High-Speed Rail Investment
Background Data

February 1, 2011

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TRANSPORTATION
ASSOCIATION

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APTA's Vision Statement

Be the leading force in advancing public transportation.

APTA's Mission Statement

APTA serves and leads its diverse membership through advocacy, innovation, and information sharing to strengthen and expand public transportation.

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Table of Contents

I. Introduction

There are two types of passenger railroad services in the United States, (1) commuter railroads which provide frequent service for trips within metropolitan areas, most often commute trips between work and home, and (2) intercity passenger rail service for longer distances between metropolitan regions. Commuter rail is a type of public transportation service and is a mode of service included in all of the American Public Transportation Association's (APTA) basic statistical and educational publications. Intercity passenger rail has not, however, historically been classified as a type of local public transportation service.

I.a. Intercity Passenger Railroad Service Contrasted to Commuter Railroad Service:

There are several differences between commuter rail service and intercity passenger rail service. Commuter rail service typically provides many trains per day in a service pattern that allows at a minimum travel into a central area during commute hours in the morning an travel back home during the evening commute period. Trips are short, the average commuter railroad trip in 2008 was 23.4 miles in length,[1] seats are not reserved for particular trains, and fares are often paid using multi-ride or monthly passes. Intercity passenger railroads are characterized by longer distance trips; the average intercity railroad trip in 2009 was 217 miles.[2] Individual fares are paid separately for each trip and reservations are usually required for specific intercity trains. Except on heavily used corridors, U.S. intercity rail does not currently offer several trips per day between city pairs. Individual passengers may, of course, use intercity trains for their commute trip on an occasional basis.

There are currently 28 commuter rail systems in the United States but only one intercity passenger railroad, the National Railroad Passenger Corporation, better known by its service mark, Amtrak. High-speed rail is a type of intercity passenger railroad service. Which qualities of operation qualify a service as "high-speed" vary depending upon where the service is and the physical constraints of operating that service.

I.b. Definition of High-Speed Rail:

The Council of the European Union defines the trans-European high-speed rail system in terms of rights-of-way and vehicle characteristics.[3] The rights-of-way are characterized as:

> "- specially built high-speed lines equipped for speeds generally equal to or greater than 250 km/h,
> - specially upgraded high-speed lines equipped for speeds of the order of 200 km/h,
> - specially upgraded high-speed lines which have special features as a result of topographical, relief or town-planning constraints, on which the speed must be adapted to each case." [3]

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[1] APTA. *Public Transportation Fact Book 2010.* Washington: American Public Transportation Association, April 2010. at http://www.apta.com/resources/statistics/Documents/FactBook/APTA_2010_Fact_Book.pdf

[2] Amtrak. *Amtrak Annual Report FY 2009.* Washington: National Railroad Passenger Corporation. at http://www.amtrak.com/servlet/ContentServer?c=Page&pagename=am%2FLayout&p=1241267362261&cid=1241245669222

[3] Council of the European Union. "Council Directive 96/48/EC, July 23, 1996: Annex 1: The Trans-European High-Speed Rail System." at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0048:en:HTML

High-speed rail trains are characterized by:

> "The high-speed advanced-technology trains shall be designed in such a way as to guarantee safe, uninterrupted travel:
> - at a speed of at least 250 km/h on the lines specially built for high speed, while enabling speeds of over 300 km/h to be reached in appropriate circumstances;
> - at a speed of the order of 200 km/h on existing lines which have been or are to be specially upgraded;
> - at the highest possible speed on other lines." [3]

The Federal Railroad Administration (FRA), U.S. Department of Transportation, defines high speed rail in similar categories:[4]

> "Definitions: High-Speed Rail (HSR) and Intercity Passenger Rail (IPR)*
>
> "HSR – Express. Frequent, express service between major population centers 200–600 miles apart, with few intermediate stops. Top speeds of at least 150 mph on completely grade-separated, dedicated rights-of-way (with the possible exception of some shared track in terminal areas). Intended to relieve air and highway capacity constraints.
>
> "HSR – Regional. Relatively frequent service between major and moderate population centers 100–500 miles apart, with some intermediate stops. Top speeds of 110–150 mph, grade-separated, with some dedicated and some shared track (using positive train control technology). Intended to relieve highway and, to some extent, air capacity constraints.
>
> "Emerging HSR. Developing corridors of 100–500 miles, with strong potential for future HSR Regional and/or Express service. Top speeds of up to 90–110 mph on primarily shared track (eventually using positive train control technology), with advanced grade crossing protection or separation. Intended to develop the passenger rail market, and provide some relief to other modes.
>
> "Conventional Rail. Traditional intercity passenger rail services of more than 100 miles with as little as one to as many as 7–12 daily frequencies; may or may not have strong potential for future high-speed rail service. Top speeds of up to 79 mph to as high as 90 mph generally on shared track. Intended to provide travel options and to develop the passenger rail market for further development in the future.
>
> "* Corridor lengths are approximate; slightly shorter or longer intercity services may still help meet strategic goals in a cost-effective manner." [4]

II. State of the Intercity and High-Speed Passenger Railroad Industry

II.a. Amtrak Created by Rail Passenger Service Act of 1970:

Amtrak was created by the Rail Passenger Service Act of 1970. The United States Congress found that "modern, efficient, intercity railroad passenger service is a necessary part of a balanced transportation system; that the public convenience and necessity require the continuance and improvement of such service to provide fast and comfortable transportation between crowded urban areas and in other parts of

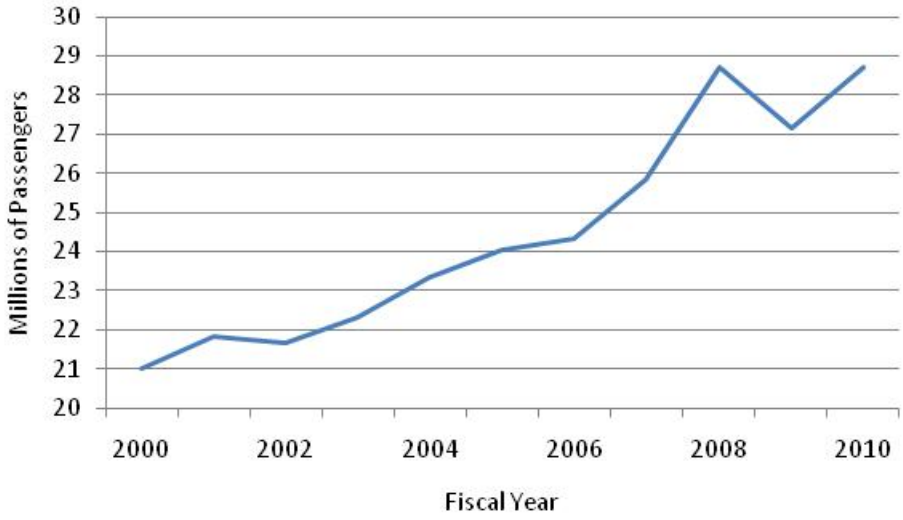
[4] FRA. "Federal Railroad Administration High-Speed Rail Strategic Plan." Washington: U.S. Department of Transportation, Federal Railroad Administration, April 2009. at http://www.fra.dot.gov/Downloads/RRdev/hsrstrategicplan.pdf

the country; that rail passenger service can help to end the congestion on our highways and the overcrowding of our airways and airports; that the traveler in America should to the maximum feasible have freedom to choose the mode of travel most convenient to his needs; that to achieve these goals requires the designation of a basic rail passenger corporation for the purpose of providing modern, efficient, intercity rail passenger service; that Federal financial assistance as well as investment capital from the private sector of the economy is needed for this purpose; and that interim emergency Federal financial assistance to certain railroads may be necessary to permit the orderly transfer of railroad passenger service to a railroad passenger corporation."[5] This law created the National Railroad Passenger Corporation, which would adopt the service mark Amtrak in April, 1971.

Amtrak was created to operate intercity passenger trains. After Amtrak began intercity service in 1971, commuter rail services continued to be operated by private railroads but the commuter rail operations were eventually taken over by public agencies from the private railroads. All commuter railroad service is currently funded and controlled by public transportation agencies, but some service is operated by private railroads under contract to public agencies and some service is operated over private railroad tracks. Amtrak also operates some commuter railroad service under contract to public agencies, provides rights-of-way and terminal facilities for some commuter railroads, and operates some Amtrak intercity service over the rights-of-way of commuter railroads.

Amtrak ridership has grown steadily. Annual passenger trips have gone from 21.0 million in 2000 to 28.7 million in 2010, a 37 percent increase. In 2010 annual passenger trips were at their highest level ever.[6]

Figure 1: Amtrak Annual Ridership Trend



[5] Rail Passenger Service Act of 1970. Public Law 91-518, Title I, Section 101, 91st Congress, H. R. 17849, October 30, 1970 http://ftp.resource.org/gao.gov/91-518/00005088.pdf

[6] Amtrak. "Amtrak Sets New Ridership Record, Thanks Passengers for Taking the Train, News Release ATK-10-134." Washington: Amtrak, October 11, 2010. at http://www.amtrak.com/servlet/BlobServer?blobcol=urldata&blobtable=MungoBlobs&blobkey=id&blobwhere=1249216336898&blobheader=application%2Fpdf&blobheadername1=Content-disposition&blobheadervalue1=attachment;filename=Amtrak_ATK-10-134_AmtrakRidershipRecordFY10.pdf

II.b. First Federal Investment in High-Speed Passenger Rail Technology:

The federal government had funded a high-speed rail initiative before the creation of Amtrak. In 1965, President Lyndon B. Johnson was critical of the existing rail system as he signed the High-Speed Ground Transportation Act of 1965.[7] Johnson stated that "We have airplanes which fly three times faster than sound. We have television cameras that are orbiting Mars. But we have the same tired and inadequate mass transportation between our towns and cities that we had 30 years ago. Today, as we meet here in this historic room where Abigail Adams hung out her washing, an astronaut can orbit the earth faster than a man on the ground can get from New York to Washington."[8]

The High-Speed Ground Transportation Act of 1965, Public Law 89-220, September 30, 1965, authorized $90 million to aid in the development of high-speed multiple-unit rail cars called Metroliners to operate on the Pennsylvania Railroad between Washington and New York and fixed-consist Turbo Trains to operate on the New York, New Haven and Hartford Railroad between New York and Boston. The law established the Office of High-Speed Ground Transportation within the Federal Railroad Administration.[9] Operation of the Metroliners and Turbo Trains were taken over by Amtrak beginning in 1970. When the original Metroliners were retired in 1981, their replacements were locomotive hauled trains, also called Metroliners, designed to maintain the same operating speeds as the original Metroliners.

II.c. Amtrak Improvement and High-Speed Service Laws:

The Amtrak Improvement Act of 1973[10] clarified law concerning Amtrak's authority to conduct business and responsibilities to the public, but did not address the development of high-speed rail. Amtrak would be required to provide equipment and service accessible to elderly and disabled persons. Amtrak was authorized to acquire property for construction facilities, advertize, establish a reservations system, service rolling stock, conduct research, develop improved rolling stock, establish facilities, purchase or lease rolling stack, and operate international rail passenger service to Canada and Mexico. Amtrak was directed to establish an auto-ferry service and introduce at least one experimental route per year. State and local laws interfering with express, mail, or auto-ferry service were prohibited. The Interstate Commerce Commission would resolve sales of property by railroads to Amtrak when agreements could not be reached.

Title VII of the Railroad Revitalization and Regulatory Reform Act of 1976[11] authorized Amtrak to acquire the rights-of-way and facilities to create the Northeast Corridor, which would become the only high-speed rail corridor in the U.S. President Gerald Ford, when signing the Act into law stated that "This act also permits us to begin a program of overdue improvements in rail passenger service in the densely populated Northeast corridor. Passenger service between Washington, New York, and Boston will be made both reliable and comfortable, with trains traveling at speeds which are as high as technologically

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[7] High-Speed Ground Transportation Act. Public Law 89-220. Washington: United States Congress, September 30, 1965.

[8] Johnson, Lyndon B., President of the United States**. "**Remarks at the Signing of the High-Speed Ground Transportation Act." on September 30, 1965. Santa Barbara, CA: The American Presidency Project. at http://www.presidency.ucsb.edu/ws/index.php?pid=27281

[9] *High-Speed Ground Transportation for America.* Washington: U.S. Department of Transportation, Federal Railroad Administration, September 1977. at http://www.fra.dot.gov/Downloads/RRDev/cfs0997all2.pdf

[10] Amtrak Improvement Act of 1973, Public Law 93-146, November 3, 1973. Washington: United States Congress.

[11] Railroad Revitalization and Regulatory Reform Act of 1976, Public Law 94-210, February 5, 1976. Washington: United States Congress. at http://c0403731.cdn.cloudfiles.rackspacecloud.com/collection/papers/1940/1940_SICA_M.PDF

feasible and financially realistic. Within 5 years we should have trains traveling at speeds of up to 120 miles per hour."[12]

II.d. High-Speed Rail Corridor Designations:

Section 1010 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA),[13] directed the Secretary of Transportation to select not more than five corridors, where train operating speeds of 90 miles per hour could be reasonably expected, to be designated as high-speed rail corridors. The Act provided funding to eliminate railroad crossing hazards in those corridors. Section 1103(c) of the Transportation Equity Act for the 21st Century (TEA 21)[14] directed the Secretary of Transportation to designate six additional corridors named in the law or based on criteria described in the law, for a total of 11 corridors.

Figure 2: High-Speed Rail Corridors as Illustrated by the Federal Railroad Administration[15]

Several of the original corridors were extended to meet these requirements and new corridors created to reach the current designation of 10 corridors. Amtrak's Northeast Corridor is already in operation and is therefore not designated as a future corridor. The corridors, cities in each corridor, and dates on which they were created or extended are shown on Table 1 and illustrated on Figure 2. Additional corridors that

[12] Ford, Gerald, President of the United States. "Statement on the Railroad Revitalization and Regulatory Reform Act of 1976." on February 5, 1976. Santa Barbara, CA: The American Presidency Project. at http://www.presidency.ucsb.edu/ws/index.php?pid=6121

[13] Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Public Law 102-240, December 18, 1991. Washington, United States Congress. at http://thomas.loc.gov/cgi-bin/query/C?c102:./temp/~c102BoAQT0

[14] Transportation Equity Act for the 21st Century (TEA 21), Public Law 105-178, June 9, 1998. at http://www.fhwa.dot.gov/tea21/tea21.pdf

[15] FRA. "High-Speed Intercity Passenger Rail Program." Washington: Federal Railroad Administration, 2010. at http://www.fra.dot.gov/Pages/2243.shtml

are proposed are included on both the map and table. Many of these corridors are represented by regional associations. Web pages for those associations can be found in the References/Resources Section VIII.b. of this paper on Page 44.

Table 1: Designation and Extension of Federal Railroad Administration and Other High-Speed Rail Corridors

Corridor	Primary Cities First Designated = D: Extended = E:	Year Designated (D) or Extended (E)
Federal Railroad Administration Designated High-Speed Rail Corridors		
Chicago Hub (originally Midwest)	D: Chicago, IL, Detroit, MI, St. Louis, MO, and Milwaukee, WI. E1: Minneapolis/St. Paul, MN. E2: Indianapolis, IN and Cincinnati, OH. E3: Toledo, OH, Cleveland, OH, Louisville, KY, Columbus, OH, and Dayton, OH. E4: Kansas City, MO.	D: 10/15/1992 E1: 12/11/1998 E2: 1/28/1999 E3: 10/11/2000 E4: 1/19/2001
Florida	D: Tampa FL, Orlando, FL, and Miami, FL.	D: 10/16/1992
California	D: San Diego, CA, Los Angeles, CA, Bay Area of California, Sacramento, CA, and San Joaquin Valley of California. E: Las Vegas, NV	D: 10/19/1992 E: 7/2/2009.
Southeast	D:Charlotte, NC, Richmond, VA, and Washington, DC. E1: Hampton Roads area of Virginia. E2: Greenville, SC, Atlanta, GA, Macon, GA, Raleigh, NC, Columbia, SC, Savannah, GA, and Jacksonville, FL. E3: Jessup, GA.	D: 10/20/1992 E1: 12/14/1995 E2: 12/1/1998 E3: 10/11/2000
Pacific Northwest	D: Eugene, OR, Portland, OR, Seattle, WA, Vancouver, WA, Canada.	D: 10/20/1992
Gulf Coast	D: Houston, TX, New Orleans, LA, and Mobile, AL. E: Birmingham, AL and Atlanta, GA.	D: 11/18/1998 E: 10/11/2000
Empire	D: New York, NY, Albany, NY, and Buffalo, NY.	D: 12/10/1998
Keystone	D: Harrisburg, PA and Philadelphia, PA. E: Pittsburgh, PA.	D: 12/10/1998 E: 10/11/2000
Northern New England	D: Boston, MA, Portland, ME, Auburn, ME, Montreal, PQ, Canada, and New Hampshire and Vermont connecting rights-of-way. E: Springfield, MA, Albany, NY, and New Haven, CT.	D: 10/11/2000 E: Pending
South Central	D: Dallas/Ft. Worth, TX, Austin, TX, San Antonio, TX, Oklahoma City, OK, Tulsa, OK, Texarkana, TX/AR, and Little Rock, AR.	D: 10/11/2000
Other Operating or Proposed High-Speed Rail Corridors		
Northeast Corridor	Boston, MA, Providence, RI, New Haven, CT, New York, NY, Trenton, NJ, Philadelphia, PA, Wilmington, DE, Baltimore, MD, and Washington, DC.	Existing Amtrak High-Speed Corridor
Unnamed	El Paso, TX, Albuquerque, NM, and Denver, CO, plus Cheyenne, WY on FRA map.	Proposed by States of CO, NM, TX
Unnamed	Phoenix, AZ and Tucson, AZ.	On FRA map, Proposed by ARPA (a)
Western	Denver, CO, Salt Lake City, UT, Las Vegas, NV, Phoenix, AZ, Los Angeles, CA, Reno, NV, San Francisco, CA, Portland, OR, and Seattle, WA.	Proposed by WHSRA (a)

Source: Chronology of High-Speed Rail Corridors, FRA[16]
(a) See Section VIII.b. Directory of Regional High-Speed Rail Associations

[16] FRA. "Chronology of High-Speed Rail Corridors: Designations and Extensions." Washington: Federal Railroad Administration. at http://www.fra.dot.gov/rpd/passenger/618.shtml

II.e. Passenger Rail Investment and Improvement Act of 2008:

The Passenger Rail Investment and Improvement Act of 2008 (PRIIA), Division B of Public Law 110-432, October 16, 2008, authorized a high-speed rail grant program.[17] The "High-Speed Rail Corridor Development Program" created at 49 USC 26106 allows states, including the District of Columbia, groups of states, an Interstate Compact, or an agency established by one or more states to receive funds for the purpose of "acquiring, constructing, improving, or inspecting equipment, track, and track structures, or a facility of use in or for the primary benefit of high-speed rail service, expenses incidental to the acquisition or construction (including designing, engineering, location surveying, mapping, environmental studies, and acquiring rights-of-way), payments for the capital portions of rail trackage rights agreements, highway-rail grade crossing improvements related to high-speed rail service, mitigating environmental impacts, communication and signalization improvements, relocation assistance, acquiring replacement housing sites, and acquiring, constructing, relocating, and rehabilitating replacement housing."

High-speed rail is defined as "intercity passenger rail service that is reasonably expected to reach speeds of at least 110 miles per hour." The grant criteria include requirements that that the project be part of a State rail plan; that there will be the legal, financial, and technical capacity to carry out the project, continuing control over the use of the equipment or facilities, and the ability to maintain the equipment or facilities; that the project be based on the results of preliminary engineering studies or other planning, that the project meet all applicable safety and security requirements; that the project be compatible with, and other criteria.

PRIIA authorizations and appropriations for high-speed rail investments for FY 2009 through FY 2013 as shown on Table 2.

Table 2: 49 USC 26106 High-Speed Rail Corridor Development Program Funding Levels (Thousands of Dollars)

Fiscal Year	Authorization	Final Appropriation	Fiscal Year	Authorization	Final Appropriation
2009	150,000	0	2012	350,000	
2010 ARRA (a)	8,000,000	8,000,000	2013	350,000	
2010	300,000	2,125,000			
2011	350,000				

(a) Authorized by the American Recovery and Reinvestment Act of 2009 (ARRA), P.L. 111-5,

Section 307(b) of PRIIA amends 49 USC 103(j) to direct the Administrator of the Federal Railroad Administration to "develop a long-range national rail plan that is consistent with approved State rail plans and the rail needs of the Nation, as determined by the Secretary in order to promote an integrated, cohesive, efficient, and optimized national rail system for the movement of goods and people." [17] This directive resulted in the publication of the *Preliminary National Rail Plan* in October 2009.[18] Included in the Plan is a "Development of Passenger High-Speed Intercity Rail: A New Transportation Vision," which reads:

> "To help address the Nation's transportation challenges, the Federal Government is determining how and where to invest in an efficient, high-speed intercity passenger rail network, which would consist of 100–600 mile intercity corridors that connect communities across America. This vision builds on the successful highway and aviation development models by adding a 21st century solution that focuses on a clean, energy-

[17] Passenger Rail Investment and Improvement Act of 2008, Division B of Public Law 110-432, October 16, 2008. Washington, United States Congress. at http://www.fra.dot.gov/Downloads/Pub.%20L.%20No.%20110-432%20in%20pdf.pdf

[18] FRA. "Preliminary National Rail Plan." Washington, U.S. Department of Transportation, Federal Railroad Administration, October 2009 at http://www.fra.dot.gov/Downloads/RailPlanPrelim10-15.pdf

efficient option (even today's modest intercity passenger rail system consumes 21 percent less energy per passenger-mile than automobiles, for example). But developing a comprehensive high-speed and intercity passenger rail network would require a long-term commitment at both the Federal and State levels. In addition to the $8 billion in the Recovery Act, consideration is currently being given at all levels of government to increase funding for high-speed rail.

"Over the past two decades, the Federal Government has taken small steps to lay the groundwork for an expansion of high-speed intercity rail and intercity passenger rail. The funding provided in the Recovery Act represents a significantly greater Federal commitment to high-speed intercity rail development in the United States.

"The first steps to advance passenger rail will emphasize strategic investments that will yield tangible benefits to intercity rail infrastructure, equipment, performance, and intermodal connections over the next several years, while also creating a "pipeline" of projects to promote future corridor development. Federal and State governments face a difficult fiscal environment in which to balance critical investment priorities, and many will have to ramp up their program management capabilities.

"The United States has a dwindling pool of expertise in the field of passenger rail and a lack of manufacturing capability. But future investment in passenger rail could lead to a resurgence of this industry and require new technologically advanced designs. Equipment could be constructed in manufacturing plants, requiring advanced subsystems along with primary materials such as high-quality steel.

"This presents a challenge, but also an opportunity. Along with the renewed Federal commitment proposed here, the country's success in creating a balanced and sustainable transportation future will require that we work to overcome these challenges through strong new partnerships among State and local governments, railroads, manufacturers, and other stakeholders." [19]

II.f. On-Going High Speed Rail Funding Programs:

Two other on-going federal programs provide funding for high-speed rail. 49 USC 26101 High-Speed Corridor Planning program provides assistance to public agencies for up to 50 percent of publicly financed planning costs for high-speed rail. Eligible planning activities include environmental assessments; feasibility studies; economic analyses; employment impact assessments; operational planning; preliminary engineering and design; financial planning; acquisition of locomotives, rolling stock, track, and signal equipment; and other activities. No funds can be used for the main line of the Northeast Corridor. Authorizations for this program are shown on Table 3.

Table 3: 49 USC 26101 High-Speed Rail Corridor Planning Program and 49 USC 26102 High-Speed Rail Technology Improvements Program Authorization Levels (Thousands of Dollars)

Fiscal Year	Authorization 49 USC 26101	Authorization 49 USC 26102	Fiscal Year	Authorization 49 USC 26101	Authorization 49 USC 26102
2006	30,000	30,000	2010	30,000	30,000
2007	30,000	30,000	2011	30,000	30,000
2008	30,000	30,000	2012	30,000	30,000
2009	30,000	30,000	2013	30,000	30,000

[19] FRA. "Preliminary National Rail Plan." Washington, U.S. Department of Transportation, Federal Railroad Administration, October 2009 at http://www.fra.dot.gov/Downloads/RailPlanPrelim10-15.pdf Page 10.

The High-Speed Rail Technology Improvements program, 49 USC 26102 provides funding to private businesses, educational institutions, states, local governments, public authorities, of federal government agencies for the improvement, adaptation, and integration of proven technologies for commercial application in high-speed rail service. Authorizations for this program are also shown on Table 3.

II.g. American Recovery and Reinvestment Act of 2009 (ARRA):

The American Recovery and Reinvestment Act of 2009 (ARRA), Public Law 111-5, February 17, 2009 provides funds for high-speed rail investment. The ARRA was enacted in order to stimulate the economy. The ARRA appropriated a total of $787 billion including $48 billion for transportation of which $8 billion was specifically for "High-Speed Rail Corridors and Intercity Passenger Rail Service" and $1.3 billion for Amtrak capital grants which includes $450 million for security improvements. Corridors receiving funding, with route length and amount of funds, are shown on Table 4, in the "Miles of Track" and "Original Allocation" columns.

Table 4: High-Speed Rail Corridors Funded by ARRA by Miles of Track and Funding Amount[20]

Corridors Receiving Funding Under ARRA							
Corridor	Route	Miles of Track				ARRA Funding (Millions of Dollars)	
		New	Upgraded	Planned	Total	Original Allocation	Allocation Dec. 9, 2010
California	All	800	880	275	1,955	2,344	2,968
Pacific Northwest	Eugene-Portland-Seattle	---	437	30	467	598	761
Chicago Hub Network	Chicago-St. Louis-Kansas City	---	570	---	570	1,133	1,175
	Minneapolis/St. Paul-Madison-Milwaukee-Chicago	144	32	275	451	823	30
	Cleveland-Columbus-Cincinnati	250	---	---	250	400	0
	Detroit-Pontiac-Chicago	---	300	---	300	244	244
	Other	---	---	---	---	0	1
Southeast Region	Tampa-Orlando-Miami	84	---	240	324	1,250	1,592
	Charlotte-Richmond-Washington	---	480	---	480	620	623
Northeast Region	All	84	1,542	727	2,353	(a) 1,191	(a) 1,207
Total for Named Corridors	---	1,362	4,241	1,547	7,150	(a) 8,603	(a) 8,602

Note: The miles of track are the entire length of the corridor; they are not the length of specific projects to be funded by ARRA which are expected to be segments of the corridors.
(a) Includes $706 million ARRA grants for Amtrak, see below.
(b) Approximate distribution of funds after December 9, 2010.
Source: U.S. Department of Transportation. [20]

On December 9, 2010, the U.S. Department of Transportation announced a redistribution of some of the ARRA funds. The incoming governors of Wisconsin and Ohio indicated that they would not move forward

[20] "President Obama, Vice President Biden to Announce $8 Billion for High-Speed Rail Projects across the Country" News, DOT 18-10. Washington: U.S. Department of Transportation, January 28, 2010. at http://www.whitehouse.gov/the-press-office/president-obama-vice-president-biden-announce-8-billion-high-speed-rail-projects-ac and FRA. "The American Recovery and Reinvestment Act of 2009: Frequently Asked Questions Rail Programs Funded Under The American Recovery and Reinvestment Act (ARRA) of 2009, Public Law 111-5." Washington: U.S. Department of Transportation, Federal Railroad Administration. at http://www.fra.dot.gov/Downloads/ARRA%20FAQs%20FINAL.pdf

in the use of high-speed rail funds from the ARRA. As a result, $810 million designated for Wisconsin and $400 million designated for Ohio were redistributed to other corridors. The column in Table 4 designated "Allocation Dec. 9, 2010" is an approximation of the distribution funds from the ARRA for high-speed rail based on U.S. DOT data,[21] but are not amounts actually published by U.S. DOT. Therefore, these amounts should be treated as indicative, but by no means exact.

ARRA high-speed rail grants are given under the provisions of the PRIIA. The funds cannot be used for planning or operations. The federal share is up to 100 percent of the project cost. ARRA grants fall under a Buy American provision.

III. Projected Growth in the Total Rail Vehicle Market and Total Rail Travel Market and Dispersion of the Rail Vehicle Manufacturing Sector

III.a. Projected Growth in the Total Rail Vehicle Market and Total Rail Travel Market

Figures 2 through 6 describe the growth in transit passenger rail and intercity passenger rail vehicles, systems, and passenger trips that occurred over the past 30 years and are projected to occur over the next 30 years. The 1980 and 2010 amounts are based on actual occurrences. The 2040 amounts are projections. The projections are based on available data for planned and proposed expansion projects reported in Federal Railroad Administration,[22] Amtrak,[23] Federal Transit Administration,[24] American Public Transit Association,[25] and high-speed rail associations (see Section VIII.b.) publications, adjusted with long-term trend data. As with any long-term projection, future economic, social, and environmental forces may dramatically change the pace of growth in either a positive or negative fashion.

Figure 3 reports the number of passenger vehicles owned by rail transit systems. In 1980, transit agencies owned 4,500 commuter rail passenger vehicles (excluding locomotives), 9,641 heavy rail vehicles, and 1,013 light rail vehicles, for a total of 15,154 vehicles. By 2010, the fleet had expanded by 35 percent to a total 20,422 vehicles; 6,887 commuter rail, 11,406 heavy rail, and 2,129 light rail.

A 49 percent overall growth to 30,400 total transit rail vehicles is forecast by 2040, including 10,800 commuter rail vehicles, 15,100 heavy rail vehicles, and 4,500 light rail vehicles.

The intercity rail vehicle fleet is projected to expand at an even greater rate. In 1980, Amtrak owned 1,531 intercity service vehicles and 58 high-speed service vehicles, excluding locomotives. Intercity service is used in the context of this report to describe any intercity rail service that is not high-speed rail. By 2010 Amtrak's fleet had grown slowly to 1,580 intercity service vehicles and 120 high-speed rail service vehicles. As shown in Figure 4, a significant increase in intercity rail passenger vehicles is forecast by 2040. Intercity service vehicles are forecast to increase to 4,500 vehicles and high-speed

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[21] U.S. DOT. "U.S. Department of Transportation Redirects $1.195 Billion in High-Speed Rail Funds." Washington: Department of Transportation, December 9, 2010. at http://www.fra.dot.gov/Pages/press-releases/231.shtml

[22] FRA. "High-Speed Intercity Passenger Rail Program" Washington: Federal Railroad Administration. at http://www.fra.dot.gov/Pages/2243.shtml

[23] Amtrak. *Amtrak Fleet Strategy: Building a Sustainable Fleet in the Future of America's Intercity and High-Speed Passenger Railroad.* Washington: Amtrak, February 2010. at http://www.amtrak.com/servlet/BlobServer?blobcol=urldata&blobtable=MungoBlobs&blobkey=id&blobwhere=1249205419477&blobheader=application%2Fpdf&blobheadername1=Content-disposition&blobheadervalue1=attachment;filename=Amtrak_FleetStrategyPlan.pdf

[24] FTA. *Annual Report on Funding Recommendations Fiscal Year 2011 New Starts, Small Starts, and Paul S. Sarbanes Transit in Parks Program.* Washington: Federal Transit Administration, 2010. at http://www.fta.dot.gov/publications/reports/reports_to_congress/publications_11092.html

[25] APTA. *Public Transportation Infrastructure Database.* Washington: American Public Transportation Association, 2008.

service vehicles to 2,640 for a total of 7,140 intercity passenger rail vehicles. Many of the new intercity service vehicles would operate in higher than current speed service but not high enough to be classified as high-speed service.

Figure 3: Increase in Number of Rail Transit Passenger Vehicles

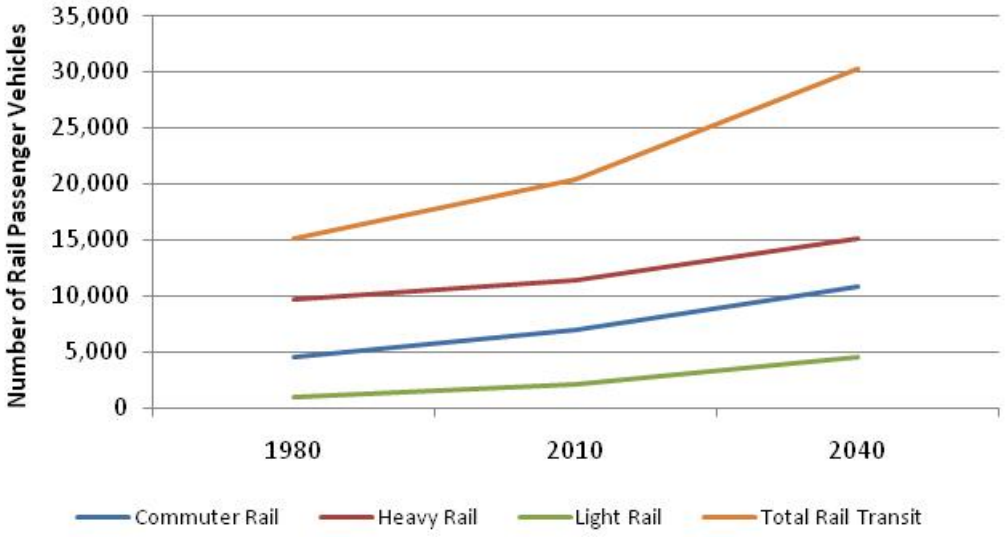
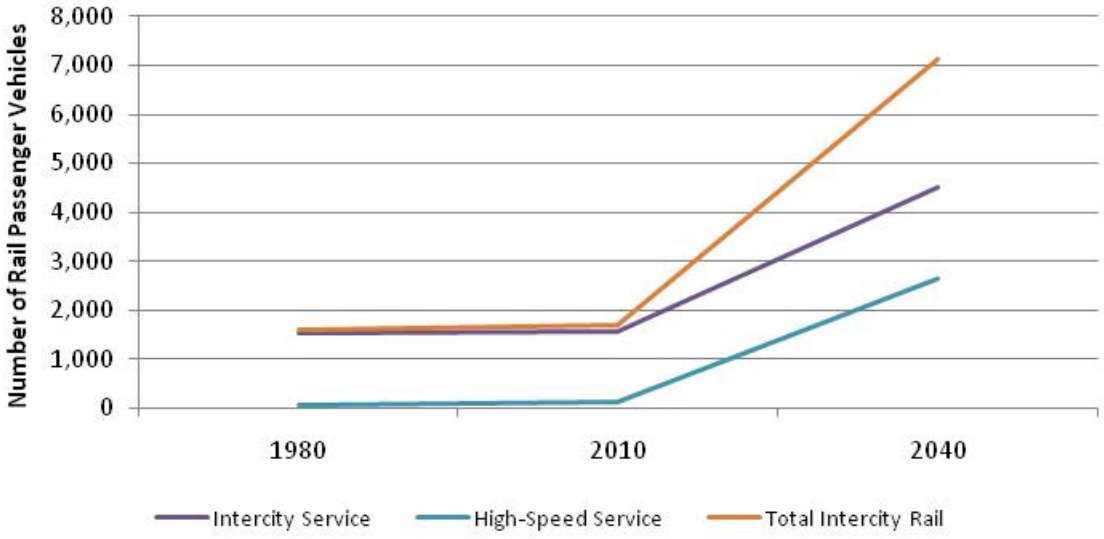


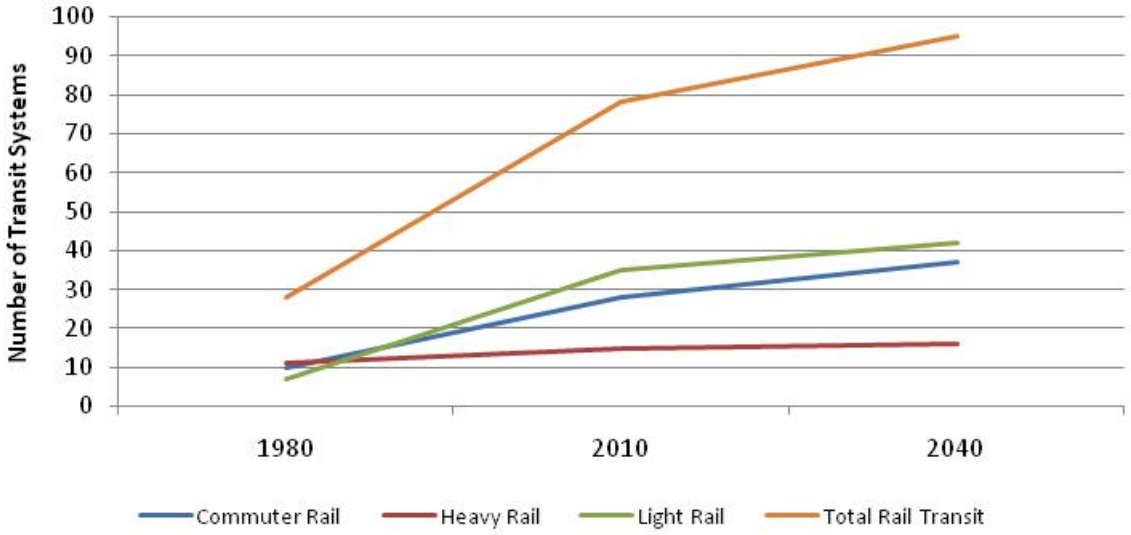
Figure 4: Increase in Number of Intercity Rail Passenger Vehicles



The increase in the number of rail transit agencies is forecast to slow down since most larger areas have begun rail transit services in the past 30 years. Most rail transit expansion is forecast to be extensions to existing transit systems rather than entirely new systems. The 1980 to 2010 period saw a rapid expansion of rail transit systems. Commuter rail systems went from 10 to 28 over the 30-year period, heavy rail systems from 11 to 15, and light rail systems from 7 to 35. In total, rail transit systems grew from 28 to 78.

As shown on Figure 5, additional growth in the number of systems is forecast by 2040, with the number of commuter rail systems increasing to 37, heavy rail to 16, and light rail to 42, for a total of 95 transit rail systems.

Figure 5: Increase in Number of Rail Transit Systems



Rail transit showed sustained growth in the 1980 to 2010 period. As shown on Figure 6, commuter rail passenger trips increased from 268 million in 1980 to 445 million in 2010, heavy rail passenger trips increased from 2,108 million to 3,507 million, and light rail passenger trips increased from 133 million to 467 million. In total, rail transit passenger trips increased from 2,509 million in 1980 to 4,420 million in 2010.

Rail transit passenger trips are forecast to increase more rapidly from 2010 to 2040. Increased passenger trips will result from growth in demand on and more efficient use of existing transit rail systems, expansion of existing rail transit systems, and construction of new transit rail systems. These projections are based on an expectation that needed investment will be made to improve efficiency and expand service to meet travel demand. By 2040, commuter rail passenger are forecast to increase to 790 million, heavy rail passenger trips to 5,840 million, and light rail passenger trips to 1,640 million, for a total of 8,270 million rail transit passenger trips in 2040.

Intercity rail passenger trips have also increased over the past 30 years and are expected to increase at a substantially greater rate by 2020. As shown on Figure 7, intercity rail intercity service, that is, non-high-speed service, passenger trips increased from 20 million in 1980 to 26 million in 2010. High-speed rail service passenger trips in the Northeast Corridor increased from 1 to 3 million over the same period.

With the construction of new high-speed rail lines and the upgrade of intercity service routes to higher speeds, intercity rail passenger trips are forecast to increase dramatically. The designation of service as intercity service or high-speed service is somewhat unclear. The speed of all categories of intercity rail service is forecast to improve with investment in intercity rail infrastructure, but the portion that will reach speeds associated with High-Speed Rail service is estimated. By 2040, passenger trips on intercity service are projected to increase to 75 million and on high-speed service to 165 million, for a total of 240 million intercity passenger trips. These trips are in addition to commuter rail trips projected earlier.

Figure 6: Increase in Rail Transit Passenger Trips

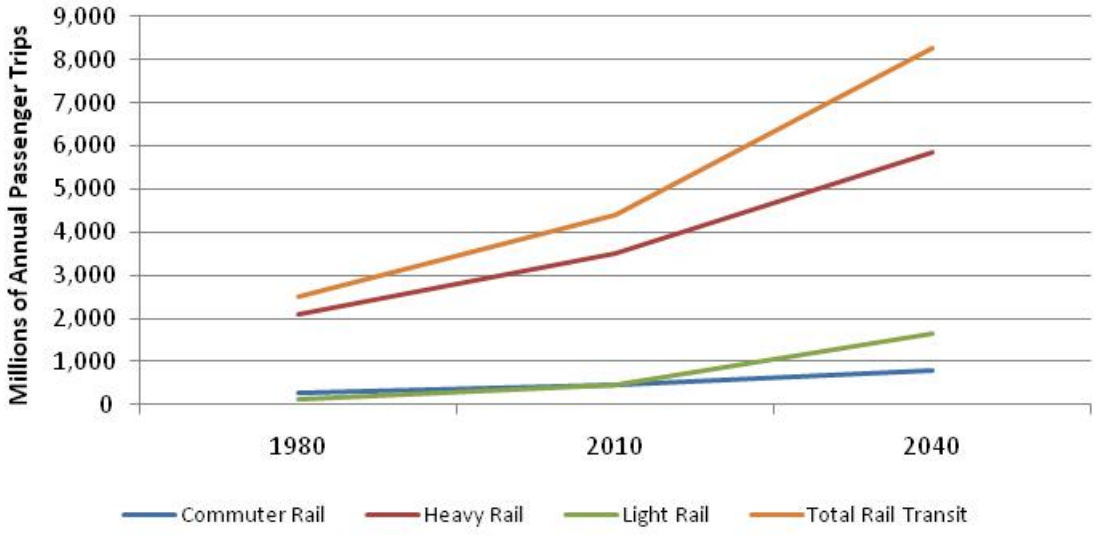
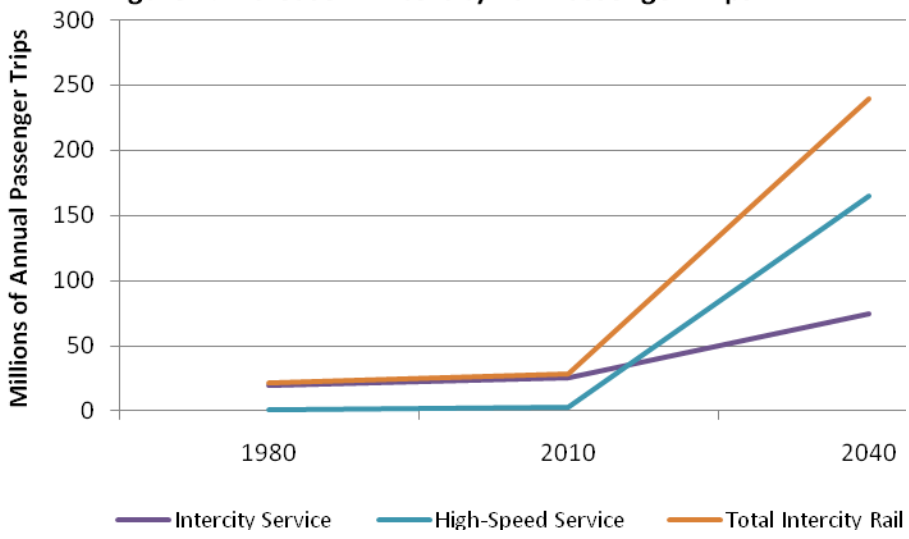


Figure 7: Increase in Intercity Rail Passenger Trips



III.b. Duke University Center on Globalization, Governance and Competitiveness Rail Passenger Vehicle Value Chain Analysis:

The Duke University Center on Globalization, Governance and Competitiveness Rail Passenger Vehicle Value Chain analysis was conducted to identify the value chain for rail passenger vehicles and the extent

of rail passenger vehicle manufacturing in the United States.[26] A value chain is a chain of business activities that add value to a product. In this case the businesses that work on or supply materials or other inputs to the manufacture of rail passenger vehicles. The analysis also sought to determine the type and portion of rail car manufacturing activity that occurs in the U.S. and the jobs created from that activity.

The supply chain which they identify included 249 manufacturing locations in 35 states. Although U.S. law requires 60 percent of rail car content to be domestic, the analysis found that higher-value activities were performed abroad.

They also found that the assembly and manufacture of rail passenger cars and locomotives supported 10,000 to 14,000 jobs in the U.S. These jobs do not include jobs resulting from multiplier effect spending. Sources are cited that the multiplier effect for manufacturing on average is 2.5. Firms that the researchers surveyed stated that not only is increased funding needed, but steady demand for vehicles is needed to stabilize the market for rail cars and allow the expansion of the U.S. manufacturing base.

IV. High-Speed Rail Plans and Funding Needs

IV.a. U.S. DOT *High-Speed Ground Transportation for America*:

The U.S. Department of Transportation published *High-Speed Ground Transportation for America.* The report predicted that "HSGT activity in the United States will only occur because of pressing transportation needs. As travel demand grows, intercity transportation by air and auto increasingly suffers from congestion and delay, particularly within metropolitan areas; at and surrounding airports; and during weekend, holiday, and bad-weather periods. This declining quality of service adversely affects intercity travelers, other transport system users, carriers, and the general public, and provides the impetus for careful evaluation of HSGT options."[27] The report explores the costs and benefits of specific proposed high-speed rail corridors but does not estimate a national need.

IV.b. APTA High-Speed Rail Funding, Advocacy, and Policy Proposals:

APTA has proposed $50 billion in high-speed rail funding as part of the authorization of a new surface transportation law to replace SAFETEA-LU, which expired on October 31, 2009. The APTA proposal calls for the creation of "a separate High-Speed and Intercity Passenger Rail title which authorizes no less than $50 billion during the next six years to facilitate the development of a transformational domestic High-Speed and Intercity Rail system. New funding for a High-Speed and Intercity Passenger rail program must come from sources other than the Highway Trust Fund (HTF). The Northeast Corridor shall be eligible for High-Speed and Intercity Rail investments under this title. Common and/or periphery benefits bestowed upon commuter rail systems as a result of High-Speed and Intercity Rail program investments should be eligible for funding under this title." [28]

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[26] Lowe, Marcy, et. al. *U.S. Manufacture of Rail Vehicles for Intercity Passenger Rail and Urban Transit: A Value Chain Analysis.* Durham, NC: Center on Globalization, Governance and Competitiveness, Duke University, June 22, 2010. at http://www.cggc.duke.edu/pdfs/U.S._Manufacture_of_Rail_Vehicles_for_Intercity_Passenger_Rail_and_Urban_Transit.pdf

[27] *High-Speed Ground Transportation for America.* op.cit. Pages 2-1, 2-2. at http://www.fra.dot.gov/Downloads/RRDev/cfs0997all2.pdf

[28] APTA. *APTA Recommendations on Federal Public Transportation Authorizing Law, Post SAFETEA-LU: Transportation for the Future.* Washington: American Public Transportation Association, November 1, 2009. at http://www.apta.com/gap/legissues/authorization/Documents/apta_authorization_recommendations.pdf

APTA has also adopted an advocacy agenda and policy principals for high-speed rail. The "APTA Four-Point Advocacy Agenda for the Finance of Intercity and High-Speed Rail" approved on December 12, 2008 states that

> "APTA will pursue the following funding opportunities:
>
> "1. Full Funding for the Passenger Rail Investment and Improvement Act of 2008: APTA supports full general fund appropriations for the programs authorized under the Passenger Rail Investment and Improvement Act of 2008, and will actively seek funding to support grants to states to pay for the capital costs of facilities and equipment necessary to provide new or improved intercity passenger rail service and for planning and development of high-speed rail corridors. Signed into law October 16, 2008, this act authorizes to be appropriated $13.6 billion over 5 years for passenger rail service.
>
> "2. Tax-Credit Bonds: APTA supports legislation to establish tax-credit bonds as one of the funding sources for intercity and high-speed rail projects. As part of this process APTA will seek to clarify language regarding eligibility, arbitrage, and length of bonding in ways that will facilitate the use of tax-credit bonding as a tool for financing high-speed rail projects.
>
> "3. Revenues Generated through Climate Strategies: APTA supports funding intercity and high-speed rail programs through revenues generated by cap-and-trade mechanisms, carbon taxes, auctions, and other measures.
>
> "4. Pursue Additional Funding Opportunities: In addition to the above revenue sources, APTA will pursue additional funding opportunities for intercity and high-speed rail in economic stimulus legislation, and also through a Passenger Rail title added to the upcoming authorization of federal surface transportation programs which could include, among other things, PPP options and private activity tax-exempt bonds, but not to include funding from the Highway Trust Fund."[29]

APTA then adopted policy principals to specify a vision for high-speed rail in the U.S. and propose parameters for a federal program in support of high-speed rail investment. The APTA "High-Speed Rail Corridor and Intercity Passenger Rail Service Principles Task Force: Policy Principles" was adopted on May 2, 2009. It states that:

> "In 1956 America put forth a vision and a plan to connect the nation through a network of interstate highways. While this program led to construction of a roadway system that is the world's best, the vision of a connected America will not be complete until it becomes an integrated and balanced surface transportation system that includes world-class intercity and high-speed rail synergized with air transportation and intercity bus service, and enhanced by local and regional transit services. The high-speed and intercity rail program envisioned and recommended by the National Surface Transportation Policy and Revenue Study Commission (i.e. a system that could accommodate and sustain 46 billion annual passenger miles) provides a sense of scope and scale from which to build. To complete the vision, APTA advocates the following principles:
>
> "1. *Vision*: A national network of high-speed and intercity passenger rail services should be driven by a vision that maximizes the capacity and the efficiency of the nation's overall transportation network (rail, highway and aviation), and unifies the regions of the nation in promoting safe and efficient mobility choices, economic growth and competitiveness, national security, energy efficiency, efficient goods movement, environmental quality, and

[29] APTA. A*PTA Four-Point Advocacy Agenda for the Finance of Intercity and High-Speed Rail.* Washington: American Public Transportation Association, December 12, 2008. at http://www.apta.com/gap/legissues/passengerrail/Documents/APTA_HSR_Advocacy_Agenda.pdf

interconnected and livable communities. To realize full potential, stations are located and designed to allow ease of transfer to the local and regional bus network, and for pedestrian and bicycle accessibility. Higher density, in-fill, transit oriented developments, at or near the station, help support station costs, and result in higher levels of ridership on high-speed and intercity rail lines as well as on feeder systems. This comprehensive, integrated transportation strategy elevates the role of high-speed and intercity rail and complements and connects these services with air transportation, the road network and intercity bus service, and with local bus and rail services.

"2. *Funding*: For this integrated and balanced vision to be fulfilled, Congress the Administration, states and local communities will need to address the large and growing gap between capital needs and available resources, not only for high-speed and intercity rail development but also for existing bus and rail transit, highway and aviation programs. Authorization of and appropriations for federal transportation funding programs should be guided by this unifying vision, and should be funded to the levels needed to achieve national and regional transportation objectives., consistent with APTA's adopted authorization principles.

"3. *Program Structure*: The newly established, ongoing high-speed rail and intercity rail programs should build on that structure established by the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) and affirmed in the American Recovery and Reinvestment Act of 2009 (ARRA.) These programs should encompass the tracks identified in the High-Speed Rail Strategic Plan announced by President Obama on April 16, 2009 (i.e. ready to go projects; programs for developing corridors, and project planning). Programs should encompass the full range of rail passenger system speeds defined in that plan (i.e. HSR Express 150+ mph; HSR Regional 110 – 150 mph; Emerging HSR 90 – 110 mph; Conventional Rail 79 – 90 mph.)

"4. *Eligible Recipients*: Funding for all programs should be available to eligible recipients as prescribed in PRIIA, or their designated agents. Private sector entities cannot and should not receive funds directly, but should be encouraged to participate in public private partnerships provided such participation is consistent with state rail plans.

"5. *Shared Corridors*: Commuter railroads and other rail operations sharing corridors to be improved using funding pursuant to PRIIA or ARRA should benefit from corridor improvements and should reasonably expect system improvements of its infrastructure and enhancement of services. Such investments should sustain and enhance existing corridor service, with the investments assuring that any negative impacts are averted with improvements as necessary and funding provided for these improvements. An equitable and fair process for negotiating passenger rail operational access on freight railroads and in the use of adjacent freight rail rights of way must also be established, along with reasonable liability terms and legal limits to liability.

"6. *Relationship to Key Federal Priorities*: High-speed and intercity rail programs should be recognized in federal surface transportation legislation, in federal aviation policy and legislation, and in federal energy and environmental legislation.

"7. *How an Ongoing Program Should Work*: Creation of a national rail passenger system map is essential, with input obtained from national, state and regional levels. This national system map should build upon the existing intercity rail network and designated high-speed rail corridors. A process must also be defined for considering additional corridors as well as refinement / expansion of existing corridors. The ongoing program should be supported through a federal High-Speed and Intercity Rail Passenger Account to be funded through dedicated revenues, with key segments of the system prioritized and funded through an efficiently administered federal process involving multi-year contract authority. As outlined in ARRA, initial federal grants may be up to 100%. PRIIA

calls for an 80-20% matching program, and FRA Amtrak-capital state matching grants call for 50-50 match. States / agencies receiving such grants should anticipate the eventual need to satisfy match requirements, as well as the requirements to demonstrate ongoing operating and maintenance funding sustainability. Prioritization should achieve an ongoing and sequential advancement of projects that result in the full implementation of the national plan. The entire nation will share the collective long term goal of seeing that the entire system is fulfilled.

"8. *Inclusion of the Northeast Corridor:* For purposes of clarifying the intent of PRIIA and ARRA, the Northeast Corridor must be included in any high-speed rail strategy for the United States.

"9. *Grade Crossing Elimination:* A robust federal high-speed rail grade crossing elimination program should be established and adequately funded within the Federal-aid highway program, with recognition to priority corridors and high-risk grade crossings within those corridors.

"10. *Related Infrastructure Issues:* APTA will continue to provide input to U.S. DOT and Congress on infrastructure and systems issues associated with the development of high-speed and intercity rail passenger services, including matters such as positive train control, sealed corridors, interoperability, equipment specifications, the possibility of joint procurement programs, and shared corridor operations."[30]

IV.c. Amtrak Northeast Corridor High-Speed Rail Proposal:

Amtrak has proposed the development of Next Generation ("Next-Gen") High-Speed Rail service for the Northeast Corridor (NEC).[31] The report projects growing demand for travel in the NEC growing by one-third and "congestion levels measured in 2002 will increase to the point of corridor gridlock by 2035. Eighty-nine percent of NEC trips longer than 75 miles are by car, 6 percent by air, and 5 percent by rail." The Amtrak report does not consider highway expansion a practical response stating that "Annual expenditures in the $25 billion range would be needed to make any headway in dealing with this congestion, according to a recently released report by the I-95 Corridor Coalition, 'A 2040 Vision for the I-95 Coalition Region.'[32] and any further expansion of highways in urban areas faces substantial practical and political difficulties. More importantly, from the local to the national level, there is a growing understanding that more highway lanes are not a sustainable transportation solution in terms of energy efficiency, environmental impacts and economic competitiveness. The proposed Next-Gen high-speed system, at full capacity, would add intercity travel capacity equal to approximately 1,900 lane miles of Interstate highway, but with 220 mph service and convenient, downtown-to downtown connections." [31]

Increased air travel is also not a solution to the problem. As the report states, "Growing demand for longer-distance domestic and international air travel puts further pressure on these constrained aviation facilities, with limited ability to create more service "slots" in congested air spaces like the New York metropolitan area. A shift to other modes – especially fast, frequent, high-quality intercity rail – for the

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[30] APTA. "High-Speed Rail Corridor and Intercity Passenger Rail Service Principles Task Force: Policy Principles" Washington: American Public Transportation Association, May 2, 2009. at http://www.apta.com/gap/legissues/passengerrail/Documents/APTA_HSR_Policy_Principles.pdf

[31] Amtrak. *A Vision for High-Speed Rail in the Northeast Corridor*. Washington: Amtrak, September 2010. at http://www.amtrak.com/servlet/ContentServer/Page/1248542787937/1237405732517

[32] I-95 Corridor Coalition. *A 2040 Vision for the I-95 Coalition Region Supporting Economic Growth in a Carbon-Constrained Environment: Final Report.* Rockville, MD: I-95 Corridor Coalition, Cambridge Systematics, Inc., December 2008. at http://www.i95coalition.org/i95/Portals/0/Public_Files/pm/reports/2040%20Vision%20for%20I-95%20Region_Full%20Report.pdf

shorter (100-500-mile) intra-corridor trips is essential, freeing up scarce air transport capacity for higher-value transnational and international flights." [31]

The Amtrak proposal calls for a $52 billion investment to the existing NEC rail system for repair, upgrades, and enhancements by 2030 to help handle a projected 60 percent increase in intercity and commuter rail trips. Preliminary studies indicate that a dedicated high-speed rail alignment would have approximately $117 billion in construction investment. High-speed rail ridership would increase 5-fold and the project would have a high benefit to cost ratio. [31]

IV.d. Amtrak Fleet Strategy:

An immediate need in the development of high-speed rail operations and improving the performance of all intercity passenger rail operations is the upgrade and replacement of Amtrak's current vehicle fleet. Amtrak announced a new fleet improvement strategy in *Amtrak Fleet Strategy: Building a Sustainable Fleet in the Future of America's Intercity and High-Speed Passenger Railroad.*[33] The new fleet strategy is designed to meet future travel demands, simplify fleet maintenance, provide the best service for passengers, and renew the vehicle fleet in an organized manner over time while s creating a constant demand to support a competitive supplier base.

Amtrak projects that the desirable procurement program would acquire 65 single level passenger cars each year, 35 bi-level cars each year, a total of 70 electric locomotives, 25 high-speed diesel locomotives each year, expansion and replacement of the existing high-speed Acela fleet, and switching locomotives. Implementation of this program is dependent upon the availability of funding.

IV.e National Surface Transportation Policy and Revenue Study Commission:

The National Surface Transportation Policy and Revenue Study Commission, Passenger Rail Working Group (PRWG), was "was created by the 109th Congress in Section 1909 of 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."[34]

The report surveys the benefits of intercity rail and high-speed rail. The extensive high-speed rail investments being made in other countries are outlined and compared to U.S. investments. The PRWG quantifies the investment needed to achieve its vision for the improvement and expansion of U.S. intercity passenger rail and high-speed rail, calling for a total funding through 2050 of $357.2 billion (2007 dollars), an annual average of $8.1 billion. The amounts the PRWG proposes and their use is shown on Table 5.

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[33] Amtrak. *Amtrak Fleet Strategy: Building a Sustainable Fleet in the Future of America's Intercity and High-Speed Passenger Railroad.* Washington: Amtrak, February 2010. at http://www.amtrak.com/servlet/BlobServer?blobcol=urldata&blobtable=MungoBlobs&blobkey=id&blobwhere=1249205419477&blobheader=application%2Fpdf&blobheadername1=Content-disposition&blobheadervalue1=attachment;filename=Amtrak_FleetStrategyPlan.pdf

[34] National Surface Transportation Policy and Revenue Study Commission. *Vision for the Future U.S. Intercity Passenger Rail Network Through 2050.* Washington: National Surface Transportation Policy and Revenue Study Commission, Passenger Rail Working Group, December 2007. at http://www.sehsr.org/reports/visionfuturerpt07dec06.pdf

Table 5: National Surface Transportation Policy and Revenue Study Commission, Passenger Rail Working Group (PRWG) Funding Proposal for Intercity Passenger Rail through 2050

Use	Funding by Time Period (Billions of 2007 Dollars)			
	2007-2015	2016-2030	2031-2050	Total
Infrastructure	50.2	115.4	78.2	243.8
Station and Recapitalization	2.7	5.3	6.6	14.6
Rolling Stock	13.4	37.9	47.5	98.8
Total	66.3	158.6	132.5	357.2
Annual Average	7.4	10.6	6.6	8.1

Data source: National Surface Transportation Policy and Revenue Study Commission, Passenger Rail Working Group

V. United States High-Speed Rail Compared to Other Nations

The United States has made a very modest investment in high-speed rail compared to other countries. The U.S. ranks 7th in miles of high-speed rail in operation, 9th in miles under construction, 5th in miles

Table 6: Miles of High-Speed Rail Lines by Country May 2010

Miles of High-Speed Passenger Railway Lines									
	Operating			Under Construction		Planned		Total	
Country	Miles	Percent of Total	Highest Speed (mph) (a)	Miles	Percent of Total	Miles	Percent of Total	Miles	Percent of Total
Argentina	0	0.0%	---	0	0.0%	197	1.8%	197	0.7%
Belgium	131	1.6%	188	0	0.0%	0	0.0%	131	0.5%
Brazil	0	0.0%	---	0	0.0%	313	2.8%	313	1.2%
China	2,206	26.3%	219	4,185	58.6%	1,813	16.5%	8,204	30.9%
France	1,170	14.0%	200	146	2.0%	1,635	14.9%	2,951	11.1%
Germany	803	9.6%	188	236	3.3%	419	3.8%	1,458	5.5%
India	0	0.0%	---	0	0.0%	309	2.8%	309	1.2%
Iran	0	0.0%	---	0	0.0%	297	2.7%	297	1.1%
Italy	577	6.9%	188	0	0.0%	247	2.2%	824	3.1%
Japan	1,533	18.3%	188	369	5.2%	364	3.3%	2,266	8.5%
Morocco	0	0.0%	---	0	0.0%	425	3.9%	425	1.6%
Poland	0	0.0%	---	0	0.0%	445	4.0%	445	1.7%
Portugal	0	0.0%	---	0	0.0%	629	5.7%	629	2.4%
Russia	0	0.0%	---	406	5.7%	406	3.7%	813	3.1%
Saudi Arabia	0	0.0%	---	0	0.0%	344	3.1%	344	1.3%
South Korea	206	2.5%	188	51	0.7%	0	0.0%	258	1.0%
Spain	1,003	12.0%	188	1,387	19.4%	1,064	9.7%	3,453	13.0%
Sweden	0	0.0%	---	0	0.0%	469	4.3%	469	1.8%
Switzerland	22	0.3%	156	45	0.6%	0	0.0%	67	0.3%
Taiwan-China	216	2.6%	188	0	0.0%	0	0.0%	216	0.8%
The Netherlands	75	0.9%	188	0	0.0%	0	0.0%	75	0.3%
Turkey	147	1.8%	156	319	4.5%	1,049	9.5%	1,515	5.7%
United Kingdom	71	0.8%	188	0	0.0%	0	0.0%	71	0.3%
USA	226	2.7%	150	0	0.0%	563	5.1%	789	3.0%
World Total	8,384	100.0%	---	7,144	100.0%	10,987	100.0%	26,515	100.0%

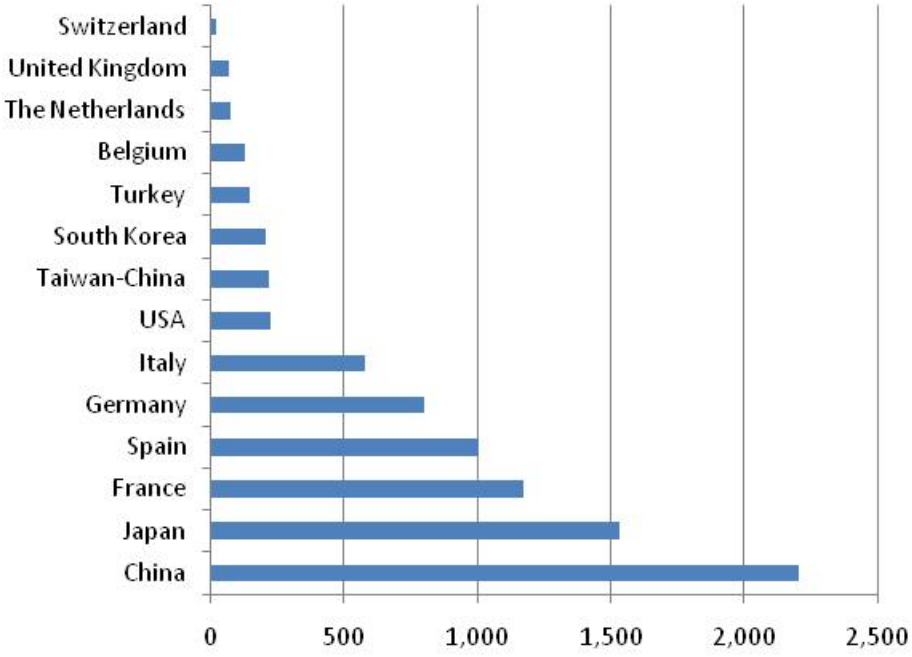
(a) Highest speed of any line currently in operation. Source: International Union of Railways.

planned, and 8th in total miles according to data reported by the International Union of Railways (UIC) in 2010 and shown on Table 6. High-speed rail standards for this table are not specified but the slowest

maximum speed reported is 150 mph, although many miles of these lines may be slower than that if the line is in part over 150 mph.[35]

Figures 8 and 9 illustrate the amount of high-speed rail infrastructure in the U.S. compared to other countries. Figure 8, which compares operational miles of route in 2010 is taken from the data reported on Table 6. Figure 8, which compares the number of high-speed train sets in operation in 2008 is also taken from UIC data and is the number of train sets from selected countries and Europe able to operate at or faster than 250 kilometers per hour (156 mph).[36]

Figure 8: Miles of High-Speed Rail in Operation May 2010



Source: International Union of Railways (UIC), 2010

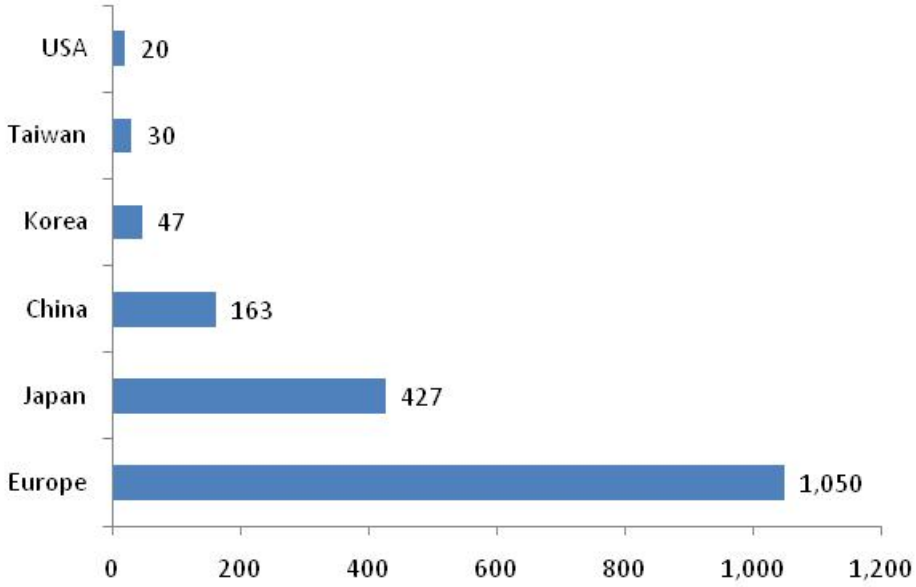
In their 2010 publication, *High-Speed Rail: The Fast Track to Economic Development*, the World Bank described how these shares of the world's high-speed rail investment is changing. [37] They noted the intensity of investment in and construction of high-speed rail in China.

"Remarkably, when it is complete the Guangzhou to Beijing line alone will catapult China ahead of France's entire TGV high-speed network, in terms of length of route operated. Even more remarkably, China's high-speed rail revolution has hardly begun. By 2012 China will have built no less than 42

[35] UIC. "Document 1.4.3 High Speed Summary Miles in the World May 2010." Paris: International Union of Railways (UIC), 2010.
[36] UIC. *High Speed Rail: Fast Track to Sustainable Mobility.* Paris: International Union of Railways (UIC), 2008. at http://www.uic.org/IMG/pdf/20101124_uic_brochure_high_speed.pdf
[37] Amos, Paul, Dick Bullock, and Jitendra Sondhi. *High-Speed Rail: The Fast Track to Economic Development?* Washington: The World Bank, July 2010. at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/07/26/000334955_20100726032714/Rendered/PDF/558560WP0Box341SR1v08121jul101final.pdf

passenger lines with maximum train speeds in excess of 250km/h, and will offer high-speed rail travel on 13,000 kilometers of route. China will have more high-speed railway than the rest of the world put together."[38]

Figure 9: High Speed Train Sets in Operation as of January 2008



Source: International Union of Railways (UIC), 2008

VI. Travel Mode Share Impact of High-Speed Rail

High-speed rail has proven to have had a dramatic impact on travel. The California High-Speed Rail Authority reports these changes in travel behavior following the introduction of high-speed rail to a travel corridor.[39] They note the following market shares:

From Tokyo to Osaka, Japan's two largest urban areas, high-speed rail is about 88 percent of the travel market. Throughout Japan, high-speed rail has 75 percent of the combined high-speed rail and air travel market. They provide the following examples of high-speed rail routes that have a dominant market share in Europe:

- In France, rail held only 22% of the combined Paris-Marseille air-rail market before TGV Mediterranean went into service (2001), but in four years that market share rose to 65% and in 2006 it was 69% and EasyJet abandoned its Paris-Marseille flights.

[38] Amos, Paul, Dick Bullock, and Jitendra Sondhi. *High-Speed Rail: The Fast Track to Economic Development?* Washington: The World Bank, July 2010. at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/07/26/000334955_20100726032714/Rendered/PDF/558560WP0Box341SR1v08121jul101final.pdf Page 3

[39] California High-Speed Rail Association. "News and Facts: Other High-Speed Train Systems." Sacramento: California High-Speed Rail Authority, 2010. at http://cahighspeedrail.ca.gov/other_systems.aspx

- Spain's Ave has 53% of air/rail/road traffic on the Madrid-Seville route.
- Thalys train between Paris and Brussels holds 52% of air/road traffic; after the high-speed rail line went into service, airlines discontinued flights Paris-Brussels – the only competition remaining is road.
- Eurostar has more than 70% of London-Paris market, 64% on London-Brussels. Last month BMI discontinued its London-Paris flights." [38]

An International Union of Railways report provides two comparisons of the percentage of traffic carried by rail in a corridor before and after high-speed rail was introduced as shown on Table 7.[40] Rail travel between Paris and Brussels as a percentage of travel by all modes increased 108 percent, from 24 percent of travel before the introduction of high-speed to rail 50 percent after. Between Madrid and Seville, rail travel went from 33 percent of rail and air travel only to 84 percent, a 155 percent increase.

Table 7: Rail Use Change After Introduction of High-Speed Rail in Two Corridors

Corridor	Percent Trips on Train Before High-Speed Rail	Percent Trips on Train Now	Percent Change in Train Share of Trips
Paris - Brussels (All Travel Modes)	24 %	50 %	108 %
Madrid -Seville (Train and Air Travel Only)	33 %	84 %	155 %

Data source: International Union of Railways, 2008

The California Public Interest Research Group (CALPIRG) [41] reports that the introduction of high-speed rail reduces air travel and intercity private vehicle travel. The point out that high-speed rail has "virtually eliminated short-haul air service on several corridors in Europe, such as between Paris and Lyon, France, and between Cologne and Frankfurt, Germany.

They also report that air travel between London and Paris since high-speed rail has connected them through the channel tunnel has been cut by one-half and that high-speed rail service between Madrid and Barcelona, Spain, has resulted in a one-third drop in air travel.

CALPRIG points out there are similar results associated with high-speed in the U.S. They point out that Amtrak service accounts for 62 percent of the combined air and rail market between New York and Washington and 47 percent of the combined air and rail market between Boston and New York. [41]

VII. The Benefits of High-Speed Rail

High-speed rail has multiple benefits that make it a high-return transportation investment for governments. The research reported in this section describes findings on a wide range of benefits that are realized from high-speed rail investments.

[40] UIC. *High Speed Rail: Fast Track to Sustainable Mobility.* Paris: International Union of Railways (UIC), 2008. at http://www.uic.org/IMG/pdf/20101124_uic_brochure_high_speed.pdf

[41] Dutzik, Tony and Erin Steva. *Next Stop: California, The Benefits of High-Speed Rail Around the World and What's in Store for California.* Sacramento: CALPRIG Education Fund, June 2010. at http://cdn.publicinterestnetwork.org/assets/a7f2564b5eff2fe6eb61d4cd31e0950e/Next-Stop-California.-HSR-Report--Final.pdf

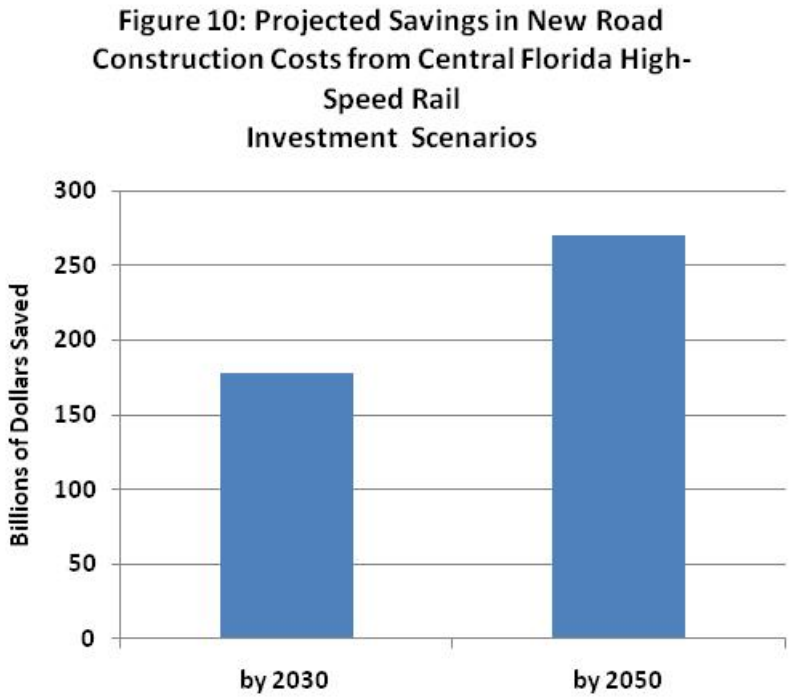
VII.a. Land Use and Value Benefits:

VII.a.1. University of Pennsylvania Design Studio, *Connecting for Global Competitiveness: Florida's Super Region*, 2010:

The University of Pennsylvania Urban Design Studio found that 1 millions fewer acres of land than will result from current growth trends would need to be developed in the next 40 years with a sound investment scenario in the I-4 corridor of central Florida. Their study, prepared for the Tampa Bay Partnership and the Central Florida Partnership, compared the development of the I-4 Corridor from Sarasota to Daytona Beach and Melbourne. Two scenarios were prepared: a continuation of current trends and an alternative growth strategy that includes high-speed rail and local transit investments.[42]

Introducing their research the report states that:

> "High-speed rail (HSR) integrated with local transit systems will connect Florida's Super Region in a way that provides an opportunity to reshape its future. Using computer-aided analysis based on population and job projections, this study presents two alternatives for the Super Region in 2050. In one alternative, new development follows the patterns already established in Florida, despite transportation investments. In the second alternative, the presence of HSR and local transit permits compact urban centers and infill development along transit corridors, while development away from the new transportation continues in current patterns. This second alternative creates a far more sustainable development future while reserving a range of lifestyle choices." [42]



Data Source: University of Pennsylvania Design Studio I-4 Corridor Study

[42] University of Pennsylvania. *Connecting for Global Competitiveness: Florida's Super Region.* Philadelphia: University of Pennsylvania Department of Regional Planning, Tampa Bay Partnership, Central Florida Partnership, Spring 2010. at http://www.orlando.org/clientuploads/myregion/cfgc_flsuperregion.pdf

The results of the study shows a dramatic difference in the outcomes of the two scenarios. The report concludes that there are significant savings from the HSR scenario. The authors state that:

> "There are substantive economic benefits associated with reduced land consumption. . . . In the alternative scenario, limited land consumption changes the way public tax dollars are spent on public infrastructure and services. Infill and redevelopment take full advantage of existing road, water, and sewer systems. Providing public services—police, fire, trash collection, and public works—becomes easier and cheaper to manage when the geography is physically smaller. Fewer acres of new development means fewer public tax dollars needed for new public infrastructure. As a result, providing public services becomes more cost effective.
>
> "One way to understand the economic difference between the trend and alternative scenarios, is to consider the savings in road construction costs. The 980,000 acres saved from urbanization in the alternative scenario will not need new roads either for access or for internal circulation. Roads occupy an average of at least 20% of developed land area. Using a FDOT estimated cost of $10 million per-mile for a 2-4 lane "rural" road, the savings quickly add up. By choosing the alternative scenario, Florida's Super Region can collectively expect to save approximately $178 billion by 2030 and $270 billion by 2050 in new road construction costs." [43]

VII.a.2. International Union of Railways, *High Speed Rail: Fast Track to Sustainable Mobility*, 2008:

The International Union of Railways *High Speed Rail: Fast Track to Sustainable Mobility*[44] finds that the amount of land used for high-speed rail facilities is significantly less than the land used for alternative roadway infrastructure. According to the UIC, high-speed rail rights-of-way use abut one-third (34.4 percent) the land that is used by a comparable roadway. High-speed rail right-of-way uses 3.2 hectares per kilometer (12.7 acres per mile) and comparable roadways use 9.3 hectare per kilometer (37.0 acres per kilometer). A high-speed rail right of way is only 25 meters (82 feet wide) while a comparable motorway right of way is 75 meters (246 feet) wide. This is especially important in the urbanized parts of the high-speed rail and roadway routes where land is intensely developed and costly.

VII.b. Energy Savings and Emissions Reduction Benefits:

VII.b.1. Chester, *Life-cycle Environmental Inventory of Passenger Transportation in the United States*, 2008:

Mikhail Chester under his committee chair Arpad Horvath at the University of California, Berkeley, wrote a dissertation that compared the life-cycle energy use and emissions of passenger transportation modes.[45] The dissertation, *Life-cycle Environmental Inventory of Passenger Transportation in the United States,* develops life-cycle energy use and emissions profile for specific transit agencies and aircraft and private vehicle types. High-speed rail data are taken from the *Final Environmental Impact Report,* August 2005,

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[43] University of Pennsylvania. *Connecting for Global Competitiveness: Florida's Super Region.* Philadelphia: University of Pennsylvania Department of Regional Planning, Tampa Bay Partnership, Central Florida Partnership, Spring 2010. at http://www.orlando.org/clientuploads/myregion/cfgc_flsuperregion.pdf

[44] UIC. *High Speed Rail: Fast Track to Sustainable Mobility.* Paris: International Union of Railways (UIC), 2008. at http://www.uic.org/IMG/pdf/20101124_uic_brochure_high_speed.pdf

[45] Chester, Mikhail. *Life-cycle Environmental Inventory of Passenger Transportation Modes in the United States.* PhD Dissertation. University of California, Berkeley, 2008. at http://www.escholarship.org/uc/item/7n29n303#page-1

California High-Speed Rail Authority.[46] Table 8 takes data from several tables in the dissertation and compares them.

Of the 13 modes of vehicles described, high-speed rail used the second lowest energy per person-mile, finishing behind only a peak-period transit bus. In carbon dioxide emissions high-speed rail again finished second to a peak-period bus. For both measures, high-speed rail was lower than any aircraft or any private vehicle type. The table also shows results for criteria air pollutants, where the rankings are mixed.

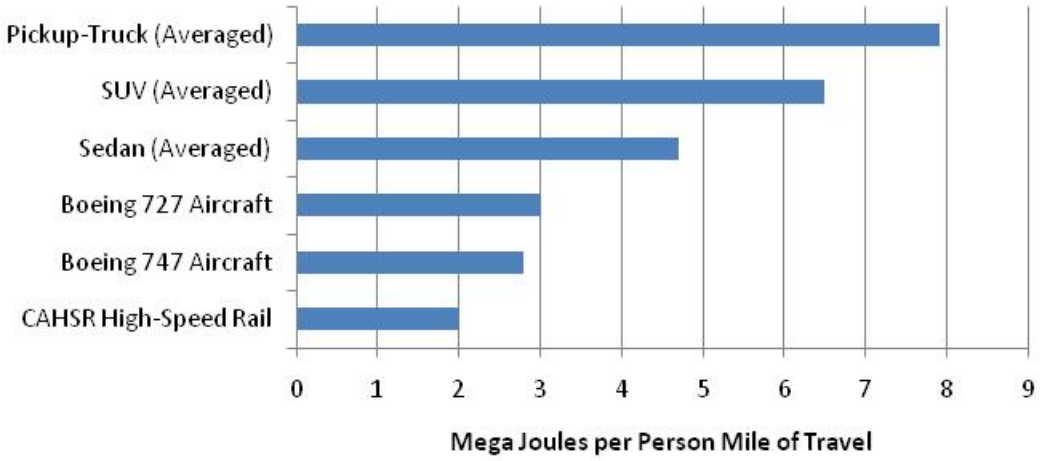
Table 8: Values Reported in Mikhail Chester PhD Dissertation

Values Reported in Mikhail Chester PhD Dissertation							
Mode or Vehicles	Total Life-Cycle Energy Use and Emissions						
	Energy (MJ/PMT)	GHG (g CO_2e/PMT)	CO (G/PMT)	SO_2 (mg/PMT)	NO_x (mg/PMT)	VOC (mg/PMT)	PM_{10} (mg/PMT)
BART (Heavy Rail) (a)	2.2	140	530	619	290	200	55
Caltrain (Commuter Rail) (a)	2.3	160	440	260	1,600	210	95
Muni (Light Rail) (a)	3.0	170	660	810	270	150	52
MBTA Green Line (Light Rail) (a)	2.3	230	720	1,200	410	130	50
CAHSR (High-Sped Rail) (a)	2.0	130	320	680	160	96	23
Embraer 145 (Aircraft) (b)	4.2	290	780	230	780	140	34
Boeing 727 (Aircraft) (b)	3.0	210	600	160	700	70	22
Boeing 747 (Aircraft) (b)	2.8	200	470	170	720	69	25
Sedan (Averaged) (c)	4.7	380	12	350	1,100	1,200	240
SUV (Averaged) (c)	6.5	450	13	410	1,200	1,300	230
Pickup-Truck (Averaged) (c)	7.9	620	20	460	2,100	2,100	270
Diesel 40' Transit Bus (Off-peak) (c)	8.8	680	2.2	380	630	630	290
Diesel 40' Transit Bus (Peak) (c)	1.1	85	0.28	47	79	79	36
(a) From Tables 64 and 65. (b) From Tables 83 and 84. (c) From Tables 33 and 34. Chester, Mikhail. *Life-cycle Environmental Inventory of Passenger Transportation Modes in the United States.* PhD Dissertation. University of California, Berkeley, 2008.							

Figure 11 shows the live-cycle energy use for intercity passenger travel modes measured in mega-joules per person mile of travel. High-speed rail is the most energy efficient of the modes. Figure 12 shows the life-cycle rate of carbon dioxide emissions per person mile of travel. Once again, high-speed rail creates the least environmental damage of the modes.

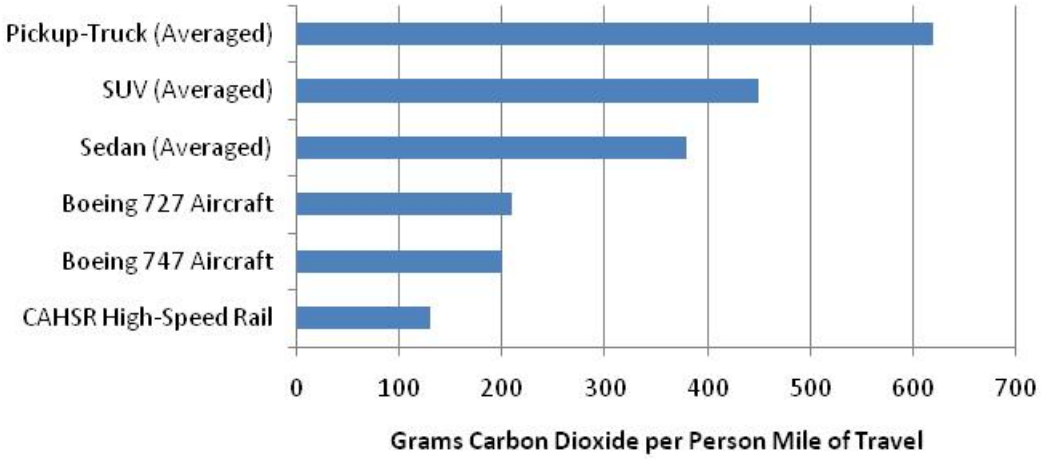
[46] California High-Speed Rail Authority. "Statewide Program Environmental Report EIR/EIS." Sacramento: California High-Speed Rail Authority, 2005. at http://www.cahighspeedrail.ca.gov/Statewide_Program_Environmental_Reports_EIR_EIS.aspx

Figure 11 Life-Cycle Energy Use



Data Source: Mikhail V. Chester, 2008.

Figure 12: Life Cycle-Greenhouse Gas Emissions



Data Source: Mikhail V. Chester, 2008.

VII.b.2. Center for Neighborhood Technology, "High Speed Rail and Greenhouse Gas Emissions in the U.S.," 2006:

The Center for Neighborhood Technology found that high-speed rail cuts emissions nationwide and in every corridor where it is proposed to be built. Their report[47] states that

> "We calculated a total emissions savings of 6 billion pounds of CO2 per year (2.7 MMTCO2) if all proposed high speed rail systems studied for this project are built.

[47] CNT. "High Speed Rail and Greenhouse Gas Emissions in the U.S." Chicago: Center for Neighborhood Technology, January, 2006 at http://www.cnt.org/repository/HighSpeedRailEmissions.pdf

> Overall, high speed rail is estimated to generate approximately half of the gross emissions it saves by enabling passengers to switch from other modes. Savings from cancelled automobile and airplane trips are the primary sources of the emissions savings; together these two modes make up 80 percent of the estimated emissions savings from all modes. The total emissions savings vary greatly by corridor, however, as do the source of those savings, as shown in Figures 3 and 4. Figure 4 [Figures not shown, see source document at http://www.cnt.org/repository/HighSpeedRailEmissions.pdf Page 12] looks at the emissions for every corridor except California, because its large potential savings overshadows the other corridors studied when the corridors are considered together." [48]

These results are summarized on Table 9. The emissions per passenger mile and per vehicle mile for 5 current high-speed rail technologies are reported. In all cases the high-speed rail creates lower emissions that air or auto travel. The types of high-speed rail show great variance in their emissions rate with maglev the highest, nearly twice the rate of any other high-speed rail alternative, and German ICE train technology the lowest.

Table 9: Center for Neighborhood Technology Greenhouse Gas Emissions Comparison by Mode

Mode	Emissions per Passenger Mile (lbs CO_2)	Emissions per Vehicle Mile (lbs CO_2)	Passenger per Vehicle
Bus	0.14	4.87	35
Conventional Rail	0.21	66.96	322
High-Speed Rail: Tokaido Shinkansen 700 - Japan	0.22	231	---
High-Speed Rail: ICE Line 6 - Germany	0.11	54	---
High-Speed Rail: MagLev TR07 - Germany	0.49	53	---
High-Speed Rail: TGV Atlantique - France	0.15	50	---
High-Speed Rail: IC-3 - Denmark	0.26	25.10	97
Automobile	0.53	0.85	1.6
Airplane	0.62	48.04	77

Source: Center for Neighborhood Technology, 2006

Table 10 reports the total savings by source for the installation of high-speed rail in all planned corridors. The greatest savings are from reduced aircraft and auto emissions. The emissions from high-speed rail are deducted from the savings resulting in a total carbon dioxide emissions savings of 6.1 billion pounds or 2.76 million metric tons per year.

[48] CNT. "High Speed Rail and Greenhouse Gas Emissions in the U.S." Chicago: Center for Neighborhood Technology, January, 2006 at http://www.cnt.org/repository/HighSpeedRailEmissions.pdf

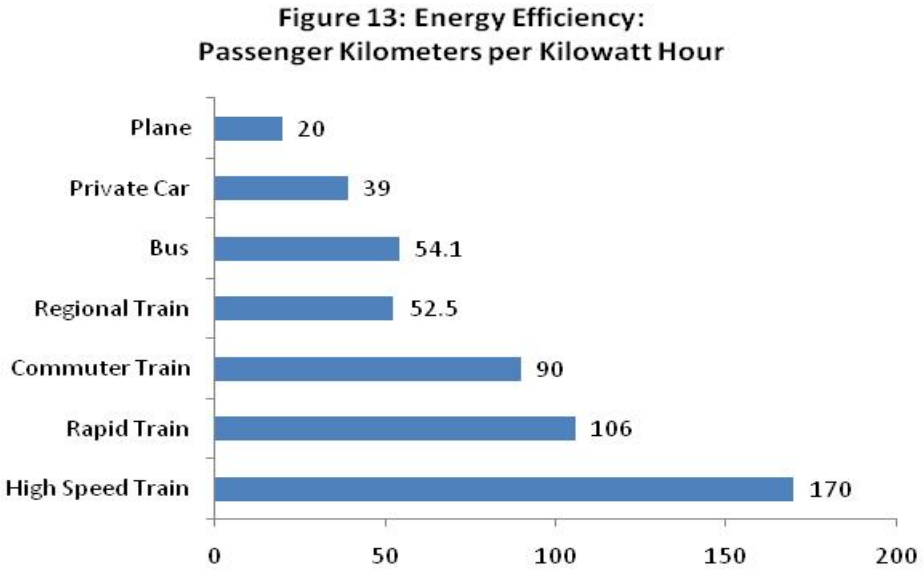
Table 10: Emission Savings by Source from All Planned U.S. Corridors

Source	Pounds of CO2 per Year	MMTCO2 per Year
Airplane Emissions Saved	5,634,626,780	2.56
Automobile Emissions Saved	4,471,974,488	2.03
Bus Emissions Saved	82,441,034	0.04
Conventional Rail Emissions Saved	2,506,574,964	1.14
Total Emissions Saved	12,695,617,266	5.76
Annual High-Speed Rail Emissions Generated	6,621,126,654	3.00
Net Emissions Saved (a)	6,074,490,612	2.76
Percentage Savings (b)	48%	48%

(a) The potential net savings from high-speed rail varies with the high-speed rail technology assumed: from a low of 213,092,381 pounds of CO2 (0.097 MMTCO2) saved, or 2%, if MagLev technology is used to a high of 9,828,925,474 pounds CO2 (4.46 MMTCO2) saved, or 77% if ICE technology is used. See Appendix A of source document..
(b) Percentage savings is as compared to baseline emissions of high-speed rail travelers if they had taken another mode, not as compared to all transportation emissions in corridor. Emissions from all transportation sources in the U.S. were 1,874.7 MMTCO2 in 2003 according the U.S. Department of Energy, Energy Information Administration. "Emissions of Greenhouse Gases in the United States, 2003." December 13, 2004. http://www.eia.doe.gov/oiaf/1605/ggrpt/executive_summary.html
Source: Center for Neighborhood Technology, 2006

VII.b.3. International Union of Railways, *High Speed Rail: Fast Track to Sustainable Mobility*, 2008:

The International Union of Railways *High Speed Rail: Fast Track to Sustainable Mobility*[49] includes data describing the energy efficiency and low emissions from high-speed rail compared to alternative intercity travel modes. Figure 13 depicts the energy use data from that report in terms of output for a given energy input. High-speed rail produces the most passenger kilometers of travel per kilowatt hour of energy among the modes studied.

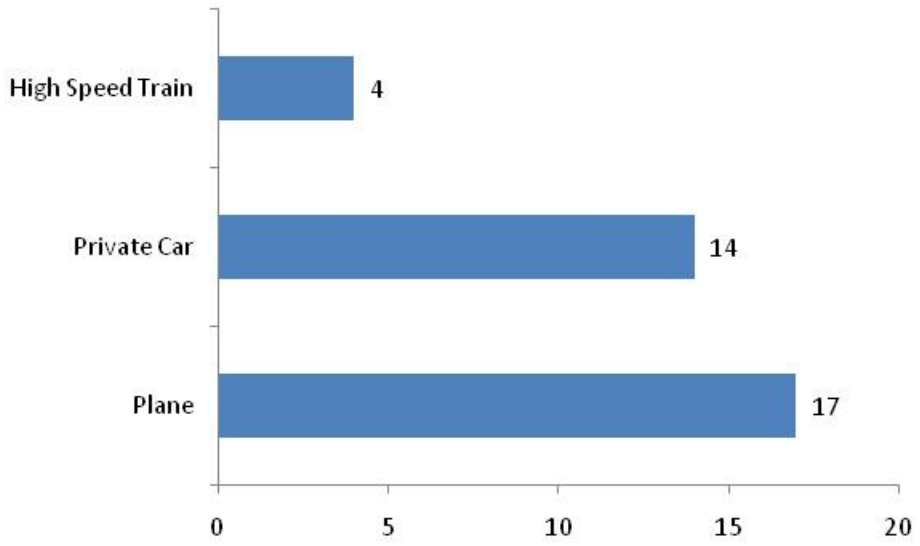


Source: International Union of Railways (UIC), 2008

[49] UIC. *High Speed Rail: Fast Track to Sustainable Mobility.* Paris: International Union of Railways (UIC), 2008. at http://www.uic.org/IMG/pdf/20101124_uic_brochure_high_speed.pdf

The International Union of Railways also reports that high-speed rail produces lower levels of emissions than other intercity travel modes. As shown on Figure 14, high-speed rail emits significantly lower levels of carbon dioxide than alternative modes. High-speed trains produce only one-fourth the carbon dioxide emissions of airplanes and less than automobiles.

Figure 14: Kilograms of Carbon Dioxide Emissions per 100 Passenger Kilometers



Source: International Union of Railways (UIC), 2008

VII.b.4. Dutzik and Steva, *Next Stop: California, The Benefits of High-Speed Rail Around the World and What's in Store for California*, 2010:

CALPRIG's *High-Speed Rail Around the World* [50] summarizes reports on energy savings from high-speed rail operation in other countries. They describe energy savings on European high-speed rail lines as:

> "Europe's high-speed rail lines deliver significant energy savings when compared to flying or driving. Passengers traveling on high-speed trains for a typical Monday morning trip from London to Paris use one-third as much energy as traveling by automobile and 30 percent as much energy as flying. . . . Passengers traveling high-speed trains between Madrid and Barcelona use 28 percent as much energy traveling by automobile and 30 percent as much energy as flying." [47]

They report energy savings from high-speed rail to be even greater in Japan compared to other modes:

> "Even greater energy savings are achieved in Japan, whose Shinkansen system is estimated to consume one-quarter the energy of air transportation and one-sixth the energy of automobiles on a per-passenger basis. Japan has continually improved the energy efficiency of the Shinkansen, with the latest, most energy-efficient trains

[50] Dutzik, Tony and Erin Steva. *Next Stop: California, The Benefits of High-Speed Rail Around the World and What's in Store for California.* Sacramento: CALPRIG Education Fund, June 2010. at http://cdn.publicinterestnetwork.org/assets/a7f2564b5eff2fe6eb61d4cd31e0950e/Next-Stop-California.-HSR-Report--Final.pdf

> consuming 32 percent less energy than the original Shinkansen trains, even though they are capable of traveling 43 miles per hour faster." [51]

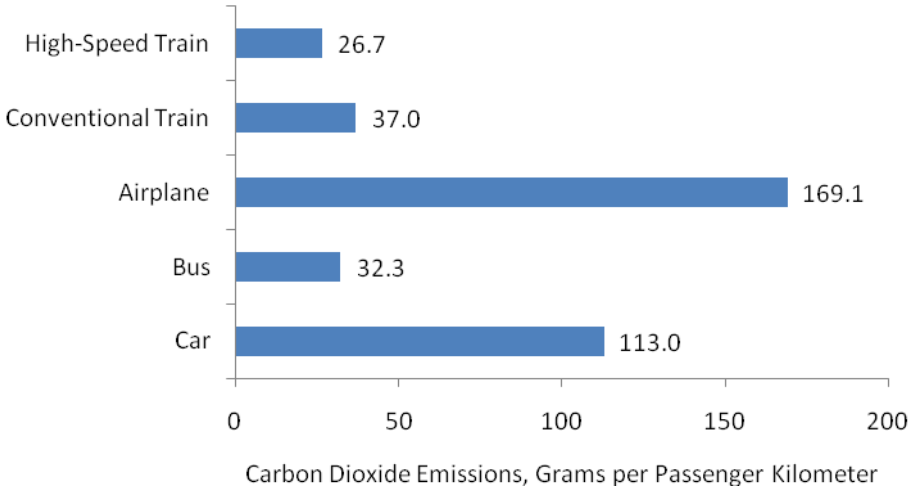
They also found significant reductions in greenhouse gas emissions associated with high-speed rail use in Japan and Europe because the are more energy efficient and the electric energy they use can be generated from less polluting fuels compared to fossil fuels.

> "High-speed rail lines in Europe produce dramatic reductions in emissions of carbon dioxide—the leading contributor to global warming—compared to other forms of travel. For a typical Monday morning business trip, emission reductions compared with air travel range from 77 percent for a trip between Frankfurt and Basel, Switzerland, to 96 percent for a trip from Paris to Marseille. . . . " [51]

VII.b.5. Alvarez, "Energy Consumption and Emissions of High-Speed Trains," 2010:

Alberto Garcia Alvarez wrote his article "Energy Consumption and Emissions of High-Speed Trains" to correct what he believes is a common misconception that high-speed rail trains use a lot of energy. Studying travel in Spain he found that high-speed trains use 29 percent less energy than conventional trains and less than one-half the energy of airplanes and automobiles. Comparisons were made of energy use in 10 intercity corridors in Spain. The results on Figure 15 are averages of data for those corridors.[52]

Figure 15: Greenhouse Gas Emissions from Intercity Travel in Spain



Source: Alvarez, 2010

[51] Dutzik, Tony and Erin Steva. *Next Stop: California, The Benefits of High-Speed Rail Around the World and What's in Store for California.* Sacramento: CALPRIG Education Fund, June 2010. at http://cdn.publicinterestnetwork.org/assets/a7f2564b5eff2fe6eb61d4cd31e0950e/Next-Stop-California.-HSR-Report--Final.pdf

[52] Alvarez, Alberto Garcia. "Energy Consumption and Emissions of High-Speed Trains." *Transportation Research Record No. 2159.* Washington: Transportation Research Board, 2010, pp. 27-35. at http://trb.metapress.com/content/v1r82q772m218154/?p=c3a885f03f1445c788aa321a78daed63&pi=3

VII.c. Economic Benefits:

VII.c.1. U.S. Conference of Mayors, *The Economic Impacts of High-Speed Rail on Cities and Their Metropolitan Areas*, 2010:

The Economic Development Research Group for the U.S. Conference of Mayor's studied the economic impact of high-speed rail on four different urban regions.[53] The impacts resulted from five factors. "First, HSR service can help drive higher density, mixed use development at train stations. . . . Second, HSR service can increase business productivity through travel efficiency gains. . . . Third, HSR service can help expand visitor markets and generate additional spending. . . .Fourth, HSR service can broaden regional labor markets. . . . Fifth, HSR service can support the growth of technology clusters." [53]

The impacts they calculated are shown on Table 11. They range from 21,000 jobs and $1.4 billion in Gross Regional Product for the smallest region, Albany, New York, up to 55,000 jobs and $4.3 billion in Gross Regional Product for the largest area, Los Angeles, California. The report includes descriptions of each region. The results in the table are for the highest rail investment scenario for each region.

Table 11: Calculated Impacts for the Four Urban Regions Studies by U.S. Conference of Mayors

Urban Region	Projected Annual Total Economic Impact of HSR Service in 2035 (2009 $)			
	Employment (Number of Jobs)	Output (Sales)	Value-Added (Gross Regional Product)	Wages
Los Angeles, CA	55,000	$ 7.6 Billion	$ 4.3 Billion	$ 3.0 Billion
Chicago, IL-IN	42,000	$ 6.1 Billion	$ 3.5 Billion	$ 2.5 Billion
Orland, Fl	27,500	$ 2.9 Billion	$ 1.7 Billion	$ 1.2 Billion
Albany, NY	21,000	$ 2.5 Billion	$ 1.4 Billion	$ 1.1 Billion

Source: Economic Development Research Group, 2010.

VII.c.2. Ahlfeldt and Feddersen, "From Periphery to Core: Economic Adjustments to High Speed Rail," 2010:

Gabriel Ahlfeldt of the London School of Economics and Arne Feddersen of the University of Hamburg found that high-speed rail systems sustainably promote economic activity within regions by bringing economic agents closer together.[54] They stated that "Our results on the one hand confirm expectations that have led to huge public investments into high speed rail all over the world. On the other hand, they confirm theoretical predictions arising from a consolidate body of (New) Economic Geography literature taking a positive, man-made and reproducible shock as a case in point." [54]

The economists examined high-speed rail in the Cologne-Frankfort corridor. Their "hypothesis is that by driving economic agents closer together and increasing access to regional markets, HSR should promote economic development." [54] The results of the study proved their hypothesis to be correct. Counties that are adjacent to two intermediate stations in the corridor saw a 2.7 percent in gross domestic product compared to the rest of their study area. They found "a 0.25% growth in GDP for any 1% increase in market access." [54]

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[53] Economic Development Research Group. *The Economic Impacts of High-Speed Rail on Cities and Their Metropolitan Areas.* Washington: U.S. Conference of Mayors, June 14, 2010. at http://www.infrastructureusa.org/wp-content/uploads/2010/06/usmayors-hsr.pdf

[54] Ahlfeldt, Gabriel M. and Feddersen, Arne (2010) "From Periphery to Core: Economic Adjustments to High Speed Rail." London: London School of Economics Research Online, September 2010. at http://eprints.lse.ac.uk/29430/

VII.c.3. Urban Land Institute, *Infrastructure 2010: Investment Imperative*, 2010:

The Urban land Institute's *Infrastructure 2010: Investment Imperative* asserts what they refer to as a simple thesis, that infrastructure must be viewed and treated as an investment.[55] Failure to invest could delay economic recovery and put the U.S. at increased disadvantages in the global market place. The report clarifies the need for infrastructure investment including investment in high-speed rail to modernize America's rail transportation system. High-speed rail is seen as the solution for taking pressure off airports and highways in regional intercity markets as travel demand increases.

Infrastructure 2010: Investment Imperative summarizes their argument by stating that:

> "Car dependence and ever-escalating driving delays in most large American cities have exposed the need for more passenger rail service to take the pressure off crowded interstates and clogged airports, which struggle to handle current traffic volumes. The urgency of addressing the issue becomes more apparent since the country's population will increase by 120 million over the next 40 years, with growth concentrated in the nation's primary urban centers and surrounding suburbs. All these people will want to move around and current systems won't be able to handle prospective volumes." [55]

VII.c.4. World Bank, *High-Speed Rail: The Fast Track to Economic Development*, 2010:

In their 2010 publication, *High-Speed Rail: The Fast Track to Economic Development*, the World Bank explained the contribution that high-speed rail makes to economic prosperity. [56] High-speed rail lines or networks have an affect on the overall performance of a county's transportation system. They state that

> "In operational terms a high-speed line will naturally provide valuable travel time savings to its users but it may also free up capacity on existing lines for other transport users, and enable performance improvements on those lines due to lower congestion. " [56]

The World Bank further stated that high-speed rail may affect interconnected modes such as transit but affecting overall trip taking patterns to include additional usage of those interconnected modes.

VII.c.5. Buchanan and Volterra, *Economic Impact of High Speed 1*, 2008:

Colin Buchanan and Partners with Volterra prepared *Economic Impact of High Speed 1* for the London and Continental Railways.[57] London and Continental Railways built and operates the Channel Tunnel Railroad Link, the British portion of the Eurostar International high-speed route from London to Paris and Brussels, now called High Speed 1 or HS1. The HS1 right-of-way opened in November 2007 and allows operating speeds up to 186 mph.

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[55] Urban Land Institute and Ernst & Young. *Infrastructure 2010: Investment Imperative*. Washington, D.C.: The Urban Land Institute, 2010. at http://www.uli.org/sitecore/~/media/Documents/ResearchAndPublications/Reports/Infrastructure/IR2010.ashx

[56] Amos, Paul, Dick Bullock, and Jitendra Sondhi. *High-Speed Rail: The Fast Track to Economic Development?* Washington: The World Bank, July 2010. at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2010/07/26/000334955_20100726032714/Rendered/PDF/558560WP0Box341SR1v08121jul101final.pdf

[57] Buchanan, Colin and Associates and Volterra. *Economic Impact of High Speed 1.* London: London and Continental Railways, 2009. at http://www.colinbuchanan.com/uploads/cms/files/147e7dfc-2a53-4267-83d7-72bdde92062e.pdf

Economic Impact of High Speed 1 examined the benefits of HS1 in terms transport user benefits, wider economic benefits, and reemployment benefits. Transport user benefits include journey time savings and congestion relief.

Wider economic benefits enable people to move to more productive jobs because agglomeration effects increase the job density of accessible employment areas. Labor force participation in employment will also increase because lower travel costs increase "effective wages" and the effects of imperfect competition that restrain output will be reduced.

Trip travel time will be reduced from 10 percent to 40 percent. The new line has an overall benefit to cost ration of 1.76 which the researchers state indicates "a strong value for the money." In addition to the conventional benefits measured in the benefit to cost ratio, significant development impacts, increased housing values, and increases in earnings are projected. Development schemes associated with HS1 in four areas are projected to result in over 20,000 homes and 80,000 permanent jobs.

VII.c.6. Florida Department of Transportation, *Florida Intercity Passenger Rail "Vision Plan,"* 2006:

The Florida Department of Transportation developed a "Vision Plan" for a statewide high-speed rail system in 2006.[58] The incrementally implemented plan would serve the entire state from Naples and Miami in the south to Jacksonville in the north and Pensacola in the west with trains operating at speeds up to 125 mph. The proposed system would be able to serve 10 million trips annually. The anticipated trip purpose of riders is 25 percent for business, 20 percent for commutation, and 55 percent for social and recreational purposes. Sixty-six percent of trips would be diverted from personal vehicles, 19 percent from air travel, 6 percent from buses, and 9 percent would be induced or new trips.

Multiple benefits are envisioned in the Vision Plan. Benefit to cost ratios range from 1.5 to 1.8 for different segments of the system, a result termed in the Vision Plan to be "very competitive with other existing and planned systems." The estimated user benefits are $15 billion for a Florida state investment of $2,25 billion. Each phase of the Vision Plan is projected to have a positive operating ratio.

The rail system is projected to generate 30,000 to 40,000 long-term jobs, increase personal income in Florida by $800 million annually, and create a potential $3.5 billion in joint development at station sites. The Florida Intercity Passenger Rail System will offer an alternative to personal vehicle travel where constraints on mobility are anticipated despite plans for significant improvements to Florida's existing transportation system.

The Vision Plan forecasts the improved passenger rail system will also provide significant benefits for other transportation providers. Freight railroad will be able to operate faster intermodal traffic, increase traffic level through the introduction of Positive Train Control, achieve safety improvements because of corridors separated from road traffic, and achieve capacity improvements from greater flexibility and efficiency. Airports will have improved accessibility and seamless connections. Local and regional passenger transportation systems will witness increased travel demand and will need to service additional intermodal terminals.

VII.c.7. Centre for Cities, *On Track: Why Rail Matters*, 2010:

The Centre for Cities with the support of the Association of Train Operating Companies (ATOC) prepared a report, *On Track: Why Rail Matters*, analyzing the economic impact of improvements to five rail

[58] Florida Department of Transportation. *Florida Intercity Passenger Rail "Vision Plan."* August 2006. at http://www.dot.state.fl.us/rail/Publications/Plans/06VisionPlan/ExecReportFinal.pdf

corridors in the United Kingdom.[59] The corridors were London to Sheffield, Liverpool to Manchester, Huddersfield to Leeds, London to Solihull, and Bathgate to Glasgow. The improvements will range from line upgrades to route electrification. The routes have already experienced substantial increases in passenger demand; from 2002 to 2009 passenger trips increased from nearly three percent annually for London to Sheffield up to an annual growth of nearly 8 percent for Manchester to Liverpool.

Projects of benefits are made for 2015, 2040, and 2070. Table 1 summarizes projected time savings between city pairs experiencing improvements, excluding any travelers with destinations between those city pairs. Aggregate (cumulative) time savings for the five city pairs studied by 2040 26,030 would be and by 2070 would be 65,400 years.

Table 12: Travel Time Savings Benefits for Trips Between City Pairs (Intermediate Destination Travel Not Included) for Passenger Rail Improvements in *On Track: Why Rail Matters*

Measure	City Pairs				
	London and Sheffield	Liverpool and Manchester	Leeds and Huddersfield	London and Solihull	Glasgow and Bathgate
Aggregate Trips: by 2025 (millions)	12.7	19.0	19.8	4.5	6.5
by 2040 (millions)	26.0	43.0	44.1	10.0	13.8
by 2070 (millions)	57.4	118.6	116.4	26.5	32.8
Aggregate Time Savings: by 2025 (years)	1,360	3,290	530	1,440	5,370
by 2040 (years)	2,780	7,470	1,180	3,210	11,390
by 2070 (years)	6,140	20,590	3,110	8,490	27,140

Data source: Centre for Cities

On Track: Why Rail Matters also projected benefits of the improvements in terms of the number of persons who could experience wage increases and the number of businesses which had the potential for productivity benefits. Table 2 summarizes these benefits for the cities and city hinterlands which were included in the study. In aggregate, nearly 3.4 million people could experience wage increases as an effect of the rail improvements and over 200 thousand businesses have the potential for productivity benefits, at least 71 percent of all businesses in each area studied and 73.5 percent of businesses in all the areas.

Table 13: Wage and Productivity Benefits from Passenger Rail Improvements in *On Track: Why Rail Matters*

Location	Number of People Who Could Experience Wage Benefits		Number of Businesses with Potential Productivity Benefits	
	Medium Skill Occupations	Higher Skill Occupations	Number	Percent of Businesses
Sheffield	155,500	60,700	12,400	72.4%
Sheffield Hinterland	119,000	40,400	8,700	74.1%
Manchester	126,400	45,000	12,800	71.7%
Liverpool	117,700	35,500	10,400	73.9%
Manchester/Liverpool Hinterland	682,100	255,700	59,800	73.7%
Huddersfield	117,200	50,400	10,300	73.5%
Leeds	223,100	93,800	20,100	73.2%
Huddersfield/Leeds Hinterland	105,000	41,200	9,600	73.2%
Solihull	50,300	30,900	6,100	74.1%
Solihull Hinterland	27,500	11,800	3,300	72.5%
Bathgate	56,200	18,700	3,600	75.1%
Glasgow	165,000	64,300	15,600	75.2%
Bathgate/Glasgow Hinterland	435,600	150,600	29,600	73.1%

Data source: Centre for Cities

[59] Centre for Cities. *On Track: Why Rail Matters.* London: Centre for Cities, Association of Train Operating Companies, July 2010. at http://www.atoc.org/clientfiles/File/cfc.pdf

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VIII.b. Directory of Regional High-Speed Rail Associations:

Many of the designated high-speed rail corridors are represented or advocated by regional associations, some of which are associated with state government Departments of Transportation. Among those associations, in alphabetical order, with web pages are:

Arizona Rail Passenger Association (ARPA) at http://www.azrail.org/2007/commuter-rail-between-phoenix-tucson-gaining-support/

California High-Speed Rail Authority (CHSRA) at http://www.cahighspeedrail.ca.gov/

Commonwealth of Massachusetts at http://www.mass.gov/?pageID=gov3pressrelease&L=1&L0=Home&sid=Agov3&b=pressrelease&f=090713_stimulus_rail_network&csid=Agov3

Florida High Speed Rail at http://www.floridahighspeedrail.org/

New York State Department of Transportation High-Speed Rail at https://www.nysdot.gov/recovery/sponsors/rail

Midwest High Speed Rail Association at http://www.midwesthsr.org/index.php

Southeast High Speed Rail Corridor at http://www.sehsr.org/

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Texas High-Speed Rail and Transportation Corporation at http://www.thsrtc.com/

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