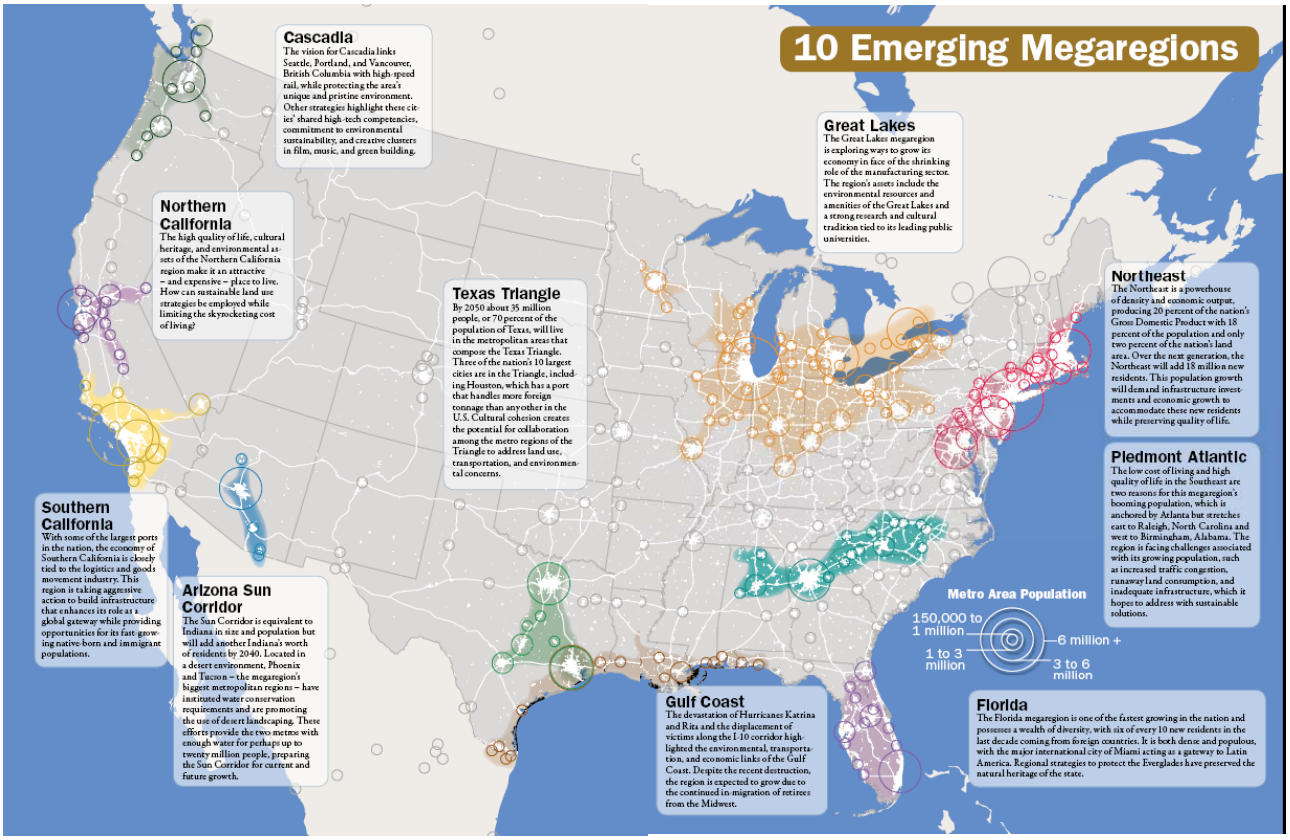
Northern California
The high quality of life, cultural heritage, and environmental assets of the Northern California region make it an attractive – and expensive – place to live. How can sustainable land use strategies be employed while limiting the skyrocketing cost of living?

Piedmont Atlantic
The low cost of living and high quality of life in the Southeast are two reasons for this mega-region's booming population, which is anchored by Atlanta but stretches east to Raleigh, North Carolina, and west to Birmingham, Alabama. The region is facing challenges associated with its growing population, such as increased traffic congestion, runaway land consumption, and inadequate infrastructure, which it hopes to address with sustainable solutions.

Southern California
With some of the largest ports in the nation, the economy of Southern California is closely tied to the logistics and goods movement industry. This region is taking aggressive action to build infrastructure that enhances its role as a global gateway while providing opportunities for its fast-growing native-born and immigrant populations.

Texas Triangle
By 2050 about 35 million people, or 70 percent of the population of Texas, will live in the metropolitan areas that compose the Texas Triangle. Three of the nation's 10 largest cities are in the Triangle, including Houston, which has a port that handles more foreign tonnage than any other in the U.S. Cultural cohesion creates the potential for collaboration among the metro regions of the Triangle to address land use, transportation, and environmental concerns.

Map of Emerging U.S. Mega-Regions



Appendix

B

Intercity Passenger Rail Investment: A Global Perspective

	DESCRIPTION	FINANCING
RUSSIA	**Land area:** 17.1 million sq. km.[1] **Population:** 143.2 million (2005 est.) **Population density:** 8.4 **GDP per capita:** $12,096[2] • Russian Railways (RZD) is one of the largest railway companies in the world with 53,127 miles of track and 1.2 million employees. • Sochi's winning bid to host the 2014 Winter Olympic Games has encouraged the president of RZD to propose a rail link between the center of Sochi and the airport and high-speed service on some sections of the Moscow-Sochi line. • Trains currently cover the 1,500-mile route through mountainous terrain from Moscow to Sochi in 30 hours; the planned high-speed service will shorten the ride to 15 hours. Russia has ordered trains capable of traveling at 155.3 mph as higher speed trains would be too expensive. • Russia's only high-speed train (the R-200 built in the 1970s) runs from Moscow to St. Petersburg and is always filled to capacity. The R-200 will be replaced by Velaro RUS trains ordered from Siemens in Germany. The contract for delivery of eight trains is for $200 million. • Alstom (France) will build trains for St. Petersburg-Helsinki. Travel time between Helsinki and St. Petersburg will be reduced from 5.5 to 3.5 hours. • RZD also has an agreement with Italy's Finmeccanica to develop a high-speed regional train. • RZD has identified 18 major lines where high-speed service is feasible and is taking steps to move production to Russia rather than continuing to purchase Western technology.[3]	• Russia launched a transportation plan in 2001 to transform the national railway from a government department into a decentralized commercial operation, attracting investment. The high-speed rail company set up in the 1990s went bankrupt, but Russian Railways (RZD) reports a net profitability on core operations in 2006 of approximately $1 billion.[4] • RZD was formed in 2003 by combining the 987 organizations previously administered by the Ministry of Railways. It is a 100% government-owned company separate from the Federal Railway Transport Agency, which regulates rail transportation, drafts legislation and licenses railway activities. RZD plans to invest $2.35 million in development of the rail link from the airport to the center of Sochi.[5] • As part of the reform plan, cross-subsidizing loss-making passenger operations from RZD's profitable freight activities was ended by physically separating passenger and freight operations and by encouraging both national and local governments to subsidize passenger services. • Russia's new Federal Passenger Agency recognizes that the low level of competitive-ness and profitability in passenger rail service does not result from poor management, but from conditions imposed by the state to provide rail services for social reasons rather than profitability. The Agency intends to split long-distance passenger services into two components, commercial/competitive trips and social/regulated trips. If the new structure is successful, RZD will convert the Agency into a company whose shareholders may also include private partners. • As in Europe, consideration is being given to complete separation of infrastructure from operations. Other changes may include an increased number of local passenger operators, sale of repair and maintenance subsidiaries, and a greater role for the private sector.[6]

[1] One kilometer = 1,000 meters or 0.62 miles.

[2] From the International Monetary Fund's list.

[3] Rossiyskaya Gazeta, *Russia, Beyond the Headlines*, An Advertising Supplement to *The Washington Post*, August 30, 2007.

[4] Ibid.

[5] Ibid.

[6] Briginshaw, David, *International Railway Journal*, Russian rail revolution enters final phase, October 1, 2006.

	DESCRIPTION	FINANCING
CANADA	**Land area:** 9.97 million sq. km. **Population:** 32.3 million (2005 est.) **Population density:** 3.2 **GDP per capita:** $35,494 • The primary provider of intercity passenger rail operations is VIA Rail Canada, a government-owned corporation. Transport Canada, a government agency, oversees VIA Rail, which operates on private tracks owned by freight rail companies. It has no statutory guarantee of access and must negotiate agreements with freight operators. The current 10-year agreements expire in 2008. Most stations are owned and maintained by VIA Rail.[7] • Intercity passenger rail traffic increased by 5% from 2004-2005; VIA Rail reported 4.3 million passengers transported over 930 million miles in 2005. VIA Rail's revenues increased by 5.9%, the ninth increase in ten years.[8] • Canada's passenger service links over 450 communities. In 1990, VIA discontinued service on one of its two transcontinental routes – the CP via Calgary and Regina. About the same time, VIA's profitable excursion Rocky Mountain train on the western portion of the route was transferred from VIA to a private operator, which continues to run (2-3 days per week, May to mid-October). Also in 1990, VIA discontinued daily service to Sydney, N.S. VIA subsequently ran a luxury service to Sydney but only once a week and only from 2000-2004. • Though a single national operator primarily provides service, the government establishes benchmarks for service and purchases it from the operator. VIA Rail's corporate plan is approved annually by the federal cabinet.[9]	• Transportation investment overall was equivalent to 2.9% of Canada's GDP in 2006.[10] • The Parliament provides an annual operating subsidy to VIA Rail of $152 million. Operating subsidies are consistent from year to year in order to force efficiencies and enable better planning for VIA Rail's management. An annual capital subsidy is not provided, but is instead requested from Parliament as needed. • In 2000, about $358 million was provided over a period of five years to replace locomotives and rolling stock and perform work on the Montreal, Quebec-Ottawa, Ontario line.[11] • Total payments to VIA Rail since 1997 have ranged from $169 million to $310 million.[12] • VIA rail has no authority to issue debt instruments or to go into the debt market to raise funds.[13] • On October 11, 2007, the Canadian ministers of transport and of finance announced a $692 million, five-year commitment to VIA. This was in addition to joint federal/provincial funding for track projects that would benefit VIA in Quebec and Manitoba, announced June 28 and October 5, respectively.

[7] United States Government Accountability Office, GAO-07-15, *Intercity Passenger Rail: National Policy and Strategies Needed to Maximize Public Benefits from Federal Expenditures*, November 2006, p. 128.

[8] Minister of Transport, Infrastructure and Communities, *Transportation in Canada 2006 Annual Report*, p.53.

[9] GAO-07-15, pp. 50 and 128.

[10] *Transportation in Canada 2006 Annual Report*, *Report Highlights*.

[11] GAO-07-15, pp. 128-130.

[12] *Transportation in Canada 2006 Annual Report,* Table A3-3, Direct Federal Subsidies, Grants and Contributions by Mode.

[13] GAO-07-15, p.51 and p.130.

	DESCRIPTION	FINANCING
UNITED STATES	**Land area:** 9.63 million sq. km. **Population:** 298.2 million (2005 est.) **Population density:** 31 **GDP per capita:** $43,444 • Amtrak, the National Railroad Passenger Corporation created in 1970, provides US intercity passenger rail service in a 21,000-mile network, including 500 communities in 46 states.[14] It does not include the Alaska Railroad. Its three major components are: • **Northeast Corridor Service (NEC) from Washington D.C to Boston** – The NEC serves Boston, Providence, New Haven, New York, Newark, Philadelphia, Wilmington, and Washington, D.C. and intermediate points on 457 miles of track, signals, tunnels, bridges and electrical power systems largely owned by Amtrak. Amtrak oversees operations, dispatching, and routine maintenance of the NEC and directs major capital projects, except on the 56-mile New Haven-New Rochelle line controlled by Metro-North Commuter Railroad. • Commuter rail services account for the largest ridership numbers and train movements on the NEC, but many trains travel only a few miles on the NEC. Amtrak is the only end-to-end user, compiling more train-miles than all other users combined. The NEC also supports freight operations through trackage rights to freight railroads. • For some routes outside the NEC, on-time performance is only mediocre. • **Long Distance Service** – Amtrak provides long distance service on 14+ routes. Trains with sleeping cars travel between 750 and 2500 miles serving major cities and smaller, intermediate communities with limited and, in some cases, no other public transportation. Most markets support one daily round trip or less. In fiscal year 2006, 45% of Amtrak's passenger miles took place on long-distance routes. The long-distance service provides essential public transportation for small communities, connecting other corridor services into a national network. *- continued -*	• The U.S. currently budgets 0.93% of GDP or $112.9 billion for infrastructure annually.[15] The U.S. investment in transportation infrastructure has been steady at about 0.9% of GDP since 1981 when it dropped below 1% of GDP. Rolling stock investment has fluctuated with the economic cycle.[16] • For most years from 1977-2000, the U.S. invested more than 6% of GDP in transportation: – 83.3% (5% of GDP) was for rolling stock (motor vehicles, aircraft, ships, boats and railroad equipment); – 14.2% (0.9% of GDP) was for infrastructure; and – 2.5% (0.15% of GDP) was for other transportation equipment such as computers for operations and air traffic control.[17] • The government is the predominant investor in highway, transit, airport and water transportation infrastructure. The business sector accounts for most infrastructure investment for railroads and pipelines, but total infrastructure investment for these two modes accounts for less than 0.1% of GDP. The business sector's investment in railroads as a percentage of GDP has decreased over time by more than 90%.[18] • Amtrak receives federal funding of approximately $1.3 billion annually. With hourly frequencies and top speeds of 135-150 mph, Northeast Corridor (NEC) service generates sufficient revenues to cover operating costs but not major capital costs.[19] Roughly $5 billion is needed to fund deferred maintenance and capital backlog projects to return the NEC to a "state-of-good-repair" under which only routine maintenance would be needed.[20] *- continued -*

[14] Amtrak National Facts at www.amtrak.com.

[15] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.15.

[16] Ibid.

[17] U.S. DOT, Bureau of Transportation Statistics, *Transportation Investment and GDP, Some Concepts, Data, and Analysis, 2004,* pp.17, 20-22.

[18] U.S. DOT, Bureau of Transportation Statistics, *Transportation Investment and GDP, Some Concepts, Data, and Analysis, 2004,* pp. 22-23.

[19] Alan M. Voorhees Transportation Center at Rutgers, *Northeast Corridor Action Plan: A Call for a New Federal-State Partnership,* p.25.

[20] Report of the Committee on Commerce, Science and Transportation on *S.294, Passenger Rail Investment and Improvement Act of 2007,* Senate Report 110-67, May 22, 2007, p.4.

	DESCRIPTION	FINANCING
UNITED STATES (continued)	• **State Supported Corridor Service** – Intercity service is more frequent in corridors between 100 and 500 miles in length where states provide funds to cover part of any operating deficits. State-supported services account for 35% of Amtrak's daily ridership and about half of all passenger trains in the system. Most of Amtrak's ridership gains over the past several years have come through state-sponsored services. Total ridership on state-supported corridor routes increased by 18% from 2002 through 2005. On other parts of the system, which have seen no investment in new rolling stock capacity, ridership has remained relatively flat.[21] • California has had impressive ridership gains and has the nation's 2nd, 3rd, and 5th busiest rail corridors. Only the NEC is busier. On-time performance is affected by simultaneous increases in both passenger and freight traffic.[22]	• Fourteen states provide operating and/or capital support for corridor routes, which provide 35 percent of Amtrak's daily ridership and half of all passenger trains in the system. Amtrak fully funds its 14 long-distance routes as well as some or all of the trains on eight corridors. • At least 35 states have developed intercity passenger rail plans for future service. States have committed hundreds of millions of dollars for incremental improvements, increasing ridership. States have completed environmental analyses and engineering studies for expanded corridor service. Based on AASHTO's 2002 Intercity Passenger Rail Transportation Report, as adjusted to 2007 dollars, about $12.7 billion over the next 6 years or $57 billion over the next 20 years is needed to implement these plans.[23] • US roads, transit systems, airports, and railroads are all experiencing some deterioration, congestion and unreliability. Airline on-time performance dipped to 68.1% in June 2007, the lowest level ever recorded. Disconnection and lack of integration characterize the evolution of land use and infrastructure schemes. Driving is becoming more expensive and time-consuming. Congestion tolls, rail and mass transit solutions could gain support under these circumstances.[24]

[21] WisDOT staff, draft decision memo for National Surface Transportation Policy and Revenue Study Commission, July 2007.

[22] RailPAC Rail Passenger Association of California, *Building California's Passenger Rail Future*, August 2006.

[23] WisDOT staff, draft decision memo for National Surface Transportation Policy and Revenue Study Commission, July 2007.

[24] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, pp.34-42.

	DESCRIPTION	FINANCING
CHINA	**Land area:** 9.6 million sq. km. **Population:** 1.3 billion (2005 est.) **Population density:** 137 **GDP per capita:** $7,598 • Railway construction in China peaked in the last decade with more than 620 miles of new construction annually. Over 47,740 route miles are in operation. • China's first priority is passenger transport, especially high-speed passenger rail between major cities. Its second priority is bulk transport for coal. Its third priority is containerization, which has advantages of safety, speed, convenience, and diversity. • China has completed a $4.2 billion rail line between Beijing and Tibet. Rail use is increasing by 30% each year. • China was first to put a 270 mph high-speed magnetic levitation train in regular service, about 30 km. between Shanghai's subway line and Pudong airport. • Over four years starting in 2006, China plans to build about 3,300 miles of high-speed lines.[25]	• China spends 9% of GDP on infrastructure ($160 billion annually for new projects). A government mandate to build state-of-the art systems led to substantial research and technology investment.[26] • Before Chinese economic reforms, railways depended entirely on government investment. Foreign investment was discouraged. • Since the reforms, the government has initiated major changes such as loans from national banks and issuance of railway construction bonds. Since 1984, the government has permitted loans from the World Bank, the Asian Development Bank, and government loans from Japan and Germany.[27] Additional funds are still needed. • China's plan calls for the government to nearly quadruple its investment in the nation's railroads to almost $200 billion by 2010. The aim is to create 10,500 miles of new track.[28]

[25] *Financial Times*, February 1, 2007.

[26] Ibid., p. 15.

[27] Guo, Lin and Jianhua, "Transition to Market Economy, Railway Trends in China," Japan Railway and Transit Review.

[28] *Wall Street Journal*, March 20, 2007.

	DESCRIPTION	FINANCING
AUSTRALIA	**Land area:** 7.74 million sq. km. **Population:** 20.2 million (2005 est.) **Population density:** 2.6 **GDP per capita:** $32,938 • Australia's transportation infrastructure is mature and well developed with 16 separate passenger train and tram operators offering services ranging from intensive suburban and metropolitan commuter trains and electric street tramways in major cities to commuter trains, rustic rural mixed trains, and long distance interstate and luxury trans-continental trains. • Its largest passenger railway operates along three of the country's most important intercity corridors. "The Overland" links Melbourne and Adelaide; "Indian Pacific" travels from Sydney to Perth and the remote West coast; and "The Ghan" connects Adelaide and Darwin via Alice Springs.[29] • The Australasia rail project, completed in 2004, is an 880-mile line from Alice Springs to Darwin. The public-private partnership agreement for this project involved construction of the new line; leasing and maintenance of the existing line, ports and terminal developments in Darwin; and operation of infrastructure and trains for 50 years before the network reverts back to government. Governments provided $395 million, effectively as grants, and another $65 million loan on commercial terms. The private sector funding contribution was around $618 million. There is no on-going government subsidy support for the operation.[30] • Australia's largely privatized rail freight industry is stronger today than at any time over the last few decades and is competing aggressively for a greater role in the national transport and logistics market. Privatization of freight railways has allowed industry consolidation across state boundaries, but the government has had to step in to fund some of the regional and light-density railways.	• Australia's infrastructure investment has fallen from 7.2% of GDP in 1970 to 3.6% today.[31] • Other than the national railway system and commission (privatized in 1997), funding of state-owned railways has been a state responsibility in Australia. The government has provided some loans and grant funding for rail projects. • Substantial funding is now available for freight railways through the Australian Rail Track Corporation (ARTC) and the AusLink land transport funding program. AusLink is the government's 2002 national transportation plan, which funds projects that benefit Australia's future, whatever the mode. Of AusLink's five-year, $7.7 billion commitment, $1 billion is for rail. The Rail Track Corporation is a federal government-owned corporation that owns, leases, maintains, and controls the majority of rail lines on the mainland. • The Transcontinental line is owned and leased by the Australian government through the ARTC. The Adelaide-Darwin line is owned by the ARTC as far as Alice Springs, with a coalition of two state governments owning the rest, but it is leased to its builders, the Asia Pacific Transport Corporation, for 50 years under a Build, Own, Operate, Transfer contract. • Private operators also provide intercity service. • Privatization of long-distance passenger rail in Australia appears successful, with improved marketing and profitability, although questions remain about its ability to fund renewal of capital. Long-distance passenger services benefited from the private owner's focus on the high-end tourist market using refurbished rolling stock. [32] • Rail privatizations have resulted in reduced operating subsidies (whether directly funded or as an opportunity cost through reduced dividends) and reduced calls to fund capital investment. • The government will never be removed entirely from financial responsibility for supporting the rail network because of lighter average densities.[33]

[29] http://traintraveling.com/australia_nz/australia_nz_intercity.shtml.

[30] The World Bank Group, September 2005, "Results of Railway Privatization in Australia and New Zealand," p.xi.

[31] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.27.

[32] The World Bank Group, September 2005, "Results of Railway Privatization in Australia and New Zealand," p.ix-x.

[33] Ibid., p.54.

	DESCRIPTION	FINANCING
INDIA	**Land area:** 3.3 million sq. km. **Population:** 1.1 billion (2005 est.) **Population density:** 336 **GDP per capita:** $3,737 • India has the world's second-largest railway network under a single management, with 38,440 miles of track and 12,000 trains. In 1997, rail carried 11 million passengers and a million tons of freight daily and employed 1.6 million people.[34] • The history of rail in India dates to 1853 when the first 21-mile passenger train was inaugurated. A network created through private investment had a route mileage of about 9,000 miles by 1880, mostly radiating inward from the three major port cities of Mumbai (formerly Bombay), Madras and Calcutta. • Before 1947, 42 railway companies were operating. Indian Railways are now entirely owned and operated by the government. Indian Railways is grouped under 15 zones for smooth and efficient operations. Policy decisions are made by a Railway Board comprised of the Railway Minister, government officials, railway officials and labor union representatives.[35] • Mega-cities in India have a large suburban network, accounting for about 60% of railway ridership. A separate corporation addresses transportation needs of the Mumbai mega-city. Mumbai suburban rail is one of the largest systems in the world carrying nearly 2 billion passengers and generating 29.1 billion passenger miles annually. Mumbai suburban rail fares are also among the lowest in the world; the yield per passenger-kilometer fluctuates between 0.20 and 0.25 cents only. India has international rail links with Pakistan, Nepal and Bangladesh. It plans to install a rail system in southern Bhutan. • India's urban population is expected to grow to 402 million by 2025 while rural population is projected to decline by 26 million. Thus, transport planning in the second 50 years after Independence will have to be very different from that in the first 50 years.[36]	• India budgets 3.5% of GDP ($25.5 billion) for infrastructure and plans to increase its investment level to 8% of GDP.[37] • The aging rail system is neglected because the government's limited resources are currently directed elsewhere. There is no interest in developing a high-speed rail system because of costs.[38] • In the 1800s, the British government encouraged the setting up of railway companies by private investors under a scheme that would guarantee an annual return of 5 percent during the initial years of operation. Once completed, the company would be transferred to the government, with the original company retaining operational control. Today, government-owned Indian Railways enjoys a near monopoly though a few private trains still exist.[39] • India's transportation infrastructure is in a state of disrepair. It doesn't have the cash to self-finance improvements but does have $190 billion in foreign exchange reserves to leverage project funding.[40]

[34] Kulkarni, Funding of Public Passenger Transport in Developing Countries – A Case of India.

[35] http://en.wikipedia.org/wiki/Indian_Railways.

[36] Project Monitor, "Urban Mobility in Asia, Challenges of This Century," http://www.projectsmonitor.com.

[37] Ibid., p.15.

[38] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.20.

[39] Ibid., p.20.

[40] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.18.

	DESCRIPTION	FINANCING
FRANCE	**Land area:** 551,500 sq. km. **Population:** 60.5 million (2005 est.) **Population density:** 110 **GDP per capita:** $30,693 • The monopoly intercity passenger rail operator in France is SNCF,[41] a public company with state-owned assets. Twenty regions receive government subsidies to purchase service from SNCF, which manages traffic on the national network and operates and maintains the safety system. • RFF,[42] also a public company with state-owned assets, owns and manages the infrastructure. When created, RFF acquired two-thirds of SNCF's debt and 19,220 miles of track. SNCF manages the infrastructure under contract with RFF. Revenue sources for RFF include network access charges, land properties in the network, and the state subsidy. By 2010-2012, the European Union is expected to require competition[43] (likely, passenger rail privatization). • 6,000 of 20,000 rail miles in France are operated by high-speed TGV[44] trains at speeds up to 186 mph, with test trains achieving a world record of 357 mph.[45] • The system comprises the largest use of high-speed trains in the world. Since 1981, TGV has expanded into Belgium, U.K., Germany, Holland, Switzerland, and Italy.[46] • Distances in France are ideal for high-speed rail. The nine major cities other than Paris are at least 124 miles from Paris – most over 248 miles. All could potentially be accessed within 3.5 hours by high-speed train if direct routes were built.[47]	• France spends 20 times more per capita than the USA on railways. The French Ministry for Transport funds both RFF, the infrastructure owner and manager, and SNCF, the operator. The government provides about $9.6 billion in rail system subsidies each year. [48] • The 21 regions receive a total of $2.5 billion to purchase operations from SNCF. RFF receives approximately $1 billion for debt service, $1.1 billion for infrastructure renewal, and $2.5 billion for capital investments. • Track maintenance is funded through infrastructure access fees. In 2004, RFF paid SNCF $3.2 billion for infrastructure management. SNCF paid RFF $2.6 billion to operate on its tracks. • The public subsidy for infrastructure is decreasing in proportion to the increase in access fees. RFF's debt has stabilized, and a new public financial agency will provide infrastructure subsidies and zero-percent interest loans for new projects.[49] • Every TGV line so far built has covered its construction costs within a few years of operation and has seen modal shifts from road and air to rail. The Perpignan-Figueras high-speed rail line is intended to be the first high-speed rail public-private partner-ship in France.[50] • France trails only Spain and Italy in planned infrastructure construction on the continent. • Project approval requires socio-economic appraisal, including a rate of return of 8%.

[41] Societe Nationale des Chemins de Fer Francais.

[42] Reseau Ferre de France.

[43] United States Government Accountability Office, GAO-07-15, *Intercity Passenger Rail: National Policy and Strategies Needed to Maximize Public Benefits from Federal Expenditures*, November 2006, pp.130-131.

[44] Train à Grande Vitesse.

[45] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.24.

[46] Railway Technology, *TGV France High Speed Rail Network,* http://www.railway-technology.com/projects.

[47] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix B, France, 2004.

[48] United States Government Accountability Office, GAO-07-15, pp. 131-132.

[49] Ibid.

[50] Railway Technology, TGV France High Speed Rail Network, http://www.railway-technolocy.com/ projects.

	DESCRIPTION	FINANCING
SPAIN	**Land area:** 506,030 sq. km. **Population:** 45.1 million (2005 est.) **Population density:** 88 **GDP per capita:** $27,522 • 292 miles of high-speed rail lines between Madrid and Seville have been in operation since 1992. Spain's expanding rail network is currently over 9,300 miles in length, with 4,464 miles of high-speed lines planned. The Madrid-Toledo high-speed train and other new lines totaling 34 miles were added in 2005-06. Work is underway on another 410 miles of new high-performance rail line.[51] • Passenger rail transport rose 30% from 1990-2000 although the average annual distance traveled (316 miles) is less than the European average (502 miles). Rail service is concentrated in the Mediterranean Corridor, which offers quality, high-speed service.[52] • RENFE, the national rail passenger operator, is a state-owned company controlled by the ministry of public works. Two other operators provide long-distance services on their own tracks. To comply with European law mandating separation of operations and infrastructure management, the government has proposed a new state-owned organization to be responsible for construction and maintenance of new rail lines.[53] • Long-distance commercial trains move passengers between Barcelona and Madrid at up to 220 mph, traveling 375 miles in 2.5 hours.[54] HSR lines are under construction to achieve the government's promise of linking all provincial capitals to Madrid within 4 hours[55] and to Barcelona within 6 hours by train.[56] The government has proposed lower journey times for all corridors, which can only be achieved through high-speed infrastructure.[57]	• From 2005-2006, Spain budgeted 1.7% of GDP for transportation infrastructure ($23.2 billion over two years),[58] 12.6% ($2.9 billion) of which was for rail (both passenger and freight).[59] • The Strategic Infrastructures and Transport Plan (PEIT)[60] calls for a $181 billion[61] investment in transportation infrastructure through 2020.[62] • Since 2000, Spain has budgeted more than $120 billion for an extensive infrastructure and public works makeover plan for all transportation modes. An additional $200 billion is earmarked through 2020.[63] • The national passenger rail operator is primarily funded by the central government. Regional governments provide some additional funding and participate in planning. • According to the PEIT, the financial framework calls for consistency with the general objectives of budgetary balance, in the context of a significant reduction in European Union Funds, which, for more than 10 years, contributed some 20-30% of the Ministry of Public Works and Transport Infrastructure expenditure. Private enterprise must discover the right channels by which to continue cooperating with the public sector to provide infrastructures and services. It is not a question of directing public action to maximize the volume of investments but rather to guarantee the stability and continuity of investment. • While high-speed rail construction costs are much lower in Spain than other European countries, Spain will no longer be receiving the European Union's regional development funds it has received in the past, so it may not be possible to implement its lower priority projects, at least in the medium term.[64]

[51] 2005-2020 Strategic Plan for Infrastructures and Transport (PEIT).

[52] Ibid.

[53] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix F, Spain, 2004.

[54] Wikipedia, *High Speed Rail by Country*, http://en.wikipedia.org/wiki/High-speed_rail_by_country#Spain.

[55] *Infrastructure 2007* reports the goal as three hours rather than four.

[56] Tdctrade.com, *Madrid's new airport signals transport revolution*, April 11, 2006.

[57] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix F, Spain, 2004.

[58] Twice as much as the European Union average of between 1.0 and .85% of GDP.

[59] Spain National Reform Programme, 2006 Progress Report (Lisbon Unit, Prime Minister's Economic Office), pp. 10-11.

	DESCRIPTION	FINANCING
JAPAN	**Land area:** 377,873 sq. km. **Population:** 128.1 million (2005 est.) **Population density:** 339 **GDP per capita:** $32,647 • The Japanese railway system was privatized in 1987. Before reform, Japan National Railways was state-owned and operated at considerable cost to the government, with extensive debt. After reform, Japan did not separate operations from infrastructure, but instead divided the system geographically and created separate private intercity passenger railways in six geographic regions. • The government assumed the majority of debt for the preexisting state-owned system (about $300 billion). • The six passenger rail companies own their own tracks and JR Freight has legal access to the tracks at marginal or incremental cost. In 1991, JR West, East and Central purchased their tracks from the Shinkansen Holding Company and the proceeds went toward paying down the company's portion of Japan National Railway's long-term debt. The Japan National Railway developed an implementation plan for its division that included how much land was needed for each railroad, which was approved by the Ministry of Land, Infrastructure and Transport. • Japan's Shinkansen (high-speed) lines connect most highly populated cities. The Japan Railway Construction, Transportation, and Technology Agency builds new Shinkansen lines; it holds title to some existing Shinkansen lines and leases them to passenger railroads for high-speed train operations. [65] • The bullet train network introduced in 1964 travels at 150-186 mph between Tokyo and other major cities. Implementation of 200 mph speed service is planned for the 2009-2011 period. Japan's bullet trains are an efficient method for transporting passengers distances that are too far to commute by car and too short to travel by plane.[66]	• Japan budgets more than 10% of spending on infrastructure, generously investing in transportation and utility systems. Its infrastructure budget has been declining since 2003. With its population declining and aging, this trend is expected to continue. If Japan's budget shortfalls persist, it may need to seek outside investment; it was an early proponent of public-private partnerships.[67] • The three rail companies on the mainland are fully privatized and receive no government assistance. The other three passenger companies are not yet financially independent from the state. • When reform occurred in 1987, the government provided a one-time Business Stabilization Fund, with funding for three passenger railroads that were not yet privatized and needed subsidies to survive: • JR Hokkaido was given $4.7 billion, JR Shikoku $1.4 billion, and JR Kyushu $2.7 billion. The three railroads were allowed to invest the funds and use any money made from them for operations and capital improvements. They could not draw down any principal—only profits or investment interest. Thus, they have maintained the original amounts given to them by the state in 1987. However, fund performance has declined as Japanese interest rates have declined since establishment of the fund. Of the three, only JR Kyushu is expected to achieve the financial stability necessary to privatize. *- continued -*

[60] In Spanish: Plan Estratégico de Infraestructuras y Transporte).

[61] Converted from euros. As of 07/17/07, 1 EUR = $1.37831; 1 USD = 0.725528 EUR.

[62] Tdctrade.com, Madrid's new airport signals transport revolution, April 11, 2006.

[63] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.24.

[64] Ibid.

[65] United States Government Accountability Office, GAO-07-15, *Intercity Passenger Rail: National Policy and Strategies Needed to Maximize Public Benefits from Federal Expenditures*, November 2006, pp.135-136.

[66] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.17.

[67] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, pp.20-21.

	DESCRIPTION	FINANCING
JAPAN (continued)		• Two other forms of assistance to JR Hokkaido, JR Shikoku, and JR Kyushu were a guaranteed interest rate offered for the stabilization fund, which was higher than the market rate available to the three mainland JR's, and a government-reduced tax rate on fixed railroad assets. • At the time of reform, Japan National Railways had accumulated about $255.8 billion of long-term debt. About $176.3 billion was placed with a newly created entity, Japan National Railways Settlement Corporation, and the remaining debt was distributed among the three mainland railroads, JR Freight, and the Shinkansen Holding Company. The state government determined the debt allocation, apparently on the basis of expected future profits of each entity. The Hokkaido, Shikoku, and Kyushu railroads were not allocated any of this debt because of their more precarious financial positions.[68]

[68] Ibid.

	DESCRIPTION	FINANCING
GERMANY	**Land area:** 357,022 sq. km. **Population:** 82.7 million (2005 est.) **Population density:** 232 **GDP per capita:** $31,095 • Germany has a dense railway system, which reaches almost every part of the country. Crossing Germany from Munich in the south to Hamburg in the north takes about 6 hours. Driving by car takes about 8 hours.[69] • In 1994, Germany opened its markets to competition, merging preexisting national rail properties. The commercial section became DB, a state-owned joint-stock company that has separate business units for long- and short-distance operations and infrastructure management. DB owns the entire rail infrastructure, with all shares held by the state. Any of 300 rail operators can bid on contracts, though DB remains the primary operator in most markets.[70] • Public and political support for HSR development is strong, though opposition has led to expensive environmental mitigation measures. Population is widely dispersed, requiring multiple stops, and the value of time is lower than in other European countries. Except for the Frankfurt-Cologne line designed for 186 mph and high-speed passenger trains only, Germany's rail lines are designed for lower maximum speeds than those in other parts of Europe.[71] • DB's high-speed InterCityExpress (ICE) trains reach 175 mph, connecting Berlin and other German cities, as well as Brussels, Amsterdam, Vienna and Zurich. InterCity trains link all major cities. InterRegionExpress trains make intermediate stops and RegionalBahn trains stop at all local stations. EuroCity trains link German cities to Budapest, Copenhagen, Chur, Paris, Prague, and Warsaw. Thalys TGV trains link Cologne (Koln) to Belgium, France, and Holland with Eurostar London connections at Brussels and Paris.	• The government provides $8.9 billion in regional passenger rail operating subsidies annually to the 15 German Lander (states) to be used at their discretion. The source of federal subsidy is the transportation fund, which is supported by a motor vehicle fuel tax. • The government provides DB about $5.1 billion annually to renew and develop new infrastructure (including stations); $3.2 billion is for infrastructure maintenance and $1.9 billion is to renew and develop new infrastructure. By establishing DB, the German government relieved it of $38 billion in debt and transferred the responsibility to the Federal Railway Property Agency (BEV). Between $8.5 and $12.7 billion annually was paid to BEV for debt relief and other administrative responsibilities such as pensions from 1999-2006.[72] • Rail's share of the passenger transportation market in Germany is 8.4% overall.[73] • A 10% decline in population and doubling of seniors by 2050 is likely to stress government budgets and lend support to privatization efforts.[74]

[69] http://wikitravel.org/en/Germany.

[70] United States Government Accountability Office, GAO-07-15, *Intercity Passenger Rail: National Policy and Strategies Needed to Maximize Public Benefits from Federal Expenditures*, November 2006, p.50, p.133.

[71] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix C, Germany, 2004.

[72] United States Government Accountability Office, GAO-07-15, pp.133-134.

[73] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix C, Germany, 2004.

[74] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, pp.25-27.

	DESCRIPTION	FINANCING
ITALY	**Land area:** 301,318 km. **Population:** 58.1 million (2005 est.) **Population density:** 193 **GDP per capita:** $30,732 • Intercity high-speed rail (150 mph) from Rome to Florence was introduced in 1978. Today, Eurostar Italia operates a network of intercity trains connecting Italy's cities and towns. ETR 500 trains traveling at 155 mph carry 590+ passengers. The only lines on which the trains travel at high speed are Florence-Rome-Naples and Novara-Turin. • Over 372 miles of new railway lines are under construction; these new lines will be usable at speeds up to 186 mph. The lines under construction are Milan - Venice and Milan - Bologna - Florence. Some lines are open; international links with France, Switzerland, Austria, and Slovenia are underway.[75] • Long-distance trains make relatively frequent stops to service the dispersed population, reducing average train speeds.[76] • The national Italian network and operations are owned by FS (State Railway) Holdings, a fully government-owned company with three operating subsidiaries: Trenitalia operates freight and passenger trains; RFI manages the infrastructure; and TAV is responsible for planning and construction of HSR infrastructure. Regional governments provide separate, local rail services.[77]	• After 20 years of neglect, infrastructure investment has become a priority for Italy. The government has spent or budgeted about $5.1 billion to expand bullet train lines and freight transport capacity.[78] • In 2004, capital funding for the rail sector (freight and passenger) was around $2.9 billion per year, half of which was allocated to high-speed rail.[79] • The government has committed to spending $20.9 billion for a network of high-speed lines that could reach 625 miles by 2008. The high-speed network is relatively self-contained so little expansion beyond the system under development is expected.[80] • A key reason for investing in HSR is that parts of the conventional rail network face capacity constraints and the transfer of long-distance services to new lines will enable an expansion of regional and freight services on classic routes.[81] • The declining and aging population is likely to stress government budgets in the future, lending support to privatization efforts.

[75] http://en.wikipedia.org/wiki/High-speed_rail_by_country

[76] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix D, Italy, 2004.

[77] Ibid.

[78] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.25.

[79] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix D, Italy, 2004.

[80] http://www.railway-technology.com.

[81] Commission for Integrated Transport (Great Britain), *High Speed Rail: International Comparisons,* Appendix D, Italy, 2004.

	DESCRIPTION	FINANCING
UNITED KINGDOM	**Land area:** 242,900 sq. km. **Population:** 59.7 million (2005 est.) **Population density:** 246 **GDP per capita:** $35,051 • The National Rail network of 10,072 miles in Great Britain and 189 miles in Northern Ireland carries 18,000 passenger trains and 1,000 freight trains daily. Urban rail networks are well developed in London and other cities. National Rail is a brand name used to promote passenger rail. Network Rail is the owner and manager of the fixed assets.[82] Network Rail earns income from access fees paid by operators, government grants, and commercial property.[83] • U.K. has non-stop rail connections from Heathrow terminals into London (under 20 minutes). The two-phase Channel Tunnel (Chunnel) project has been partially in operation since 2003. Eurostar trains run through the tunnel between Belgium, U.K., and France at high speeds. High-speed Chunnel trains are planned for London to Paris and Brussels. The British route will achieve speeds up to 186 mph and will be branded High Speed 1. High Speed 2 is a proposed U.K. line to run between central London and Birmingham.[84] • Most intercity passenger rail traffic is restricted to a maximum speed of 125 mph since intercity services share the lines with freight and local passenger traffic. • The U.K. began privatizing its rail system in 1993, breaking up British Railways into a private infrastructure company, Railtrack (replaced later by Network Rail), over 20 train operating companies, 3 rolling stock ownership and leasing companies, and 3 government regulators. Private operators bid on franchises to provide service, with the government subsidizing unprofitable service or receiving a premium for excessively profitable service. • In 2004, the U.K. restructured again to improve customer service, cost-effectiveness, safety, efficiency and performance.[85]	• The U.K.'s rail system is privatized, but the government still plays a role in setting strategic direction for the railways and provides operating subsidies. About 50 percent of all costs are covered through public subsidies. Government officials expect this percentage to fall in the future. • Network Rail's total debt is $34 billion and is projected to peak at $37 billion between 2008 and 2009. This debt was incurred by paying for enhancements to its regulatory asset base. Network Rail also assumed $1.5 billion of this debt from Railtrack.[86] • Budget deficits have made the UK the world's leader in implementing public-private partnerships, including all major railways. The results of privatization have been mixed; while prices are higher, trains have better on-time records.[87] • "The public gnashes its teeth and gets a dose of reality – transport and congestion costs begin to align more directly with user fees. That's what happens when a government no longer chooses to provide all the necessary funds to build and maintain infrastructure projects." [88]

[82] The private for-profit corporation, Railtrack, established as owner and manager of the UK's infrastructure in 1993, went bankrupt in 2001 and was replaced by Network Rail.

[83] United States Government Accountability Office, GAO-07-15, pp.137-139.

[84] http://en.wikipedia.org/wiki/Eurostar.

[85] United States Government Accountability Office, GAO-07-15, pp.137-139.

[86] Ibid.

[87] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.24.

[88] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.24.

	DESCRIPTION	FINANCING
SOUTH KOREA	**Land area:** 99,538 sq. km. **Population:** 48.8 million (2005 est.) **Population density:** 480 **GDP per capita:** $23,926 • South Korea's state-owned rail system consists of 2,108 miles of track, with a recently completed HSR line connecting Seoul and Busan. A second HSR line from Seoul to Mokpo is underway, and bullet trains to other cities are planned. • The Korean Train Express (KTX) became operational in April 2004, 12 years after groundbreaking. It achieved two goals: new rail capacity on two trunk routes (Seoul to Busan and Seoul to Mokpo) and transfer of new high-speed technology for further local application.[89] Station improvements eased connections to other modes and to local transport. • Despite growing pains at the startup and initial dissatisfaction with some cutbacks in conventional rail service, KTX is an important addition to the Korean transportation system. The entire country is now reachable within three hours. • Completion of Phase 2 in 2010 will deliver a completely dedicated 253-mile high-speed service on new alignment. The Mokpo line will also be electrified and upgraded for high-speed use. • The maximum speed of the KTX, which derives its technology from France's Alstom TGV, is 186 mph. Daily ridership is in the range of 85,000 passengers. Diversions from other modes show wide variability. KTX enticed 56% from existing rail services, 17% from air, 15% from express buses, and 12% from highways.[90] • Rail demand rose 25% in the second three months of high-speed service (April-June 2004). Rail revenue increased more than 91% from the previous year with 33% more seats offered.	• South Korea is the world's 11th largest economy, in part because of massive government investment in transportation infrastructure – roads, railways, subways and airports.[91] • The government looked at various funding sources for its high-speed rail lines based on potential benefits and financial circumstances. Funds were raised from the government budget, from loans, and from the budget of the Korea High Speed Rail Construction Authority (KHRC). • The difficult economic circumstances in Korea required a number of measures to acquire foreign loans. Funding for electrification of the Honam Line was provided entirely by the government.[92] • KTX costs for Phase 1 have been about $10.6 billion (at 1,200 won to the U.S. dollar) and will reach an estimated $15.3 billion including Phase 2. • Funding for the route to Mokpo has yet to be finalized, though there is the possibility of it being constructed under a build-operate-transfer agreement. Government rules call for up to 65% of the projected cost of high-speed lines to be provided by the operator.[93]

[89] Transportation Research Board, Current Research and Development in Intercity Rail Passenger Systems, "Korean Train Express: An Element in a Balanced Transportation System," Fall 2005.

[90] http://en.wikipedia.org/wiki/High-speed_rail_by_country#Korea

[91] Ernst & Young, Urban Land Institute, *Infrastructure 2007, A Global Perspective,* 2007, p.22.

[92] Kim Chun-Hwan, "40 Years of High Speed Railways, Transportation Revolution: The Korean High Speed Railway, Japan Railway and Transit Review No. 40, pp. 8-13.

[93] http://www.railway-technology.com/projects/mokpo-railway.

	DESCRIPTION	FINANCING
TAIWAN	**Land area:** 35,980 sq. km. **Population:** 22.9 million (2005 est.) **Population density:** 636 **GDP per capita:** $30,084 • Taiwan's conventional railway network of 1,635 miles and 216 stations connects small and remote towns and cities, while its high-speed line connects major cities. • The Taiwan Railway Administration (TRA) runs most passenger and freight lines, forming a closed loop around the island, as well as three branch lines. • Easy transfers between the high-speed and conventional lines are possible at several stations. • To reduce noise pollution and solve traffic bottlenecks, planning is underway to elevate railways or move them under ground in major cities. Express train projects are planned for the Kaohsiung-Pingtung area and the east cost.[94] • Construction of a 214-mile HSR rail line between Taipei and Kaohsiung began in 2000 and was completed in 2007. Thirty high-performance trains serve the line; the fleet is valued at $31 billion. • Train speeds of up to 186 mph have reduced travel time to 90 minutes from the previous 4 hours by conventional rail. 700T Shinkansen technology was imported from a consortium of Japanese companies.[95] • Special zones at 5 of 10 stations are being developed with high-speed rail facilities and industrial zones. Both residential and commercial districts are planned.[96] • A separate Japanese-led project will link Taipei with its international airport by high-speed rail.	• Taiwan High Speed Rail (THSR) from Taipei to Kaohsiung is one of the largest privately funded rail construction projects in the world. It is valued at $13 billion and funded by Taiwan High Speed Rail Corporation under a 35-year concession agreement, signed in 1998.[97] • There has been some controversy regarding failure to meet funding targets on time, construction quality and safety, but supporters say the project will relieve congestion, increase safety, conserve energy, and promote balanced development in western Taiwan.[98]

[94] 2006 Yearbook, Ministry of Communications and Transportation.

[95] Taiwan High-Speed Rail Line Network, http://www.railway-technology.com.

[96] 2006 Yearbook, Ministry of Communications and Transportation.

[97] Taiwan High-Speed Rail Line Network, http://www.railway-technology.com.

[98] http://en.wikipedia.org/wiki/Taiwan_High_Speed_Rail.

Appendix

C

New and upgraded Passenger Rail Service

2007-2015

NEW SERVICE

- Milwaukee – Madison
- Twin Cities – Duluth
- Chicago – Rockford
- Chicago – Quad Cities
- Cincinnati – Cleveland
- Longview – Jackson – Meridian
- Petersburg – Raleigh
- St. Albans, VT - Montreal

UPGRADED EXISTING SERVICE

- Pacific Surfliner
- San Joaquin Corridor
- Capitol Corridor
- Pacific Northwest Corridor
- Milwaukee – Minneapolis
- Washington – Richmond – Petersburg
- Raleigh – Greensboro – Charlotte

2016-2030

NEW SERVICE

- California High Speed Rail
- California Coast Extensions
- Los Angeles – Las Vegas
- Kalamazoo – Grand Rapids
- Milwaukee – Green Bay
- Toledo – Detroit
- Tulsa – St. Louis
- Oklahoma City – Newton
- Dallas – Houston
- Albuquerque – El Paso
- Denver – Colorado Springs
- Denver – Cheyenne
- Trinidad – Colorado Springs
- Houston – Baton Rouge
- Baton Rouge – New Orleans
- New Orleans – Mobile
- Florida East Coast
- Jacksonville – Pensacola
- Mobile – Pensacola
- Atlanta – Macon
- Macon – Jesup
- Goldsboro – Wilmington
- Selma – Pembroke – Wilmington
- Asheville – Salisbury
- Petersburg – Norfolk
- Portland, ME – Brunswick
- Brunswick – Bangor
- Portland, ME – Auburn/Lewiston
- Brunswick – Rockland
- Boston – Montreal
- Salt Lake City – Las Vegas
- Salt Lake City – Boise
- Boise – Portland, WA

UPGRADED EXISTING SERVICE

- Pacific Surfliner Corridor
- San Joaquin Corridor
- Capitol Corridor
- Chicago – Detroit
- Chicago – St. Louis
- Wyanet – Quincy
- South Central Corridor
- Gulf Coast Corridor
- Jacksonville – Orlando
- Tampa – Auburndale – Orlando
- Auburndale – Miami
- Charlotte – Blacksburg
- Keystone Corridor
- Empire Corridor

2031-2050

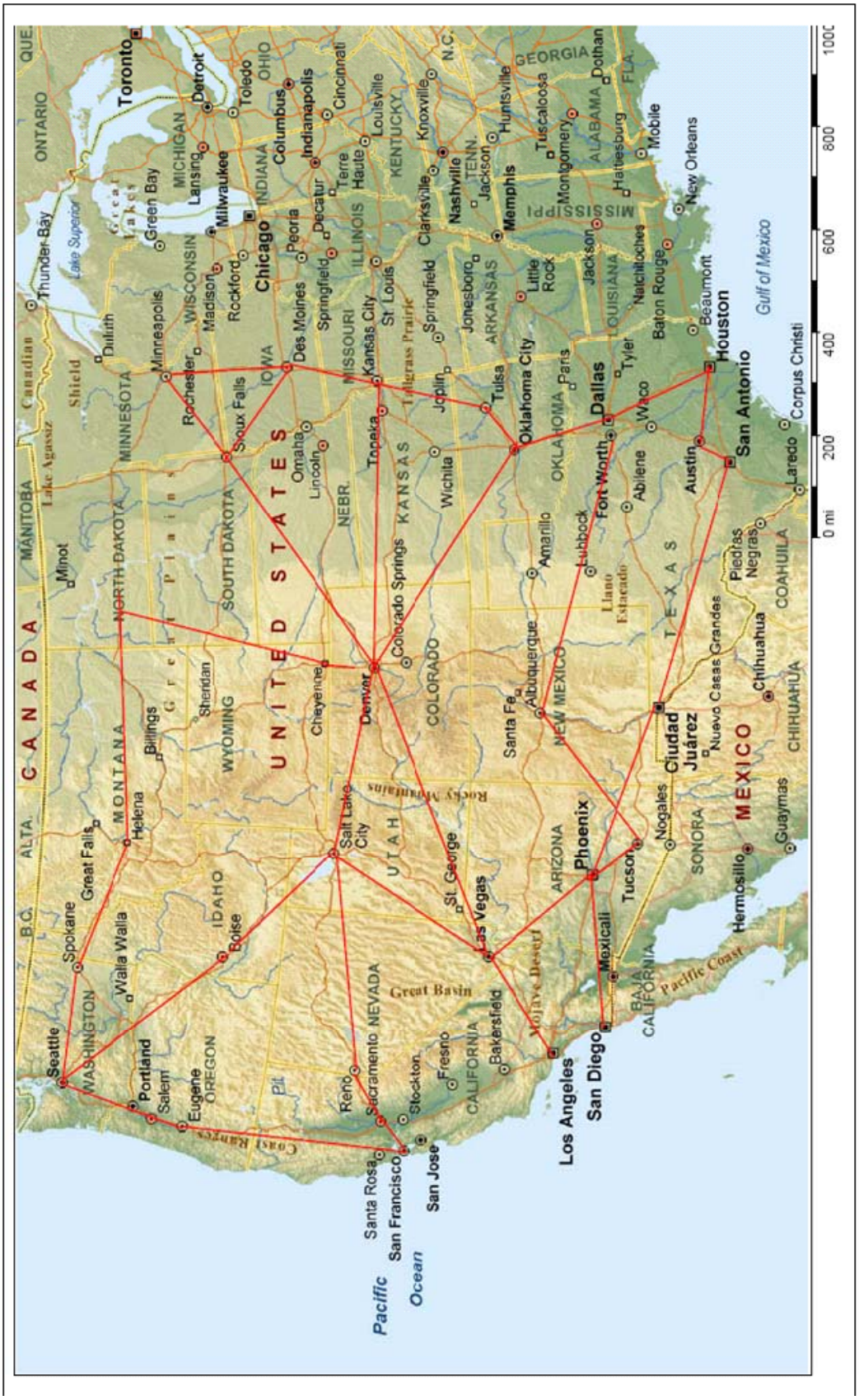
NEW SERVICE

- Ft. Wayne - Chicago
- Quad Cities – Omaha
- Kansas City – Omaha
- Omaha – Twin Cities
- St. Louis – Louisville
- Louisville – Cincinnati
- Indianapolis – Louisville
- DeLand – Daytona
- Tampa – Naples
- Macon – Savannah
- Charlotte - Pembroke
- Charlotte – Raleigh (straight route)
- Raleigh – Greenville
- Goldsboro – Morehead City
- Bristol – Richmond
- Knoxville – Chattanooga
- Louisville – Nashville
- Nashville – Atlanta
- St. Louis – Kansas City
- Ohio-Lake Erie Regional
- Pontiac – Detroit
- Detroit – Port Huron
- Toledo – Detroit
- Dallas – Houston
- Gulf Coast Corridor
- Florida East Coast Corridor
- Jacksonville – Orlando
- Tampa – Auburndale – Orlando
- Auburndale – Miami
- Jacksonville – Pensacola
- Mobile - Pensacola
- Charlotte – Blacksburg
- Blacksburg – Atlanta
- Adirondack Corridor
- Boston – Montreal
- Boston – Portland, ME
- St. Albans, VT – Montreal

UPGRADED EXISTING SERVICE

- California Coast Corridor
- Bakersfield – Palm Springs
- Barstow – Las Vegas
- Sacramento – Redding
- Chicago – Quad Cities
- Chicago – Cleveland
- Chicago – Cincinnati
- Chicago – Carbondale

Appendix D

Proposed Western U.S. Intercity Passenger High-Speed Rail Routes

Proposed Western U.S. Intercity Passenger High-Speed Rail Routes