Commission Briefing Paper 4B-08

Driving Factors and Potential Impacts of Future Increases in Rail's Share of Intercity Passenger Travel

Prepared by: Cambridge Systematics
Date: February 23, 2007

Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents information on the driving factors and potential impacts of future increases in rail's share of intercity passenger travel. The paper will also identify areas of possible future research.

Key Findings

Basic Concepts

- Rail corridors which are less than 500 miles apart and have fairly dense population along them are considered to be the most viable places for intercity passenger service. Intercity passenger rail therefore competes with automobiles, buses, and regional air service.
- Amtrak provides all of the intercity rail service in the U.S. As of 2002, this network included about 23,000 miles of rail over which 267 intercity trains operate per day, serving more than 500 communities in 47 states and about 23 million riders annually[1]. Currently, it is estimated that intercity passenger rail captures about 4 percent of all non-automobile intercity passenger trips.

Driving Factors

- Many factors dictate the demand for intercity passenger rail. They can be grouped into three categories: population factors (population growth, population densification and increasing urbanization), economic factors (rising personal transportation costs), and transportation service factors (congested highways and airports). In addition, new and improved rail services such as the higher speed Acela trains and the successful *Cascades* service in the Pacific Northwest are helping to drive demand.
- The driving factors seem to suggest the opportunity to increase intercity passenger rail service, particularly in corridors of five hundred miles distance or less where factors such as population density and corridor congestion make intercity passenger rail a competitive mode with the automobile and regional air service. However, substantial investment may be needed in order to expand intercity rail service, and in some corridors, more than one state may be affected.

[1] Intercity Passenger Rail Transportation: Standing Committee on Rail Transportation, AASHTO Executive Committee, 2002.

Benefits of Intercity Passenger rail

- Intercity passenger rail has the potential to generate public benefits by complementing other modes of transportation, especially in those markets where rail can be competitive. These benefits could include reduced highway and air congestion, pollution, improved safety and energy dependence, as well as providing a transportation choice and system redundancy.
- Even considering this potential, intercity passenger rail is unlikely to significantly shift modal shares in the future. Since it represents only 4 percent of non-automobile intercity passenger trips, even a doubling of the ridership growth rate (which is highly unlikely) would not substantially diminish the air or highway mode shares.

Impediments to Expanding Intercity Passenger rail

- Passenger rail is very expensive to build and operate, and currently requires federal and state subsidies to operate. The combined subsidy needs to operate the entire system is very high: in 2001, Amtrak estimated that it would need about $16 billion (in 2000 dollars) in federal capital support from 2001 to 2020 just to maintain current operating levels of service[2].
- About 95% of Amtrak's 22,000 route miles of service are on track owned by the private freight railroads[3]. The rail industry is already straining to meet the growing demand for rail freight transportation, and it must add capacity to handle a projected 60 percent more tonnage and 73 percent more ton-miles by 2035. With capacity tightening on most freight rail lines, the freight railroads may be less willing or able to accommodate expansion of the intercity rail program.

Staff Comments

None.

Defining Intercity Passenger Rail

Passenger rail includes both intercity and commuter rail. Commuter rail is generally used to connect outlying communities to centralized cities with services that take less than an hour or two, and is meant to offer an alternative to the automobile or bus for daily commuting trips. Commuter rail has a different intent and purpose than intercity rail, and will not be discussed further in this paper. Intercity passenger rail connects a central city to another central city or intermediate station. Those rail corridors which are less than 500 miles apart and have fairly dense population along them or at the ends are considered to be the most viable places for intercity passenger service. Because of these characteristics, intercity passenger rail competes with automobiles, buses and regional air service. Intercity rail can further be divided into long distance service and corridor service. The two are differentiated by their market and service types, as illustrated below in Table 1.

Table 1: Corridor and Long-Distance Intercity Passenger Rail Service

	Corridor	Long-Distance
Market	Under 500 miles	500+ miles

[2] U.S General Accounting Office, *Intercity Passenger Rail: Congress Faces Critical Decisions in Developing a National Policy*, April 2002.

[3] The exception is the Amtrak Northeast Corridor, which is mostly owned by Amtrak.

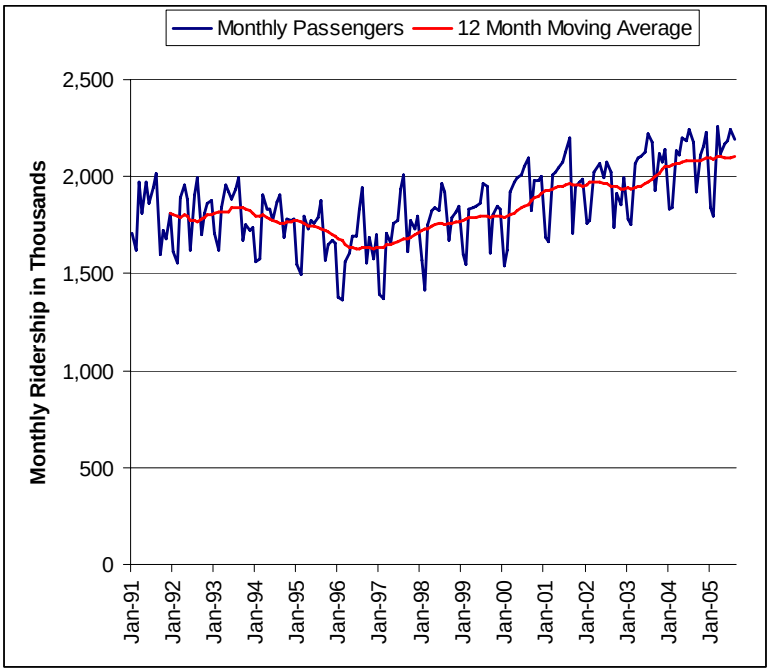
	Several hours	Many hours/days
	Transportation	Transportation & travel experience
	Frequent travel	Less frequent travel
	Important business travel segment	Mix of personal and leisure travel
Service	"Seat" service	"Seat" and "sleeper" service
	Travel time (speed)	Departure/arrival time of day
	Frequency (number of departures)	On-board services
	Reliability (on-time performance)	Reliability (on-time performance)
	High-speed rail (Acela)	Conventional speeds
	Conventional Speeds	Coach and sleeping car
	Coach and business/first class	(Viewliner, Superliner)
	Snack/beverage service	Lounge car/dining car

Source: AASHTO Executive Committee, 2002.

Amtrak provides all of the intercity rail service in the U.S. As of 2002, this network included about 23,000 miles of rail over which 267 intercity trains operate per day, serving more than 500 communities in 47 states and about 23 million riders annually[4].

After a decline in the early 1990's, the use of intercity passenger rail has been steadily, but modestly, growing over the past 10 years. [Figure 1] Daily, intercity passenger rail carried about 64,000 passengers in 2002, compared with 1.5 million intercity passengers carried by air and 83,000 passengers per day by bus. [5] This is equal to about a 4 percent modal split for all non-automobile intercity travel.

Figure 1 Amtrak Ridership



Data Source:
http://www.bts.gov/publications/white_house_economic_statistics_briefing_room/october_2005/html/rail_amtrak_ridership.html

Driving Factors Determining the Demand for Intercity Passenger Rail

There are many different driving factors that determine the demand for intercity passenger rail. This section will discuss driving factors in three different groups:

[4] Intercity Passenger Rail Transportation: Standing Committee on Rail Transportation, AASHTO Executive Committee, 2002.

[5] U.S. General Accounting Office, *Intercity Passenger Rail: Issues for Consideration in Developing an Intercity Passenger Rail Policy.* GAO-03-712T (Washington, D.C.: April 30, 2003).

1. **Population factors**, such as population growth, population aging, increasing population density, and increasing numbers of very large urban areas.
2. **Economic factors**, such as rising income levels (which drives increased longer distance trip making), accompanied by rising costs of auto travel.
3. **Transportation service factors**, such as the amount of congestion that is prevalent on comparable transportation facilities such as highways and at and around airports.

It is also worth noting that service quality factors such as speed, frequency, and the type of amenities offered to travelers will affect ridership levels. Often, these service factors overlap or influence the other three types of factors. For instance, when higher quality service is offered on high density, targeted corridors, it may be able to attract many business travelers willing to pay for the convenience and frequency of travel. On the other hand, slower and less frequent long-distance routes may attract lower-income riders who are willing to trade lower cost of travel for time. Other driving factors are described below.

Population Factors

The population is growing and aging - The United States' population reached 300 million in October 2006 and will reach 380 million by 2035. The profile of the United States' population is changing. Children and working age adults will continue to make up the majority of the United States' population, but the number of children below age 21 will grow at a compound annual growth rate of only 0.6 percent and the number of working age adults age 16 to 54 at a rate of only 0.4 percent. By contrast, the number of adults age 65 to 84 will grow at 2.4 percent and the number of adults age 85 and above will grow at 3.0 percent.[6]

Population density is increasing and very large urban areas are proliferating - The density of the United States population has grown steadily since 1950, from an average density of 51 people per square mile in 1950, to 94 people per square mile in 2000, and is projected to reach an average of 122 people per square mile in 2030. Further, as of the 2000 Census, there were nine metropolitan areas over 5 million population, an increase from five in 1990, as shown in Table 2. The most recent Census data now shows twelve metropolitan areas with populations over 5 million, now including Atlanta, Houston, and Miami in addition to those shown in Table 2[7] These twelve areas total approximately 100 million people, or roughly one-third of the national population. These urban areas provide the potential population concentrations to generate additional intercity rail connectivity service, particularly in the dense costal regions where most of these over 5 million metropolitan areas are located.

Corridors As the Primary Expansion Option

Corridor service may be the more attractive option for future implementation or an increased role for intercity rail for several reasons, including:

- The majority of intercity passenger travel is concentrated in short trips of less than 500 miles- over 80 percent of all trips that exceed 100 miles in length are less than 500 miles.
- Rail is relatively more effective in serving highly congested corridor markets that would require long drives or short flights- i.e. those between 100 and 500 miles. This is especially true if the highway or airport congestion is significant along the corridor.

[6] Global Insight, 2006.
[7] Alan Pisarski, "Commuting in America", 2006

- There already exist several examples that suggest future opportunity for intercity passenger rail corridor service. These include corridors such as the Capital Corridor in the San Francisco Bay Area and the Northeast Corridor on the Eastern Seaboard.[8]

Table 2 Metropolitan Areas over 5 Million Population[9]

Pop Rank	Metropolitan Name	April 1, 1990 (millions)	April 1, 2000 (millions)	Numerical Change (millions)	Percent Change
1	New York City	19.55	21.20	1.65	8.44%
2	Los Angeles	14.53	16.37	1.84	12.68%
3	Chicago	8.24	9.16	0.92	11.14%
4	Washington-Baltimore	6.73	7.61	0.88	13.10%
5	San Francisco	6.25	7.04	0.79	12.57%
6	Philadelphia	5.89	6.19	0.30	5.01%
7	Detroit	5.46	5.82	0.36	6.67%
8	Boston	5.19	5.46	0.27	5.19%
9	Dallas	4.04	5.22	1.18	29.34%

As the U.S. population continues to densify and cluster into metropolitan areas, they are becoming candidates to support healthy intercity passenger rail corridor service. As shown in Figure 2 below, this corridor service currently exists between city pairs including: Seattle to Portland and Seattle to Vancouver, Sacramento to San Francisco Bay Area, and the Northeast Corridor from Boston to New York to Washington, D.C.

Economic Factors

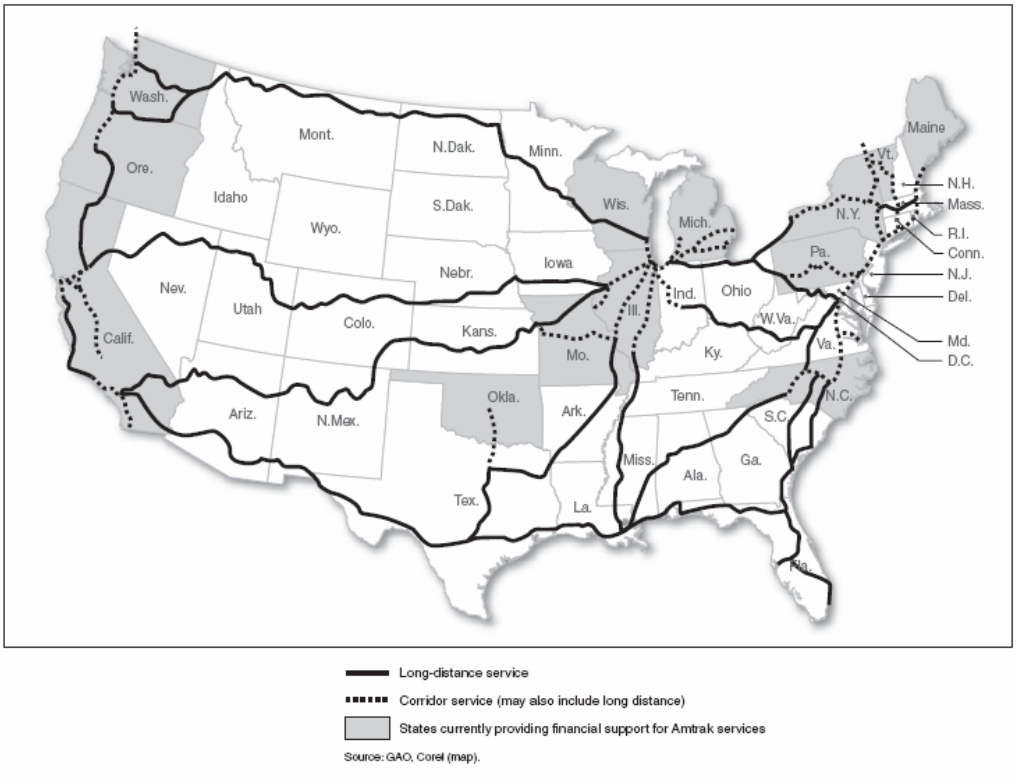
Economic growth leads to more intercity travel - Rising personal income levels and a healthy national economy create a greater demand for leisure and business transportation. Since 1990, personal income per capita (in constant 2000 dollars) has risen steadily- from a national average of $24,196 in 1990 to an average of $31,071 in 2005[10]. Rising income levels are making travel more attainable to many people and businesses, as well as increasing the frequency of travel for other individuals and businesses.

Automobile travel costs are increasing - Despite rising incomes, transportation (usually automobile costs) remains a large expenditure for most American households. On average, households spent $7,681 (in 2000 dollars[1]) on transportation in 2003, almost 20 percent of total household expenditures. Transportation is therefore the second largest expenditure for households, behind only the cost of housing itself.[11] These costs are increasing steadily.

[8] Intercity Passenger Rail Transportation: Standing Committee on Rail Transportation, AASHTO Executive Committee, 2002.
[9] Ibid
[10] U.S. Census Bureau, Statistical Abstract of the United States: 2007. Retrieved from www.census.gov
[11] U.S. Department of Labor, Bureau of Labor Statistics, *Consumer Expenditure Survey*, available at http://www.bls.gov. March, 2005.

Between 1993 and 2003, consumer spending on private transportation (mainly motor vehicles and related expenses) increased by 27 percent. On average, households spent $3,834 purchasing new and used motor vehicles in 2003, up 49 percent from $2,569 in 1993. Spending on other vehicle expenses (e.g., insurance, financing charges, maintenance, and repairs) also increased, from $1,806 to $2,216 (23 percent). Fuel prices have also been increasing steadily- from an average of $1.39/gallon in 2002, to $1.60/ gallon in 2003, to the 2005 average of $2.09/gallon[12].

Figure 2 Amtrak Route Map, Fiscal Year 2005



Transportation Factors

Congestion is increasing on highways - According to the Texas Transportation Institute's 2005 Urban Mobility Study, the average delay per traveler, total area delay and total costs incurred due to congestion have increased substantially in urban areas of all sizes over the last few decades. The TTI report found that rail and bus transportation service along the most congested corridors within urban areas provides substantial reduction in overall area congestion. Figures 3 and 4 show the projected changes in highway congestion from 1998 to 2020, assuming no additional increases in physical and operational highway capacity. In 1998, several metropolitan areas experienced congestion, . By 2020, it is projected that unacceptable levels of congestion will expand along several intercity corridors connecting these metropolitan areas, thus creating new opportunities for intercity rail corridors.

[12] Surface Transportation Policy Project, *Driven to Spend: Pumping Dollars out of Our Households and Communities,* June 2005.

Figure 3 1998 National Highway System Peak Period Congestion

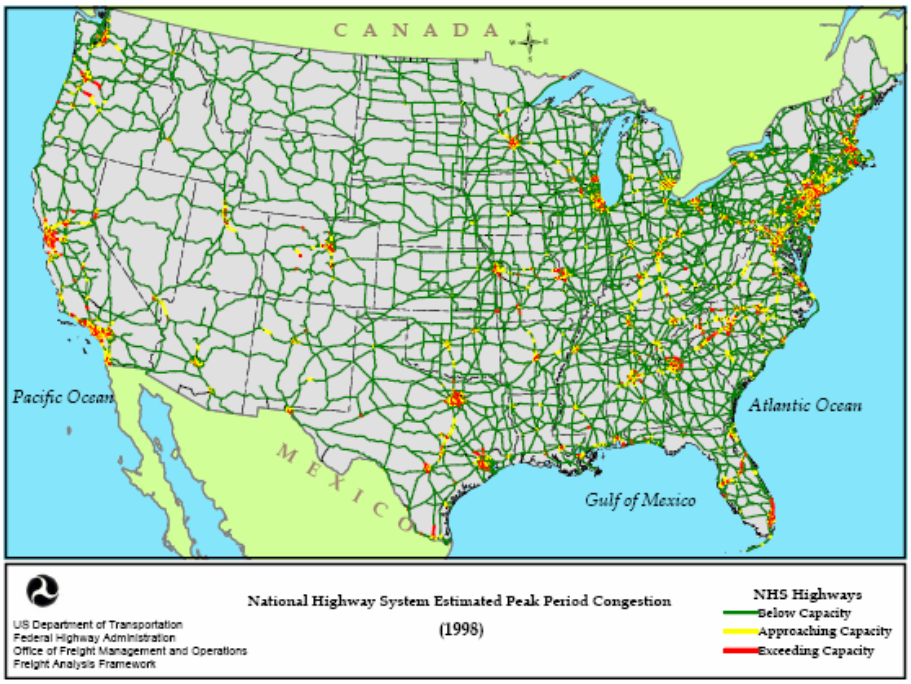
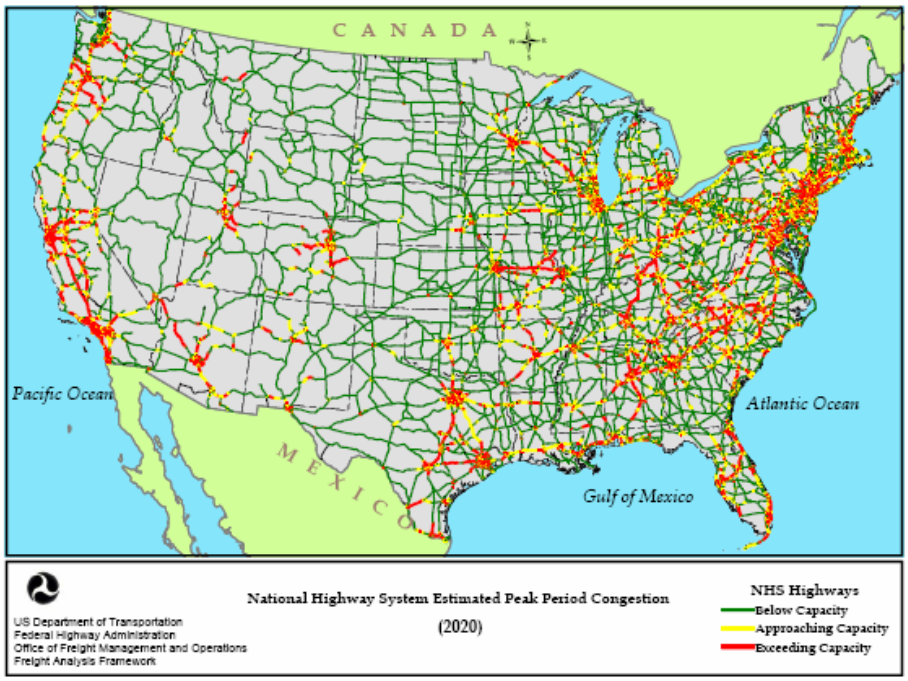


Figure 4 2020 National Highway System Estimated Peak Period Congestion



Source: FHWA Freight Analysis Framework

Many airports are also experiencing high levels of aircraft delay, often greater than 20,000 hours per year. These airports include those serving large urban areas that are on either end of potential intercity passenger rail corridors. For example, San Francisco (SFO), Los Angeles (LAX), and San Diego (SAN) (500 miles apart); Las Vegas (LAS) and Los Angeles (LAX) (270 miles apart); and Houston (IAH) and Dallas-Ft. Worth (DFW) (240 miles apart). Also, increased security in the post-9/11 era have added to the total time of air travel, making other travel modes more competitive in some markets.

Potential Impacts of Changes in Intercity Passenger Rail Service

Mobility - Intercity passenger rail offers an alternative to using the private automobile, bus, or airplane for transportation. At the current average of 2.2 million monthly riders, this means that several million people every month are removed from the already crowded roadways and airports. Using an auto occupancy rate of 1.4 people, this means that rail is keeping an additional 1.6 million cars from roadways each month. Most of these automobiles, and their associated contribution to congestion, are concentrated along dense, congested corridors.

System Redundancy - Intercity passenger rail also creates system redundancy in the intercity corridors that it serves. Redundancy helps to ensure that transportation is possible even when an event occurs that disrupts the primary transportation system. An example of this could be the observed spike in ridership on the Amtrak system following the events of September 11, 2001, and the associated airport closures.

Delay reductions - One potential benefit of intercity passenger rail service is the reduced highway congestion that will result if a percentage of travelers use trains rather than highways. In congested corridors, intercity passenger rail would only have to capture a small share of the total traffic in order to generate a substantial public benefit for all corridor travelers. This benefit would only be realized in specific markets where the intercity passenger rail is competitive with airplane and automobile. For example, the I-5 corridor between Seattle, Washington and Portland, Oregon already operates above its carrying capacity all day for much of its length. It is not uncommon, during peak hours, for motorists to take 5 hours to traverse the 180 miles between the two cities.

Environmental - Intercity passenger rail may also generate potential public benefits by reducing vehicle emissions, lowering pollution, and indirectly mitigating health and environmental costs. This benefit would occur where intercity passenger rail can provide the incentive to shift people out of their cars and onto rail. In general, this could only happen in shorter-distance, city-to city markets such as the New York to Philadelphia or the Seattle to Portland corridors. The *Amtrak Cascades* Long Range Plan found that if compared to airplane and automobile travel, rail costs for the average environmental externality cost per passenger mile, by some measures, is competitive. Using emissions data, cost estimates, and health costs by gram of emission, the analysis produced the numbers shown in Table 3. By these measures, rail is generally comparable to the airplane, and is somewhat less expensive than the automobile. This suggests a public benefit every time a passenger is diverted from an automobile to rail or air. The Downeaster service connecting Boston to Portland, ME was able to offset operating losing in the first few years of service with Congestion Mitigation and Air Quality (CMAQ) funding based on improvements in air quality resulting from a diversion of automobile passengers to rail.

Safety - Passenger rail is one of the safest modes of travel. A recent study for Washington State's *Amtrak Cascades* Long Range Plan compared the cost-per-passenger mile of accidents attributed to each of the major modes. Automobile had the most expensive estimated safety cost. (at an average of $.040 per passenger mile), with airplanes second ($.0035 per passenger mile). Passenger rail costs were calculated to be much lower, at $.0007 per passenger mile[13]. This suggests that there is a public benefit of safety savings whenever a passenger is diverted from airplane or automobile onto rail.

Table 3 Estimates of External Costs (Dollar per Passenger Mile)

	Automobile	Airplane	Rail
Air Pollution	$0.049-$0.081	$0.003-$0.004	$0.016-$0.031
Noise Pollution	$0.001-$0.006	$0.002-$0.018	$0.001-$0.005
Total	$0.05-$0.087	$0.005-$0.022	$0.018-$0.036

Source: Amtrak Cascades Cross Modal Analysis Technical Report, Volume 6, WSDOT, June, 2004.

Development around stations - Intercity passenger rail creates natural transportation nodes at its major origin and destination points, as well as serving as a centralized location to pick up and deposit passengers. These nodes can serve as focal points for development and business activity. They offer a fixed, permanent point of reference which guarantees foot traffic and customers to other businesses that may wish to locate near a transportation hub. They can also attract residential development to those developers wishing to offer the amenity of public transportation to prospective tenants.

Lower costs through competition - By offering a feasible alternative to air or automobile service, intercity passenger rail corridor service helps to regulate the price of intercity transportation. However, it is not clear how much of the lower cost is attributable to the existence of intercity passenger rail service, and how much is attributable to competition between regional air service providers. It is therefore mentioned here, and suggested as an area of further study.

Impediments to Expanding Intercity Passenger Rail Services

There are also significant impediments to expansion of intercity rail, which are noted here.:

High costs to expand and operate - Intercity passenger rail is expensive to build and maintain. Amtrak has called for $30 billion in federal capital support over 20 years to upgrade its operations and to invest as seed money in high-speed rail corridors. Amtrak also estimates that the cost to fully develop the 10 federally designated high-speed rail corridors and Amtrak's Northeast Corridor could exceed $50 billion over 20 years.[14] Amtrak has only one route- the Metroliner service on the Northeast Corridor- on which train revenue covers operating costs. Operating losses on the other routes ranged between $600,000 to $71.5 million (in 2001). The combined subsidy needs to operate the entire system is very high: in 2001, Amtrak estimated that

[13] Amtrak Cascades Cross Modal Analysis Technical Report, Volume 6. WSDOT, June, 2004.
[14] U.S General Accounting Office, *Intercity Passenger Rail: Congress Faces Critical Decisions in Developing a National Policy,* April 2002.

it would need about $16 billion (in 2000 dollars) in federal capital support from 2001 to 2020 just to maintain current operating levels of service[15].

Lack of stable and reliable funding sources - Federal operating and capital assistance programs have not provided for the estimated needs for the passenger rail system. Some new funding has occurred as a result of state initiative and investments. A dedicated and reliable funding program is required to continue rail passenger corridor development and to preserve corridor and long-distance routes.

Conflicts with increasing freight movements – About 95% of Amtrak's 22,000 route miles are owned by the private freight railroads[16]. Decades ago, when many of the current intercity passenger rail programs were initiated, the freight railroads were willing to sell slots to the public sector, especially in return for physical improvements to the rail lines. The rail industry is already straining to meet the growing demand for rail freight transportation, and it must add capacity if it is to handle the forecasted increases of 60 percent more tonnage and 73 percent more ton-miles by 2035. Therefore, the added cost of resolving rail network rail choke points to meet passenger service and ridership goals is increasing, potentially reducing the cost-effectiveness of passenger rail programs. The future cost of many intercity passenger rail programs may exceed the public benefits anticipated in the original plans, and the public sector may need to examine alternative strategies. Improved understanding of the cost sharing for capacity expansion and maintenance between freight and passenger rail services is an area needing further research.

Rail relocations away from urban areas - Growing population, market pressures, and the inability to expand are causing freight railroads to relocate facilities and yards to rural areas removed from the urban core. Often, the track right-of-way which supported the previous location is abandoned by the freight railroads in the relocation process. This removes rail access from the population centers, where passenger rail services are most viable. There is a proposal in Mississippi, for example, to relocate the rail lines away from the densely populated coastal area as a means of protecting the rail from further hurricane damage and to free the land for more residential and commercial development.

CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 4B-08

One reviewer commented as follows:

Although this paper is thorough in providing an overview of intercity rail nationwide, this reviewer would suggest that understates the potential significance to the New York-New Jersey region in two ways, as follows:

1. On page 2, the paper indicates that intercity passenger rail "represents only 4 percent of non-automobile intercity passenger trips" and, therefore, "even a doubling of ridership

[15] U.S General Accounting Office, *Intercity Passenger Rail: Congress Faces Critical Decisions in Developing a National Policy,* April 2002.

[16] The exception is the Amtrak Northeast Corridor, which is mostly owned by Amtrak.

growth rate (which is highly unlikely) would not substantially diminish the air or highway mode shares."

Although this reviewer's employer does not track the share of intercity passenger rail trips into our region, we are quite confident that it is higher than 4 percent. (We know that rail and bus together represent about 20 percent of interregional travel to New York City.)

However, even if this region's rail share were as low as 4 percent, a doubling to 8 percent would represent a noteworthy relief in regional congestion. Whether or not the congestion, air quality, and economic benefits of increased rail usage would merit the costs needed to make it both possible and attractive enough to double the share of intercity rail travelers to this region is not a statement that should be made without more in-depth analysis.

2. Although the paper does note the substantial investment necessary to make incremental improvements to intercity rail travel, it does not raise the issue of how much greater a share of intercity travel could be handled through rail if the service were much faster, much more reliable, much more frequent, and offered a variety of price points. In short, the paper does not offer a vision of what a topnotch intercity rail service might contribute to servicing an area like the Northeast. This is no small matter as economic growth in our part of the nation is very likely to be held back substantially if we do not come up with a viable substitute for the automobile and short-haul air travel.

Another reviewer commented as follows:

Page 2 states: "With capacity tightening on most freight rail lines, the freight railroads may be less willing or able to accommodate expansion of the intercity rail program." This statement is potentially misleading. Freight railroads have expressed willingness to accommodate intercity rail expansion, provided that the relevant issues — including adequate compensation, provision for future capacity needs, and liability — are resolved in arms-length negotiations between freight and passenger rail operators.