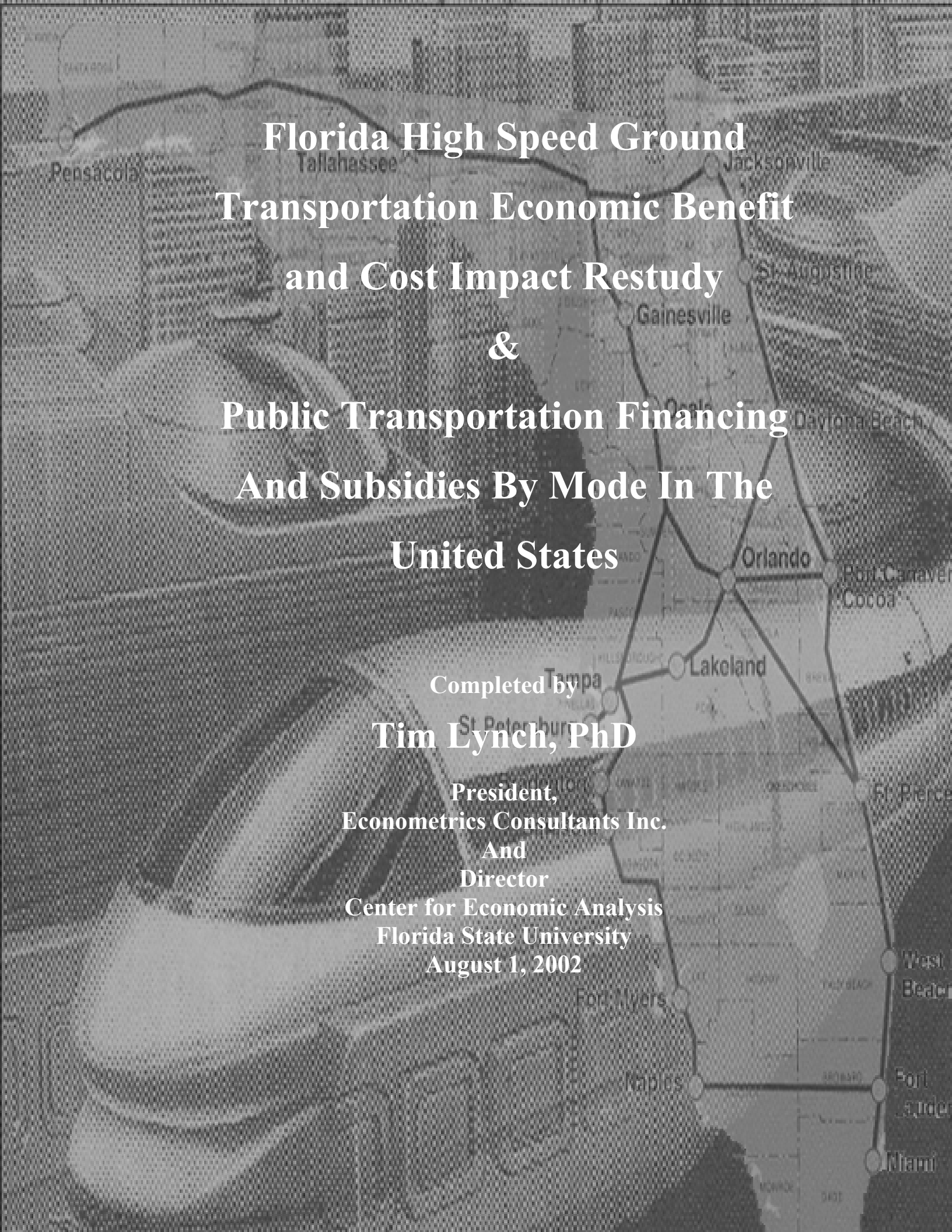

Florida High Speed Ground Transportation Economic Benefit and Cost Impact Restudy

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Public Transportation Financing And Subsidies By Mode In The United States

Completed by

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August 1, 2002

Acknowledgments

Part 1 - Section One of this High Speed Rail Restudy was funded by the Florida Transportation Association (FTA). The FTA is a not-for-profit Foundation dedicated to supporting a balanced approach to solving the transportation needs of commerce, citizens and tourists throughout Florida. Dr. Julie Harrington, President of Economic Research Enterprises, provided invaluable assistance in its preparation.

Part 2 - Public Transportation Financing and Subsidies By Mode in the United States was funded by economic research grants awarded to the Center for Economic Forecasting and Analysis (CEFA) at Florida State University. Douglas Lee, Research Assistant for CEFA, supplied helpful assistance in the research and tabulations for the report.

Table of Contents

Section II Public Transportation Financing and Subsidies by Mode in the U.S.

Figures

Introduction

Article X, Section 19 of the Florida Constitution requires the State of Florida to build a high speed rail system and Section 35 (2) (a) and (b) of HB 261 requires that the initial segment of the system shall be developed and operated between St. Petersburg area, the Tampa area, the Lakeland/Winter Haven area and the Orlando area, with future service to the Miami area.

During the 2002 Legislative session an initiative titled HB 65-e was passed which requires the Revenue Estimating Conference members to analyze and produce a fiscal impact statement for any "…proposed constitutional revisions or amendments…" (Section 16.061).

One of the current initiatives identified by the Division of Elections is a pending amendment sponsored by Derail the Bullet Train (DEBT) which is titled "Florida's Amendment to Repeal the Provisions that Requires High-Speed Ground Transportation".

The restudy and summary of Florida high speed rail proposals examined in this report provides an objective baseline overview and survey of the range of the magnitude of the nominal and net present value of benefits and costs across the most recent studies completed on corridors in Florida. This summary should serve as a baseline for the Revenue Estimating Conference for any assessment of the potential losses of private and public economic benefit citizens and businesses and the State of Florida would expect to sustain if the mandate expressed in Article X, Section 19 of the Florida Constitution, building a high speed rail system, is repealed.

A recommended 50 word summary for the ballot could read:

"If Article X, Section 19, of the Constitution is repealed the loss of economic benefits by private sector businesses, the public and State of Florida will include 41,267 jobs, $11.7 billion in wages and salaries and $34.1 billion in additional economic activity and a $5.7 billion loss of other benefits. "

High Speed Ground Transportation Economic Benefit and Cost Impact Restudy

Executive Summary of the Benefits of Implementing High Speed Rail in Florida

Over the past three decades, more than a dozen high speed rail and magnetic levitation system economic benefit assessment and benefit-cost analysis studies have been completed by the State of Florida Department of Transportation, Florida University transportation research institutions, The Federal Department of Transportation and internationally prominent private sector private corporations and ridership consultants. The specific corridors and technologies evaluated, method of evaluation and time frames vary widely, but there is general converge on their central conclusion:

> ***Benefits from implementing a version of high speed ground transportation across the most highly populated urbanized areas of Florida will, over time generate benefits that are considerably in excess of system costs.***

This study focuses on four separate high speed ground transport studies completed over the past five years.[1] For consistency, the results of these more recent 85-mile long central Florida St. Petersburg-Tampa-to-Orlando corridor studies were extended to the longer St. Petersburg-Tampa-Orlando-Miami approximate 325 mile corridor, and all costs and benefits were recalculated into 2002 dollar values. The standard 180 mph (or 150 mph in one case) HSR technology option from each study served as the base of this comparative analysis. Researchers also extended this analysis and calculated preliminary benefit and cost estimates for the Florida High Speed Rail Authority's "Florida Vision Plan". This plan envisions a statewide approximate 1,300-mile high speed ground transportation network eventually linking all the major urban areas of Florida.

[1] One study was completed in 1997 and focused on the 325-mile Tampa – Orlando – Miami corridor. Two Florida University transportation research institutes worked with the Florida DOT and the private sector team members to complete the analysis. Two more recent studies completed in 2001 and 2002 were directed by the Florida DOT and primarily examined the 85-mile Tampa to Orlando segment.

Summary of the Conclusions of the Studies of the180 mph HSR System Operating Across the 325 mile Tampa-Orlando-Miami Corridor

In summary, the conclusions of these studies evaluating the Tampa-Orlando-Miami urban areas find that development of a HSR system will generate:

Economic Benefits:

- HSR project life benefits of $39.2 to $51.5 billion nominal dollars.
- Net Present Value benefits (over varying time periods) ranges from $11.1 billion to $16.3 billion expressed in 2002 dollars.
- The average NPV of economic benefits created per linear mile ranged from $34.1 million to $42 million.

Economic Costs:

- Net present value of construction costs to build the HSR system range from $5.4 to $8.2 billion.

Operating Costs to Operating Revenues:

- In each case operational revenues exceeded operational costs and deferred a varying percentage of capital costs.

Job Creation:

- The number of permanent jobs created for Floridians varied from 5,380 to 41,267 over the life of the projects (these differences are associated with different economic models used and number of years evaluated).
- The average number of permanent jobs for Florida residents per corridor mile varied from 16.6 to 127 (these differences are associated with different economic models used and number of years evaluated).

Benefit-Cost Ratios:

- The range of the final benefit/cost ratios over the life of the projects varies from 1.34 to 3.02. (these differences are associated with different economic models used and number of years evaluated).

Summary of the Conclusions of Extension of the Studies of the 180 mph HSR System Operating Across the 1,300 Mile FHSRA Statewide Vision Plan Linking all Major Florida Urban Areas

In summary, the conclusions of these studies evaluating the HSR System operating across the estimated 1,300 Mile FHSRA Statewide Vision Plan[2] linking all major Florida urban areas system will generate:

Economic Benefits:

- HSR project life benefits will range between $156.9 to $205.9 billion in benefits in nominal dollars.
- Net Present Value benefits (over varying time periods) ranges from $44.3 billion to $65 billion expressed in 2002 dollars.
- The average NPV of economic benefits created per linear mile ranged from $34.1 million to $42 million.

Economic Costs:

- Net present value of construction costs to build the HSR system range from $21.5 to $32.9 billion (these differences are associated with different economic models used and number of years evaluated).

Job Creation:

- The number of permanent jobs created for Floridians varied from 21,520 to 165,069 over the life of the projects (these differences are associated with different economic models used and number of years evaluated).
- The average number of permanent jobs for Florida residents per corridor mile used to calculate these final values from the earlier studies varied from 16.6 to 127.

Benefit-Cost Ratios:

- The range of the final benefit/cost ratios over the life of the projects will be over unity when completed but are indeterminate at this time.

[2] The approximate distances of 85 miles for Tampa to Orlando with 240 additional miles to Miami (325 total) and 1,300 for the Vision Plan are first approximations only of the distances of each corridor examined.

The Florida High Speed Rail Authority Act of 2000 and a Restudy of Recent High Speed Ground Transportation Research for the State of Florida

Florida High Speed Rail Authority Act, CS/HB 261

Florida voters ratified an amendment to the State Constitution in 2000 that requires the state to build a high-speed rail (HSR) system capable of traveling at least 120 miles per hour to connect Florida's largest urban areas. The amendment specifies that construction of the system must begin by November 1, 2003.

The 2002 Legislature passed CS/HB 261 which states in part:

"The intent of this act is to implement the purpose of s.19, Art. X of the State Constitution, which directs the Legislature, the Cabinet and the Governor to proceed with development, either by the state or an approved private entity, of a high-speed monorail, fixed guideway, or magnetic levitation system, capable of speeds in excess of 120 miles per hour. The development of such a system, which will link Florida's five largest urban areas as defined in this act, includes acquisition of right-of-way and the financing of design and construction with construction beginning on or before November 1, 2003. Further, this act promotes the various growth management and environmental protection laws enacted by the Legislature and encourages and enhances the establishment of a high-speed rail system."[3]

OPPAGA Progress Report: Some Public Transportation Improvements Made; Stronger Planning for High-Speed Rail Needed, 2001

In response to the initial Constitutional amendment, the 2001 Legislature enacted the Florida High Speed Rail Authority Act, creating a 10 member high speed rail authority with the power to administer, and manage the preliminary engineering and environmental assessment of the Florida intrastate high speed rail system, and to seek funding to fulfill

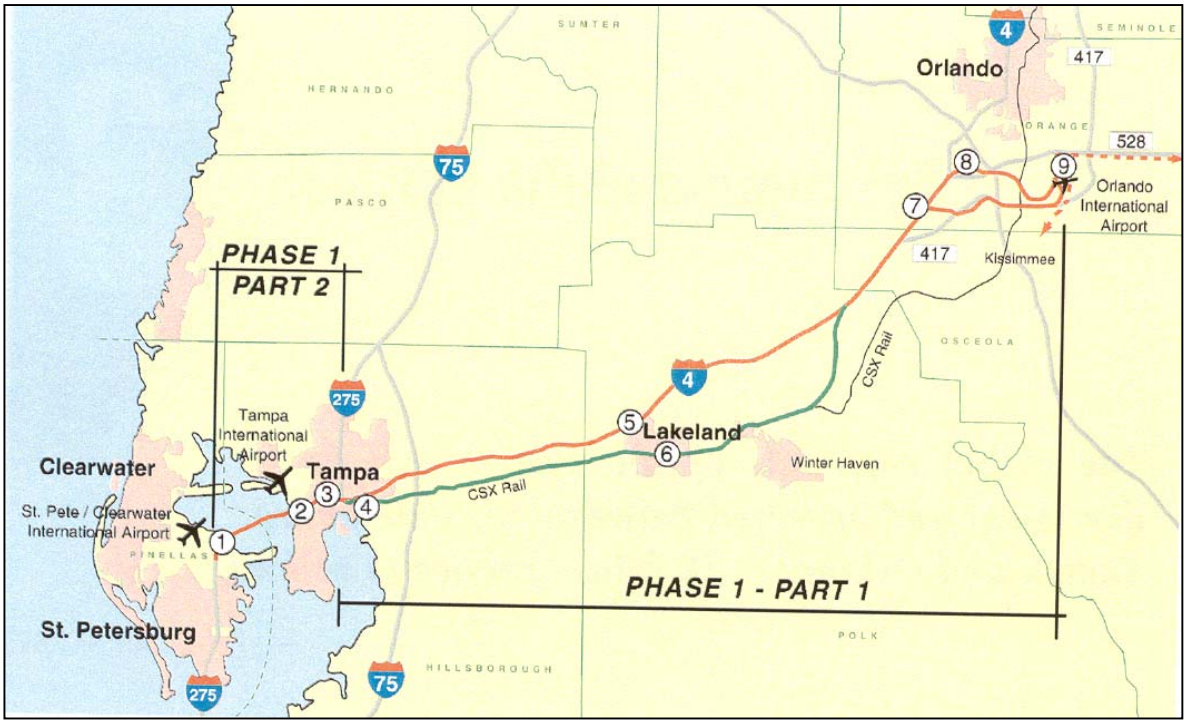
[3] Florida High Speed Rail Authority Act, CS/HB 261, 2002 Legislature, Tallahassee, Florida.

the requirements of the act.[4] As required by Title XXVI, Chapter 341.821-341.822, the Florida High Speed Rail Authority (FHSRA) presented the findings, recommendations and actions related to the implementation of a High Speed Rail (HSR) system in the State of Florida. In the 2002 Legislative session the Authority was granted additional powers to build, finance, own and maintain the HSR system.

Cross-State Rail Feasibility Study Final Report: FDOT, June 2001, Economic Benefit Study of High Speed Rail on the I-4 Corridor, 2001

Economic impact analysis was performed as a component of the Cross-state rail feasibility study final report, by STV Inc., for the Florida Department of Transportation, in June 2001.[5] They examined Phase I (Parts 1 and 2) of the HSR feasibility plan, as shown in Figure 1 linking St. Petersburg, Tampa, Lakeland and Orlando.

Figure 1. Phase One (Part One and Two) of the HSR Development Plan.



The economic analysis results of sales among Florida firms, earnings by Florida workers, and permanent jobs for Florida residents, and also transportation benefits were

[4] OPPAGA. Progress Report: Some Public Transportation Improvements Made; Stronger Planning for High-Speed Rail Needed. Report No. 01-37. August, 2001

[5] Cross-State Rail Feasibility Study Final Report June 2001, (CSRFS), STV Inc. Florida Department of Transportation. June, 2001.

drawn from a Florida Department of Transportation supported study completed by AECOM. STV also examined the accelerated development from Tampa to Ybor City that would take place as a result of the HSR system. They found that based on year 2000 data, the construction of three million square feet of commercial development in Tampa and Lakeland generates the following economic impacts (Table 1 and 2, respectively).

Table 1. Economic Impact for 3 million ft^2 of commercial development in Tampa.

Impact Category	Impact Value 2000$
Construction Value	$252,000,000
Sales Among Florida Firms	$535,752,000
Earnings for Florida Workers	$172,090,800
Jobs for Florida Residents	1,769

Table 2. Economic Impact for 3 million ft^2 of Commercial Development in Lakeland.

Impact Category	Impact Value 2000$
Construction Value	$143,922,000
Sales Among Florida Firms	$305,978,000
Earnings for Florida Workers	$98,284,000
Jobs for Florida Residents	1,010

Based on a cost benefit assessment of the various rail technology and alignment alternatives considered, the STV team concluded that Alternative 2C was the most feasible option. Alternative 2C is the non-electrified, 150 mph HSR mode that connects Orlando International Airport to Tampa Union Station via the I-4/Beeline alignment, with intermediate stations in Disney, the Orange County Convention Center, Tampa Union Station, and Lakeland.

A report produced by the AECOM Consulting Transportation Group examined the economic benefits of HSR on the I-4 corridor.[6] The economic impact analysis measured the statewide economic impacts, up to year 2030, resulting from the construction, operation, and maintenance of the HSR for the I-4 corridor. The economic impact from construction and operation of the Florida Coast-to-Coast Rail System (CCRS) was analyzed using data from the Cross-State Rail Feasibility Study Preliminary Report. The

[6] Economic Benefit Study of High Speed Rail on the I-4 Corridor, AECOM Consulting Transportation Group, Florida Transportation Association. March 15, 2001.

economic impacts from construction activities in proximity to station areas were analyzed through the preparation of development scenarios.

Representatives from the development community, business leaders, and economic development specialists were contacted to discuss the potential land use impacts from implementation of rail service. A separate analysis was developed to estimate the transportation benefits that are generated from the rail service. The transportation benefits analysis extends to year 2030 to conform to the analysis time-period of the economic impact analysis.

The economic impacts were estimated using the RIMS II input-output model, and results were depicted in terms of business sales (that are the inter-industry sales among firms located in Florida), employee earnings for Florida workers (that are generated as a result of the increased economic activity), and jobs (that are created as a result of the increased economic activity and are measured in full time equivalent (FTE) employment of one year's duration. Estimates of the impact are summarized in Table 3 and 4.

Table 3. Summary of Economic Impacts (in net present value year 2000$).

Activities Generating Economic Impacts	Sales Among Florida Firms	Earnings by Florida Workers	Jobs for Florida Residents
Project Implementation	$1,286,080,000	$413,106,000	6,793
Operation and Maintenance	$471,256,000	$171,688,000	1,230
Construction at Station Sites	$607,636,000	$195,181,000	2,779
Total	$2,364,972,000	$779,975,000	10,802

* Project implementation and O&M discounted at 7%, construction discounted at 3%.

Table 4. Summary of Economic Impacts (stated in year of expenditure, current $).

Activities Generating Economic Impacts	Sales Among Florida Firms	Earnings by Florida Workers	Jobs for Florida Residents
Project Implementation	$2,532,230,000	$813,387,000	6,793
Operation and Maintenance	$4,776,589,000	$1,740,205,000	1,230
Construction at Station Sites	$1,167,439,000	$374,997,000	2,779
Total	$8,476,258,000	2,928,589,000	10,802

In addition, transportation benefits were presented for the 2010 horizon year, the 21 year total (year of expenditure dollars) and the 21 year net present value (2000$) in Table 5.

Table 5. Summary of Transportation Benefits

Benefit Category	2010 Horizon Year (Year of Expenditure)	2010-2030 Total (Year of Expenditure)	2010-2030 Total NPV (2000 $)
Travel Time Savings	$24,520,000	$697,196,000	$138,855,000
Operating Cost Savings	$17,237,000	$582,271,000	$85,813,000
Accident Costs Avoided	$3,551,000	$100,973,000	$20,110,000
Induced Trips	$822,000	$27,577,000	$4,018,000
Total	$46,130,000	$1,408,017,000	$248,796,000

The CCRS produces $46 million in benefits during the 2010 horizon year. During the 2010-2030 analysis period, total benefits equal $1,408 million expressed in year of expenditure dollars. For the 2010-2030 analysis period, the net present value is $249 million. Travel time savings represent approximately 56 percent of the total net present value benefits, and vehicle operating savings represent over 34 percent of the total net present value benefits. Nearly 15 million hours are forecasted to be saved in 2010 by new rail travelers that divert from auto travel, with a value of $24.5 million.

It is estimated that the CCRS will reduce 2010 automobile travel by 39.1 million miles, compared to the base case. Using a rate of 32.5 cents per mile (IRS standard mileage rate), this translates to a savings of $17 million in 2010. Over the 21 year time horizon (2010-2030), cost savings resulting from trip reductions are estimated to have a $582.3 million value in year of expenditure dollars and a net present value of $85.8 million (2000$), respectively. It is estimated that there would be 64 injury accidents and one fatal accident avoided in 2010. This yielded a cost savings of $3.6 million. Induced trips are valued at less than $1 million for 2010, with an average trip length of 31 miles. The authors contend that although this estimate is not a sizable transportation benefit, it is highly reflective of the reasonableness of the ridership forecasts.

Table 6 extends this study to evaluate the benefits and costs across this proposed approximate 325 mile Tampa-Orlando-Miami (T-O-M) corridor and is expressed in updated 2002 dollars.

Table 6. Net Present Value of HSR Economic Impact of the HSR System Extended to the Tampa-Orlando-Miami 325-Mile Corridor, CSRFS Report, June 2001.

Total Economic Impact Summary - Net Present Value (Millions of 2002$)				
Activities Generating Economic Impacts	**Sales Among Florida Firms (Millions of 2002$)**	**Earnings by Florida Workers (Millions of 2002$)**	**Direct Economic Impact (Millions of 2002$)**	**Permanent Jobs for Florida Residents**
Project Implementation	$ 5,166	$1,659	$6,826	25,973
Operation and Maintenance	$1,893	$690	$2,583	4,703
Construction at Station Sites	$2,441	$784	$3,225	10,591
Total	$9,500	$3,133	$12,634	41,267
	Total NPV of Benefits (Millions 2002$)			
Transportation Benefit Category	(2010-2030)			
Travel Time Savings	$558			
Operating Cost Savings	$345			
Accident Costs Avoided	$81			
Induced Trips	$16			
Total	$999			
Estimated NPV of Economic Impact Per Mile (2002$)			$41,947,662	
Estimated Permanent Jobs Per Mile			126.98	
Note: Project implementation and O&M Discounted at 7%. Construction at station sites discounted at 3%				
Consumer Price Index factor 2000 to 2002 =			1.051	
* STV Incorporated with AECOM Consulting et al. Submitted to the Florida Department of Transportation, June 2001				

Section 10 of this study[7] recommended a more comprehensive economic analysis and indicated the need for the State to conduct an investment grade ridership study as the next step and issue a preliminary set of engineering and environmental work activities in the next year. These tasks were completed and the FHSRA also revisited the economic benefits and costs in their 2002 report titled Florida High Speed Rail Authority, 2002 Report to the Legislature, 2002. In summary, the NPV economic benefits associated with the Cross-State Rail Feasibility Final Report extended to the 325 mile T-O-M corridor

[7] Ibid, CSRFS, 2001, Chapter 10.0 Next Steps

expressed in 2002$ is $12.6 billion, and total transportation benefits are estimated at $999 million and generate 41,267 permanent jobs for Floridians.

Florida High Speed Rail Authority, 2002 Report to the Legislature, 2002

In the Florida High Speed Rail Authority 2002 Legislative report[8], the authors established that based on preliminary ridership, revenue and cost estimates for the corridor (and subject to more detailed engineering, environmental and ridership studies currently underway), the first segment of a high speed rail system corridor will have operating revenues that exceed operating costs and meet Federal Railroad Administration (FRA) standards of commercial feasibility. They found that a HSR system can be implemented using private funds exclusively for operations and maintenance of the system, and a mixture of private and public funding for construction of the infrastructure and on-going capital requirements.

The capital cost of infrastructure (in 2000$ millions) is outlined in Table 7 and the range of estimated annual operating and maintenance costs by technology in Table 8.

Table 7. Capital Cost of Infrastructure (in 2000$ Millions)

Segment	Non-electric (120-150 mph)	Electrified (180 mph)	Maglev (250 mph)
Phase 1, Part 1	$1,090-$1,300	$1,470-$1,650	$5,820-$6,140
Phase 1, Part 2	$700	$740	$1,100
Total	$1,790-$2,000	$2,210-$2,390	$6,920-$7,240

Table 8. Range of Estimated Annual Operating and Maintenance Costs by Technology (2000$ Millions)

Segment	120 MPH	150 MPH	180 MPH	250 MPH
Phase 1, Part 1	$26.2-$31.3	$32.2-$36.8	$40.8-$44.9	$40.8-$45.4
Phase 1, Part 2	N/A	$6.0	N/A	N/A
Total	$26.2-$31.3	$38.2-$42.8	$40.8-$44.9	$40.8-$45.4

According to the study, the proposed HSR project is expected to provide a wide range of benefits, contribute to regional economic growth, and improve mobility between the major corporate, industrial and tourism centers of Florida. The comparison of benefits to costs was based on the methodology used in the FRA's High Speed Ground Transportation for America (Commercial Feasibility Study – CFS) study. The community

[8] 2002 Report to the Legislature, Florida High Speed Rail Authority. HNTB Corporation, with Transportation Economics and Management Systems, Public Financial Management, and Booz-Allen and Hamilton, January, 2002.

or supply side benefits were estimated using the national rates and methodology developed for the Greater American Station Foundation (January, 2001). Table 9 presents the benefits to costs comparison for Tampa to Orlando.

Table 9. Benefits to Costs Comparison (30 Year Present Value in 2000$ Millions) for Tampa to Orlando.

Segment	120 MPH	150 MPH	180 MPH	250 MPH
Total Benefits	$1,486	$2,009	$2,285	$2,839
Total Costs	$1,502	$1,577	$1,985	$5,563
Ratio of Benefits to Costs	0.99	1.27	1.15	0.51

Indirect (supply side) benefits may be derived from an improvement in transportation efficiency, as measured by increases in accessibility and connectivity, which decrease the actual and perceived total cost of traveling to market centers. Preliminary estimates of indirect benefits in terms of employment, average household income and property value increases for the Tampa to Orlando route are presented in Table 10. In addition, indicative capital cost estimates from Orlando to Miami, and future service to Miami are included in Tables 11 and 12.

Table 10. Estimated Indirect Benefits of HSR (Tampa to Orlando)

Employment	Average Household Income ($/year for Corridor Households)	Aggregate Property Value Increase (2000$ Millions)
5,000 – 8,000	$250 - $450	$750 - $1,500

Table 11. Indicative Capital Cost Estimates (Millions 2000$)– (Orlando to Miami)

Non-Electric (120-150 mph)	Electrified (180 mph)	HSR (250 mph)
$3,500	$4,600	$17,100

Table 12. Indicative Characteristics of Future Service to Miami ($2000)

Impact Category	Impact Value
Annual Operating and Maintenance Costs	$123,700,000
Annual Ridership	7,800,000
Annual Revenue	$300,000,000
Operating Ratio	2.42
Ratio of Benefits to Costs	1.41

One section of the technical report described the financial and economic evaluation criteria and results for a high-speed rail system in Florida through comparisons of four technologies based on the generalized alignment case.[9] A key measure of financial success involved achieving an operating ratio of at least one. All four technologies (120+, 150+, 180+, and 250+ mph) achieved operating ratios above one.

Regarding the economic analysis, the proposed Tampa-Orlando HSR passenger rail service is expected to provide a variety of benefits, contribute to regional economic growth, and improve mobility between the major corporate, industrial and tourism centers of Florida. The economic benefits outlined in Chapter 7 of the FHSRA technical report are two types, users' (or travelers') benefits and community benefits. These benefits were measured using TEMS' RENTS model.

Users' benefits included consumer surplus, system revenues, and resource savings, which provide benefits to the general traveling public such as congestion and emissions savings. The community benefits of the proposed project were measured by estimated potential increases in employment, household income, and property values resulting from the project's implementation. Sensitivity analysis was also performed which examined the impacts of changes in the corridor, e.g., route alignment, socioeconomic outlook (based on population projections), and varying benefit-to-cost ratios (due to changing economic and financial assessments).

In addition, analysis was performed on route alignments including the Disney contract ridership. Results indicated that as with system implementation, between 5,000 and 8,000 jobs could be created (including both direct and indirect jobs) over the life cycle period. Average annual household income is projected to increase between $250 and $450, with continued annual increases during the project lifecycle. Also, there will be an increase in regional property values in the range of $750 million to $1.5 billion, garnered over a three to ten year period post-system's full implementation.

The largest property value increases will occur around Tampa and Disney stations, however, in percentage terms, Lakeland would experience the largest impact. Thus, the results of the economic impact analysis suggest that the Tampa-Orlando HSR service will

[9] Florida High Speed Rail Authority. Technical Report. In Chapter 7, Financial and Economic Analysis. HNTB Corporation, with Transportation Economics and Management Systems, Public Financial Management, and Booz-Allen and Hamilton, January 2002.

create a high level of both users' and community benefits and will generate indirect economic benefits for the communities along the route. Based on 180+ mph technology and General route alignment, the overall level of total benefits for the system is projected around $2.4 billion (in 2002$ present value terms) with total expenses estimated at approximately $2.08 billion. The system benefits-cost ratio is projected to be 1.15 (the overall benefits exceed the overall costs).

Table 13 provides a profile of the FHSRA Benefits and Costs and final benefit / cost ratio for both the Tampa-Orlando and Tampa-Orlando-Miami (T-O-M) alignments extracted for the 180 mph technology from Tables 4.10 through 4.12 with extrapolations to the longer alignment derived from Table 4.13 and 4.14. The NPV is updated and estimated in terms of millions of $2002 dollars.

Table 13. FHSRA 2002 Report to the Legislature - Summary of Net Present Value of Economic Benefits and Costs Extended to the 325 Mile Tampa Orlando Miami HSR Corridor Summarized and Updated to 2002$*.

Tampa to Orlando to Miami 325 Mile 180 mph HSR System Final Economic Impact			
From the FHSRA 2002 Report to the Legislature -Summary of Net Present Value of Economic Benefits and Costs in 2002$			
	Tampa - Orlando	Orlando - Miami	Estimated Totals
Tampa to Orlando (Millions of 2002$)	180 MPH	180 MPH	
Total NPV of Benefits	$2,401	$8,671	$11,072
Total NPV of Costs	$2,085	$ 6,150	$8,235
Ratio of Benefits to Costs	1.15	1.41	1.34
Mid Point Jobs Created - Tampa to Orlando	6,500	18,353	24,853
NPV of HSR Benefits Created per Corridor Mile (Millions 2002$)	$28,243,272	$36,128,451	$34,066,174
Number of Jobs Created Per Corridor Mile	76.5	76.5	76.5
2002 Report to the Legislature, Florida High Speed Rail Authority. HNTB Corporation, with Transportation Economics and Management Systems,			
Public Financial Management, and Booz-Allen and Hamilton, January 2002.			

Figure 2 presents a proposed layout of HSR alignment in Florida that has been proposed for the short and long term time horizons.

Figure 2. Tampa-Orlando-Miami 325 Mile Generalized HSR Alignment.

Prior to this analysis, one other important current Florida specific evaluations of HSR benefits and costs were completed. This analysis[10] was completed under the direction of the author of this restudy (with others) and was developed for the proposed Florida Overland Express (FOX) in 1997 for their proposed Tampa-Orlando-Miami alignment. This 1997 study will be examined next and as in the previous studies the benefit and cost estimates will be brought forward to 2002 dollars for baseline comparisons and

[10] Travel Time, Safety, Energy, and Air Quality Impacts of Florida High Speed Rail, Lynch, T., N. Sipe, S. Polzin, and Zuehao Chu for Florida Department of Transportation and Florida Overland Express. June 1997.

further evaluation. Also the author completed a comparison of the discounted benefits and costs from that original analysis in this restudy using the baseline values from that study which will be reported on in the next section of this restudy.

An Analysis of the Economic Impacts of Florida Overland Express (FOX) High Speed Rail Project, 1997

Travel Time, Safety, Energy, and Air Quality Impacts of Florida High Speed Rail, 1997

In June 1997 two Florida University system research Centers in cooperation with the Florida Department of Transportation and Florida Overland Express (FOX) produced a report documenting travel time, safety, energy and air quality impacts of the proposed Florida High Speed Rail system.[11] The research team began with data on the overall travel markets and the forecasts of travel changes as a result of the implementation of HSR. This information was used along with other estimates of mode specific performance to determine estimates of overall travel benefits stemming from HSR implementation. The analysis was dependent on two sets of data, ridership and specific performance characteristics. The analysis was performed at an aggregate level for the HSR system, and 2010 was used as the base year. Cumulative impacts over the performance time frame were also calculated. While in the initial study (in 1997) all benefits and costs were calculated, a final benefit-to-cost ratio was not calculated at that time. The author of this report has since completed that calculation and the relevant data is in the Appendix of that report.

In addition, the study introduced uncertainty (risk) into the analysis. The study found that the Florida HSR will have a significant positive impact on the state of Florida, creating thousands of job opportunities, stimulating economic development, serving and encouraging tourism, and providing increased transportation capacity. [12] Travelers will save time, cost, and energy while traveling on a safer and less polluting mode.

[11] Lynch, Polzin, et al., 1997.

[12] High Speed Rail in the U.S: Super Trains for the Millennium. In Chapter 8: Executive Summary: An Analysis of the Impacts of Florida High Speed Rail. Edited by Thomas Lynch. Gordon and Breach Science Publishers. 1998.

The authors found the following results:

- The diversion of passengers from auto to HSR will result in 1.4 million fewer auto trips in 2010.
- The diversion of passengers from air to HSR will result in 60 thousand fewer aircraft flights in 2010.
- Florida HSR will serve 1.116 billion passenger miles of travel in 2010.
- An average of 5,380 person-years of employment will be created and supported over the life of the HSR franchise.
- During the four peak construction years, the project will increase economic activity by $1.667 billion (1997 dollars) per year in Florida.
- A traveler shifting from auto to HSR from Tampa to Miami could be expected to save 2.7 hours of travel time per trip.
- An air or auto traveler shifting to HSR between Miami and Orlando in 2010 would be expected to reduce pollutants by 80 pounds and reduce energy consumption by the equivalent of 4.7 gallons of gasoline.
- Based on the expected shifts in demand, the Florida HSR project would be expected to prevent 389 auto accidents, 380 auto accident injuries, and five auto fatalities annually.

Researchers found that the Florida HSR will improve Florida's economy by: creating 78,100 job years of employment and $2.8 billion in wages and salaries over the first eight year of the project (planning and construction phase), and creating 174,800 job years of employment and 5,380 full time jobs for Floridians and $6.04 billion in wages and salaries over the next 39 years (operations and reinvestment phase). [13]

Their evaluation study was based on the ridership, construction, operating and maintenance costs, projected revenues and other financial data provided by the FOX team. They used both RIMS input-output (I-O) and REMI econometric-I-O (static and dynamic) modeling tools in their economic impact analysis. Prior to the economic analysis, transportation benefits were examined in this project. Transportation benefits are an integral factor to economic benefits, safety, air quality and energy and are important considerations in making transportation investment decisions.

These benefits take two forms. The first is the benefit to the traveler, above the cost of the fare, including consumer surplus, time, safety, environmental and other savings. The second is the economic and other savings to travelers using existing transportation modes in the form of reductions in congestion as a result of some air and auto travelers switching to HSR.

[13] An Analysis of the Economic Impacts of Florida High Speed Rail, August 1998. Lynch, T., and Olivier Picq. Eurailspeed 98:, July 1998

Florida FOX HSR project was expected to carry 6.13 million one-way riders in the year 2010. This would result in approximately 16,780 daily trips, averaging 182 miles. Forty-six percent of the ridership will be concentrated in the Orlando-Miami ridership, with 36 percent and 18 percent concentrated in the Tampa-Orlando and Tampa-Miami segments, respectively. Fifty-seven percent of the trips would be made for business purposes, the remainder being personal travel and tourism. Of the total ridership, 31 percent were expected to switch to HSR from air travel, 45 percent from auto, and 24 percent will be new trips induced by the cost and convenience of HSR.

Approximately five percent of highway traffic between cities served was expected to shift to HSR, while approximately 80 percent of intrastate air travel would make the transition to HSR. HSR represents about 11 percent of the total travel that begins and ends in the Tampa-Orlando-Miami corridor. The average fare would be approximately $64 per trip, or $0.35 per passenger mile. HSR was projected to serve approximately 1.1 billion passenger miles of travel in 2010, in a state that has over 127 billion vehicle miles of travel on roadways. HSR will reduce pollutants due to travelers shifting from auto or air travel. Table 14 illustrates changes in air pollutants for 2010 and 2035.

Table 14. Net Reduction in Tons of Air Quality Pollutants (Years 2010 to 2035).

Year	Pollutant	Auto	Air	Florida HSR	Net Reduction
2010	Carbon Dioxide	69,658	65,260	41,257	93,661
	Carbon Monoxide	4,414	17,220	9	21,625
	Hydrocarbons	595	13,499	1	14,093
	Nitrous Oxides	307	654	191	770
	Particulate Matter	37	97	33	101
	Sulfur Oxides	25	145	287	(117)
	Tire Wear Matter	38			38
	Totals	75,074	96,875	41,778	130,171
2035	Carbon Dioxide	112,765	105,645	66,789	151,621
	Carbon Monoxide	7,145	27,876	15	35,006
	Hydrocarbons	963	21,853	2	22,814
	Nitrous Oxides	497	1,058	309	1,246
	Particulate Matter	61	157	54	164
	Sulfur Oxides	40	235	465	(190)
	Tire Wear Matter	62			62
	Totals	121,533	156,824	67,634	210,723

Results of the economic analysis revealed an estimated 78,102 job years will be created by the HSR project during the planning and construction phases (eight years). An

additional 174,786 job years will be created over the period of operation and reinvestment (39 years). These jobs would be distributed widely across most sectors of the economy.

As Table 15 illustrates the HSR project would create 5,380 permanent jobs for Floridians (with the strongest job growth, at approximately 4,000 jobs per year, in the non-manufacturing area).

Table 15. Nominal and NPV of the Economic Impacts of HSR FOX project (1997 Study in $2002).

Nominal and Net Present Value of the Economic Impacts of the Florida High Speed Rail FOX Project: State of Florida*	
	Categories of Costs and Benefits
Wages Millions Nominal $	$9,891
Private Non-Farm Output (included wages & other benefits) Millions Nominal $	$39,233
Construction Costs Millions of Nominal $	$8,696
NPV of Benefits Millions of 2002$	$16,251
NPV Construction Costs Millions 2002$	$5,385
Permanent Jobs for Florida Residents	5,380
FINAL BENEFIT / COST COMPARISON	
Final B / C =	3.02
Permanent Jobs for Florida Residents Per Corridor Mile	16.55
NPV Economic Impact per Project Corridor Mile (Sensitivity Discount Rate)	$31,953,250
Discount Rate and varying sensitivity rate -	4% to 7%
Consumer Price Index 1997 to 2002 multiplier =	1.1172
Source: Table 16, Page 64 - An Analysis of Economic Impacts of Florida High Speed Rail - Economic Impacts of the Florida High Speed Rail State of Florida Step 4, June 1997, Lynch et al.	

This includes growth in services including tourism, transportation, retail, trade, finance, and government. Additionally, an average annual increase of 200 jobs will be realized in the manufacturing sector during the years of HSR operation. This overall increase in employment is attributable to the construction and operation of the HSR and subsequent economic impacts. The secondary impacts result from an increase in the competitiveness of Florida's business and the attractiveness of Florida's economy.

Summary of the Range of Benefit and Costs Over the 325-Mile Tampa-Orlando-Miami Corridor from All Three High Speed Rail Studies

Table 16 profiles the summary benefits and costs of all of the studies reviewed in this analysis in both net present value 2002 dollars and nominal dollars.

Table 16. Ratio of the Benefits and Costs of HSR for the Tampa-Orlando-Miami 325-Mile Alignment.

	Florida High Rail FOX Project Final Report 1997	Cross-State Rail Feasibility Study 2001*	Report to the Legislature FHSRA 2002**
Wages Millions Nominal $	$9,891		
Private Non-Farm Output Millions Nominal $	$39,233		
Construction Costs Millions of Nominal $	$8,696		
Direct Sales & Earnings & Florida and Transport Benefits Millions of Nominal $		$51,470	
NPV of Benefits Millions of 2002$	$16,251		$11,072
NPV Direct Sates & Earnings in Florida & Transport Benefits Millions 2002$		$13,633	
NPV Construction Costs Millions of 2002$	$5,385		$8,235
Permanent Jobs for Florida Residents	5,380	41,267	24,853
FINAL BENEFIT / COST COMPARISON			
B /C RATIO	3.02		1.34
Permanent Jobs for Florida Residents Per Corridor Mile	16.55	126.98	76.47
NPV Economic Benefit Impact per Project Corridor Mile (Mid Point)	$40,978,362	$41,947,662	$34,066,174
*Benefits extrapolated from the CSRFS 2001 study of the Tampa-Orlando Corridor. ** These costs and benefits were taken from The 2002 Report to the Legislature and uses the Orlando - Miami Indicative Capital and benefit estimates Tables 4.13 & 4.14			

The obvious conclusion to be drawn from Summary Table 16 is that over the past five years three comprehensive Florida studies of high speed rail have been completed and each study documented the findings that the amount of benefits flowing from development of a high speed rail project in the evaluated corridor areas generates considerable amounts of benefits well in excess of the projects costs. This conclusion is only the most current update of a number of other high speed rail studies that go back almost three decades. The range of benefits generated by the studies evaluating the Tampa-Orlando-Miami HSR

corridor in nominal terms could range from a low of $39.3 billion to a FHSRA estimated high of $51.5 billion. The FHSRA estimate of benefits is actually considerably higher given that the study predicts an average increase in property values of $1.1 billion (2000$) and average household income increase for those along and around the proposed route of $350 annually with continued annual increases during the project lifecycle. This income reflects the new employment and increased profitability of businesses associated with the service implementation[14]. Given that over 1.3 million households exist in the counties between Pinellas and Orange counties, this could translate annually into over $450 million in income increasing each year for the thirty plus years of the projects existence. Together, the property value increases and income increases (and related property tax increases to local governments) suggest billions of additional dollars of benefits are not included in these benefits estimations.

The ranges of the discounted net present values of benefits these three studies generate vary from $11.1 billion to $16.3 billion over the 325-mile system. This translates into a per corridor linear mile range of NPV of benefits varying from $34 million to $42 million. These differences are attributable to a wide range of differences in methodologies and benefits measured and so forth, but it is interesting to note that two of the studies, Lynch et al 1997 and CSRFS, generate average benefits per mile values that are within 2% of each other and range between $41 to $42 million with $41.5 falling as the mid-point in the range. While other values will continue to be evaluated in this summary, this convergence of values provides the most likely range of reliable estimates on which to rely and extrapolate forward for future.

While each of the studies examined also provide a wide range of benefit to cost ratios, those that provide this final measure of project strength are above unity indicating, as described above, that the benefits of implementing each examined project clearly exceed system costs. Each system also reported positive operating ratios, which indicate that system revenues exceed system-operating expenditures over the life of the project. The B/C ratios range from 1.34 to 3.02 with a median value of 2.18, which suggests that using conservative estimates (see the above paragraph) that on average over the life of the

[14] Ibid, FHSRA Technical Report, 2002, p. 7-8.

T-O-M HSR project that system benefits will likely outweigh system costs by more than two to one.

The number of permanent jobs for Floridians generated by implementing HSR in each case also ranged widely between these studies. The average number of permanent jobs generated per corridor mile varied from implementing HSR across the 325 mile proposed system varied from 16.6 to 127, with a mid-point of 71.8 jobs per linear mile. Interestingly, as in the case of the average benefits, there is very close agreement between this mid-point estimate and the most recent FHSRA 2002 analysis, which estimates 76.5 jobs per corridor linear mile. This small 6.6% difference suggests the mid-point between these two values is the most reliable estimate for future corridor forecasts from among those evaluated. Lastly, the final number of permanent jobs created ranges from 5,380 to 41,267.

Summary of the Range of Benefits and Costs over the Extended Florida High Speed Rail Authority 2002 Proposed Statewide Vision Plan 1,300 Mile Corridor

Beyond the examined 325 mile Tampa-Orlando-Miami corridor, the Florida High Speed Rail Authority has adopted a "Vision Plan"[15] which connects the five major urban areas of Florida with high speed ground service in the future. The 2002 Legislative session defined the five major urban areas of Florida as North West Florida, North East Florida, Central Florida, South West Florida and South East Florida. The state proposed plan envisions extending the services of HSR when the resources and travel demand allow and the benefit / cost ratios are positive. The FHSRA noted that:

> *The Authority's Vision Plan anticipates a high-speed ground transportation network that closely parallels Florida's major highway infrastructure serving communities, cities, airports and seaports throughout the State.*[16]

The general Vision Plan alignments include the basic St Petersburg-Tampa-Orlando-Miami route with additional southern extensions from Tampa to serve Ft. Myers and Naples en route to Ft. Lauderdale. The service will also extend northeast to Jacksonville via Port Canaveral and Daytona Beach and St Augustine. Finally, the Plan

[15] FHSRA, 2002 Vision Plan, Figure 1, p 1-2
[16] Ibid, FHSRA, 2002

calls for service to extend both north and northwest to Ocala, Gainesville, Tallahassee and eventually far west to Pensacola (see Figure 3).

Figure 3. Proposed Statewide 1,300 Mile FHSRA Vision Plan to Provide HSR Service in Florida.

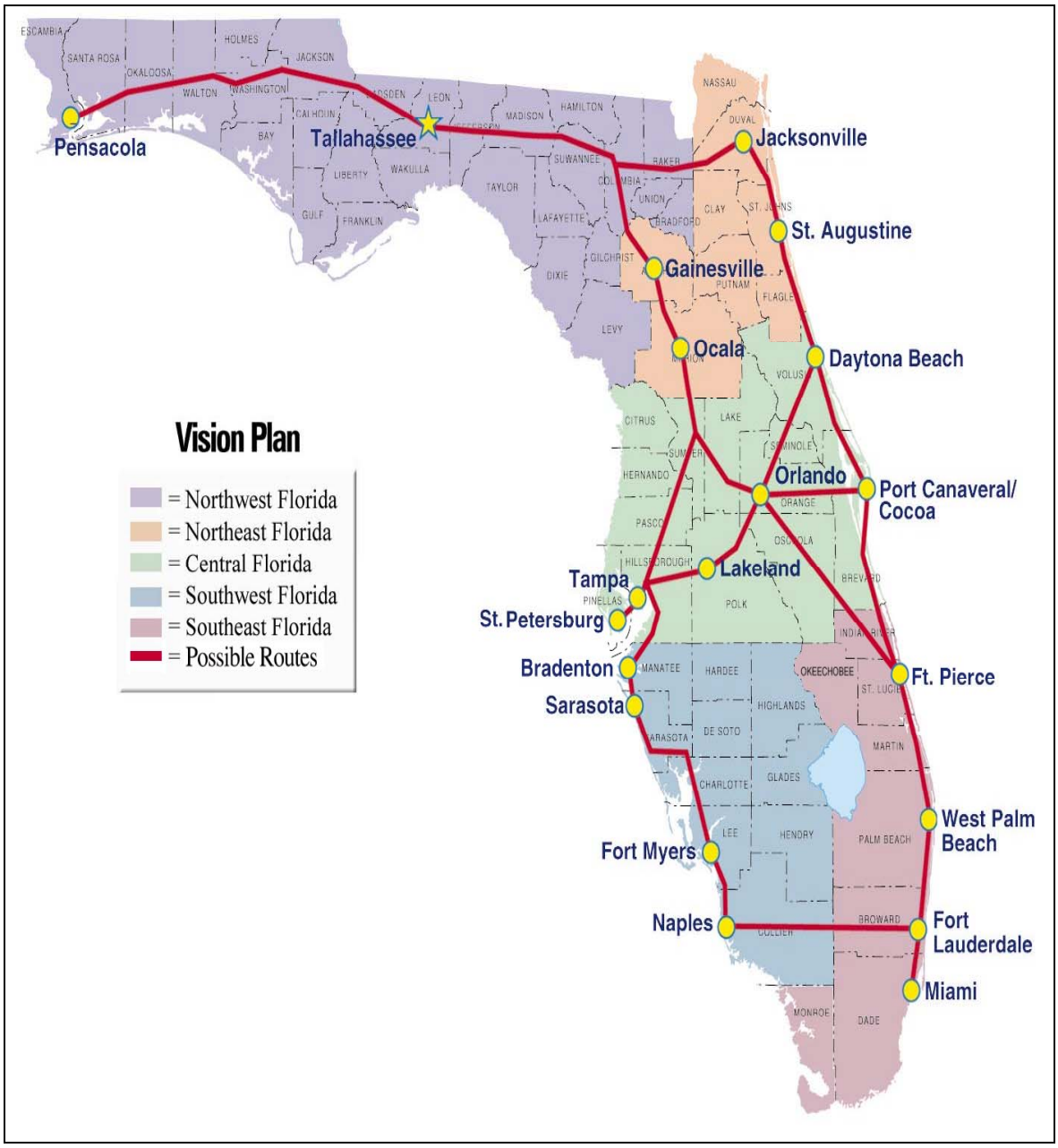


Table 17 provides a similar profile of the range of values for the same Florida Specific HSR evaluations with a generalized linear interpolation of the average costs and the benefits projected from each of the three studies examined to the proposed statewide 1,300 mile FHSRA Vision plan to provide HSR service to all parts of the state.

Table 17. Summary of the Range of Benefits and Costs of HSR for the 1,300 Florida HSR Vision Plan Alignment.

	Florida High Rail FOX Project Final Report 1997	**Cross-State Rail Feasibility Study 2001***	**Report to the Legislature FHSRA 2002****
Wages Benefits in Millions Nominal $	$39,563		
Private Non-Farm Output Benefits in Millions 2002 $	$156,932		
Construction Costs Millions of Nominal $	$34,785		
Direct Sales & Earnings & Florida and Transport Benefits Millions of 2002 $		$205,882	
NPV of Benefits Millions of 2002$	$65,005		$44,286
NPV Direct Sates & Earnings in Florida & Transport Benefits Millions 2002$		$54,532	
NPV Construction Costs Millions of 2002$	$16,969		$32,940
Permanent Jobs for Florida Residents	21,541	165,069	99,412
FINAL BENEFIT / COST COMPARISON			
B /C RATIO	3.02		1.34
*Benefits extrapolated from the CSRFS 2001 study of the Tampa-Orlando Corridor - single B /C ratios were calculated in 2002			
Permanent Jobs for Florida Residents Per Corridor Mile	16.6	127.0	76.5
NPV Economic Benefit Impact per Project Corridor Mile (Mid Point)	$40,978,362	$41,947,662	$34,066,174
Ratio of the T0O-M alignment to the FHRSA Vision Plan Statewide Alignment = 4.00			
*Benefits extrapolated from the CSRFS 2001 study of the Tampa-Orlando Corridor. ** These costs and benefits were taken from The 2002 Report to the Legislature and uses the Orlando - Miami Indicative Capital and benefit estimates Tables 4.13 & 4.14			

A similar conclusion can be drawn from Summary Table 16 in the evaluation of the potential economic benefits and costs of the 1,300 mile long statewide Vision Plan. These estimates indicate the range of nominal values potential of benefits and costs generated by the Tampa-Orlando-Miami combined with the links to Ft Myers and Ft Pierce to the South and Jacksonville to the North East and Tallahassee and ultimately Pensacola to the north-west, are projected to range from a low of $156.9 billion to a high of $205.9 billion.[17]

The range of the fully discounted net present value of benefits these three studies generate in 2002$ varies from $44.3 billion to $65.1 billion over the 1,300-mile system. This extrapolation is consistent with the earlier analysis with per corridor linear mile range of NPV of benefits in 2002$ varying from $34 million to $42 million. These differences are attributable to a wide range of differences in methodologies and benefits measured and so forth, but it is interesting to note that two of the studies, FOX 1997 and CSRFS generate average benefits per mile values that are within 2% of each other and range between $41 to $42 million with $41.5 falling as the midpoint in the range. The number of permanent jobs for Floridians generated by implementing the statewide 1,300 Vision Plan HSR system also ranged widely between these studies. As reported above, the average number of permanent jobs generated per corridor mile varied from 16.6 to 127, with a mid-point of 71.8 jobs per linear mile over the range of studies examining the 85 and 325 mile corridors studied. Final number of permanent jobs created across the 1,300-mile corridor ranges from 21,541 to 165,069 over the life of these proposed extension projects.

[17] Lynch, et al., 1997

SECTION II

Public Transportation Financing And Subsidies By Mode In The United States

Federal, State And Local Government Transportation

Finance And Subsidies By Mode In The United States

Executive Summary

- Public transportation expenditures for all modes; highway, transit, air, rail, and water, have grown by 11.1% annually in constant 2002 dollars from $15.8 to $143.7 billion and totaled $1,533 billion over the 1978 to 1999 period in the United States.[18]
- Federal transportation expenditures for all modes have annually increased by 8.5% from $7.4 to $41.0 billion over that same time period.
- Federal percent of total government expenditures has declined from 47% to 29% over the 1978-1999 period.
- State and local transportation expenditures in constant dollars have risen annually by 12.7% from $8.4 to $102.6 billion over the 1978 to 1999 period.
- State and local governments' percent of total transportation expenditures has risen from 53% to 71% over the 1978-1999 period.
- Federal transportation expenditures in constant 2002 dollars exceeded $504 billion over the 1978-99 period. The modal share of federal expenditures were:

Highway -	$251.6 billion or 49.9%, annual growth rate of 9.3%
Transit -	$ 58.3 billion or 11.6%, annual growth rate of 7.3%
Air -	$ 114.0 billion or 22.6%, annual growth rate of 10%
Rail -	$ 18.3 billion or 3.6%, annual growth rate of –1.9%[19]
Water -	$ 58.0 billion or 11.5%, annual growth rate of 7.5%

[18] This report estimated the projected years 2000-2002.

[19] Railroad activity generates tax revenues in the form of fuels and property taxes, but these are not treated as transportation-related revenues in this report as in the other modes with Federal Trust Funds. Fuel taxes collected from railroads are channeled into the general fund for deficit reduction and hence do not fall under the definition of transportation-related revenues. State and local governments collect property taxes from the rail mode, and some of these proceeds may be used to finance transportation activities. That portion of the state and local governments' property tax revenue, which is used for transportation, is not accounted for in this report because of lack of data. For a similar reason, transportation-related property taxes for other modes are also not covered abut most are public and not private, as is the case with rail in the US. Amtrak, the national passenger railroad service, generates revenues from passenger fares, but since Amtrak is not an entity of the federal government its revenues are not treated as transportation-related revenues either.

- Federal, state and local transportation expenditures in constant 2002 dollars exceed $1,533 billion over the 1978-99 period. The modal share of federal state and local government expenditures were:

  Highway - $932.7 billion or 61.8%, annual growth rate of 11.1%
  Transit - $294.3 billion or 19.2%, annual growth rate of 12.5%
  Air - $195.9 billion or 12.8%, annual growth rate of 12.4%
  Rail - $ 18.4 billion or 1.2%, annual growth rate of -1.7%
  Water - $ 87.5 billion or 5.7%, annual growth rate of 8.8%

- Federal subsidies for each mode in constant 2002 dollars over the 1978-99 period were:

  Highway - $ 5.1 billion, annual growth rate of -0.8%
  Transit - $ 24.6 billion, annual growth rate of 1.0%
  Air - $ 41.0 billion, annual growth rate of 4.6%
  Rail - $ 18.8 billion, annual growth rate of 1.6%
  Water - $ 48.6 billion, annual growth rate of 7.2%

- Federal, state and local subsidies for each mode in constant 2002 dollars over the 1978-99 period were:

  Highway - $149.0 billion or 33.5%, annual growth rate of 13.2%
  Transit - $182.4 billion or 40.9%, annual growth rate of 11.4%
  Air - $ 41.3 billion or 9.3%, annual growth rate of 0.6%
  Rail - $ 18.9 billion or 4.2%, annual growth rate of 1.6%
  Water - $ 55.3 billion or 12.4%, annual growth rate of 7.9%

- All transportation modes receive considerable subsidies with transit (40.9%) and highway (33.5%) modes each receiving slightly over a third of all transportation subsidies.

- Federal, state and local highway (automobile, truck related) expenditures accounted for 61.8% of all transportation expenditures over the 1978-99 period.

- Public highway expenditures were:

  3.2 times larger than transit mode expenditures
  4.8 times larger than air mode expenditures
  50.7 times larger than rail mode expenditures
  11.2 times larger than water expenditures
  1.6 times larger than all other modes combined

- This post WWII highway expenditure emphasis has generated the automobile centered transportation economy and culture most acutely developed in the United States.

- This automobile dominated public investment pattern and increasing air mode subsidies have resulted in substantial under investment in development and deployment of rail surface modes of transportation in the United States.

- Under investment in rail technological advances has resulted in serious erosion of potential ridership and high end commodities shipments and resulting losses in user revenues and tax sources to support the mode.

- Dominant highway investments have resulted in considerable economic expansion of highway oriented truck transport commerce to the detriment of competitive high end rail commodities market transport development.

- Continued over investment and dominant reliance on the highway automobile mode within the U.S. will result in increasing loss of transportation efficiencies and increasing long run losses in international markets and reduction in economic competitiveness in expanding global markets to other developed market economies.

- Over investment in the highway modes and thereby over dependence on the automobile and truck transportation mode results in much higher energy consumptive transportation network in the United States with resulting higher inefficiencies, pollution emissions, and transportation bottlenecks and delay costs relative to other developed nations.

Federal, State And Local Government Transportation Expenditures

Over the 1978-2002 period annual federal, state and local government transportation spending rose from $40.6 billion to an estimated $154.8 billion (nominal dollars).[20] This is an average compound growth rate of 6.6% per year over twenty-one year period. However, in real terms (or constant 2002 dollars) the actual increase in expenditures for transportation has been 11.1% annually. Real transportation spending rose from $15.8 billion in 1978 to $143.7 billion in 1999. In addition, for the projected the years 2000-02, after examination of the historical data (1978-1999), it was determined that a linear extrapolation method was best suited to estimate the years 2000-02.

Figure 1 provides a bar graph of total federal, state and local expenditures for all modes of transportation in constant 2002 dollars.[21] Total transportation spending in real terms in the U.S. gradually rises over the 1978-1999 period. But, as shown in Figure 2, the ratio of federal and state and local expenditures dramatically decreases over the time period.

Figure 1 graphically shows that state and local expenditures for all modes has increased an average 20.3% annually over the 1978-1999 period, from $7.0 to over $34.3 billion in constant 2002 dollars while federal funds alone declined.

Figure 2 shows that federal spending averaged 32.9% of total government transportation spending during the 1978-1999 period, and declined to a low of 28.6% for two years from 1997 to 1998, finishing in 1999 at 28.5%. State and local governments contributed almost 71.4% of total governmental funding for all transportation systems in these two years. All levels of government expended $143.7 billion for transportation in 1999 with $102.74 billion, almost 71.5%, coming from state and local finance sources.

[20] Federal, State, and Local Transportation Financial Statistics, Fiscal Year 1978 through 1995., Bureau of Transportation Statistics, U.S. Department of Transportation.
[21] All figures show the financial estimation of the projected periods 2000-02.

Figure 1. Total Federal, State and Local Government Transportation Expenditures for all Modes (Amounts)

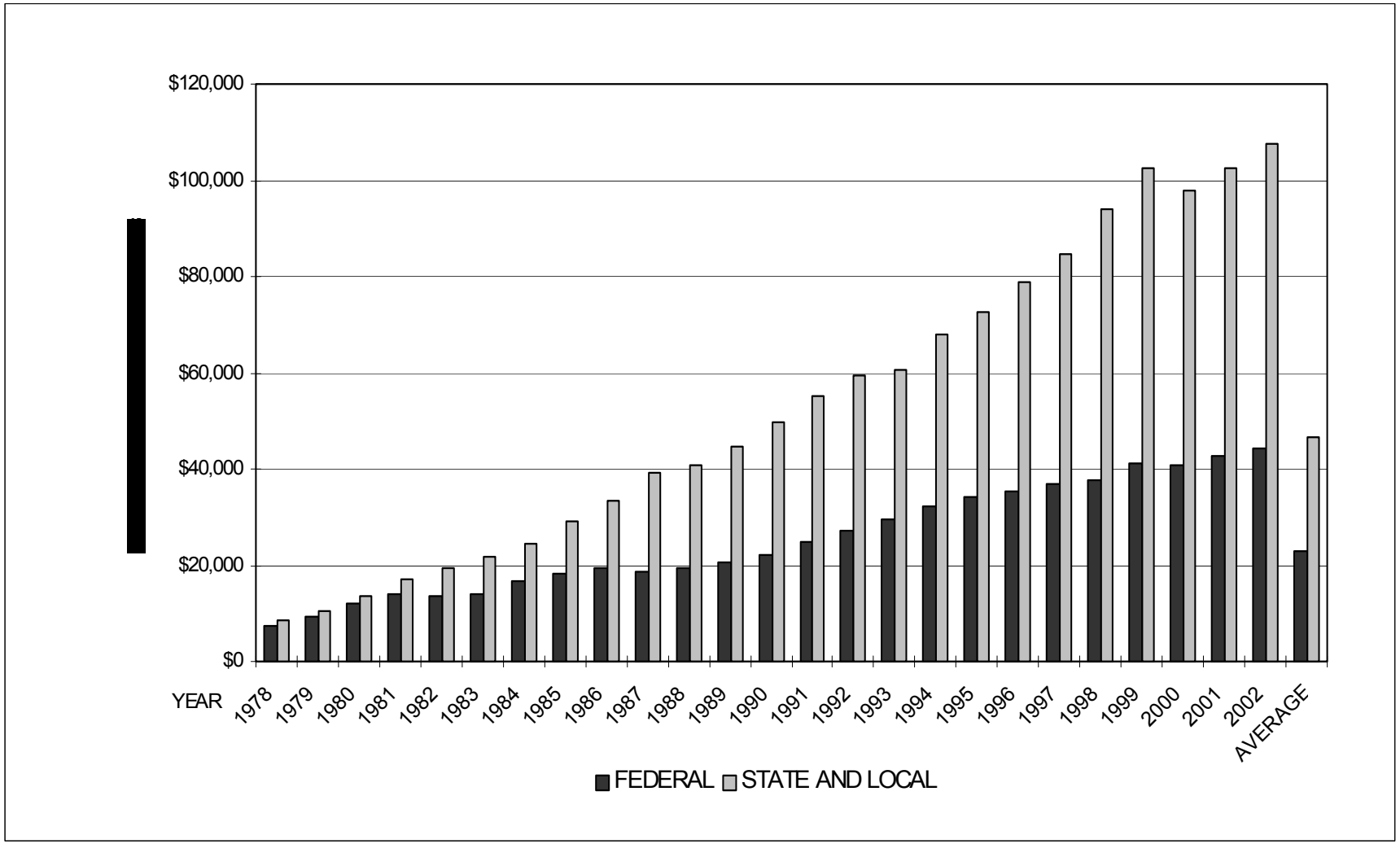
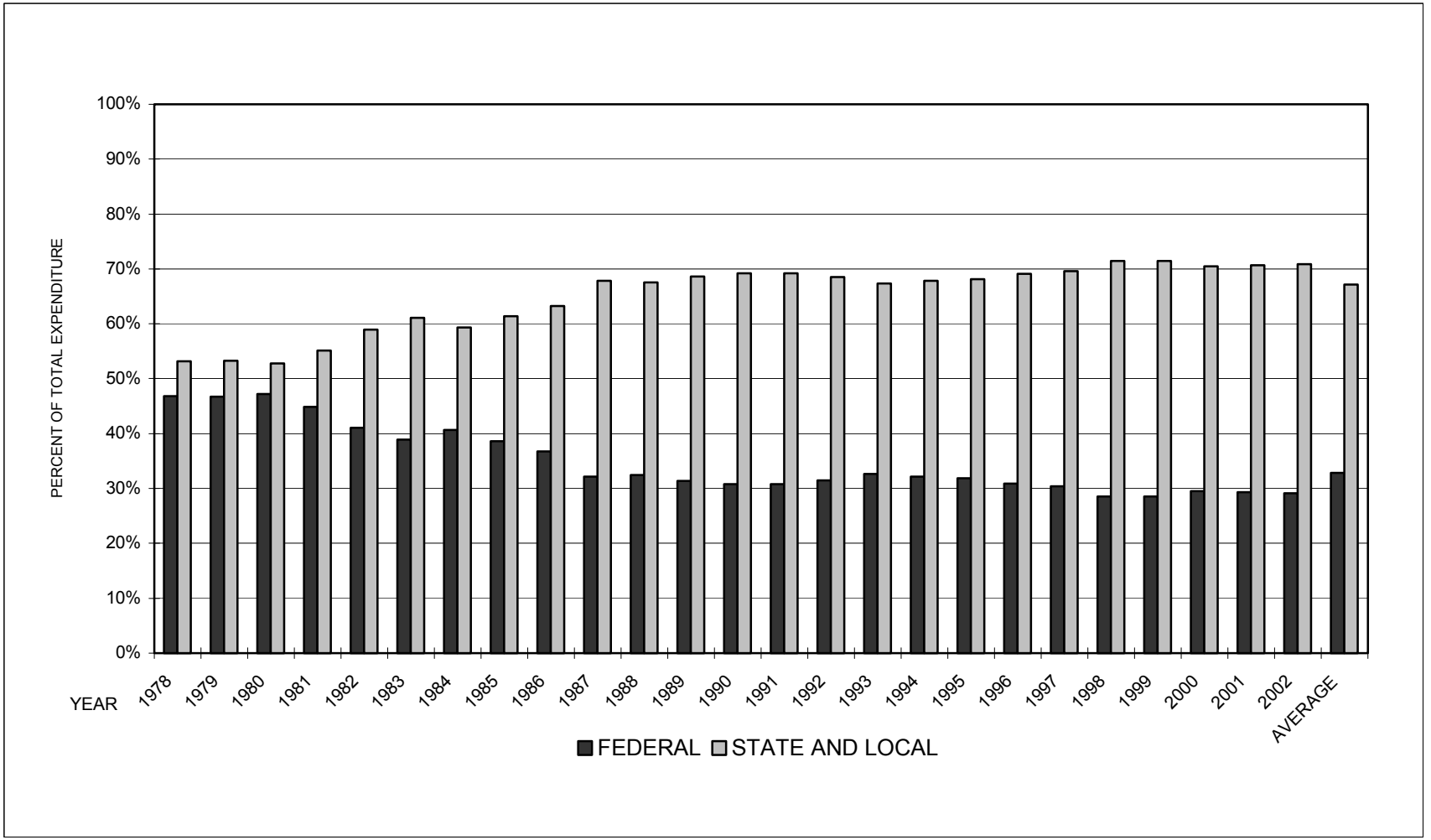


Figure 2. Total Federal, State and Local Government Transportation Expenditures for all Modes (Percent)



Distribution Of Federal, State And Local Transportation Expenditures By Transportation Mode

Figures 3 and 4 provide comparisons of total federal spending in constant 2002 dollars and percent of total for each year for highway, transit, air, water and rail modes of transportation, respectively. [22] Note that the highway mode over the 1978-99 period received between $3.4 and $21.9 billion, or 43.0 to 53.7% of total federal transportation spending in any given year. Highway expenditures averaged 49.9% of total federal transportation outlays over the 1978-99 period.

Transit federal expenditures ranged from $0.9 to $4.1 billion in constant 2002 dollars or received 9.4% to 17.1% of total spending over twenty-one year period with an average of 11.6%. The air mode of transportation received between $1.4 and $10.0 billion annually or 15% to 27.0% of total transportation expenditures in any given year and averaged 22.6%. The water mode received between $0.9 and $4.3 billion with a 10.1% to 14.4% range of total federal outlays and an 11.5% average. Finally, the rail mode received $0.8 billion in 1978 and that level declined to only $0.5 billion by 1988. Federal expenditure for rail mode seemed to increase again up to $1.0 billion by 1997, but annual percentage of total federal expenditure for rail continuously decreased from 10.2% to 1.2% over the twenty-one year period.

Figures 5 and 6 show graphic comparisons of annual federal, state and local governmental spending for each of the transportation modes in constant 2002 dollars. Federal, state and local government spending for the automobile highway modes has increased from $9.8 to $88.6 billion with an annual average increase of 11.1% per year compounded over the 1978-99 period. By comparison, transit increases have risen from $2.3 to $26.9 billion with an average annual compound rate of 12.4% over the period. Air transportation expenditures have risen from $1.7 to $20.2 billion with an annual compound rate of 12.5% over the period.

[22] All figures show the financial estimation of the projected periods 2000-2002.

Figure 3. Federal Government Transportation Expenditures by Modes (Amounts)

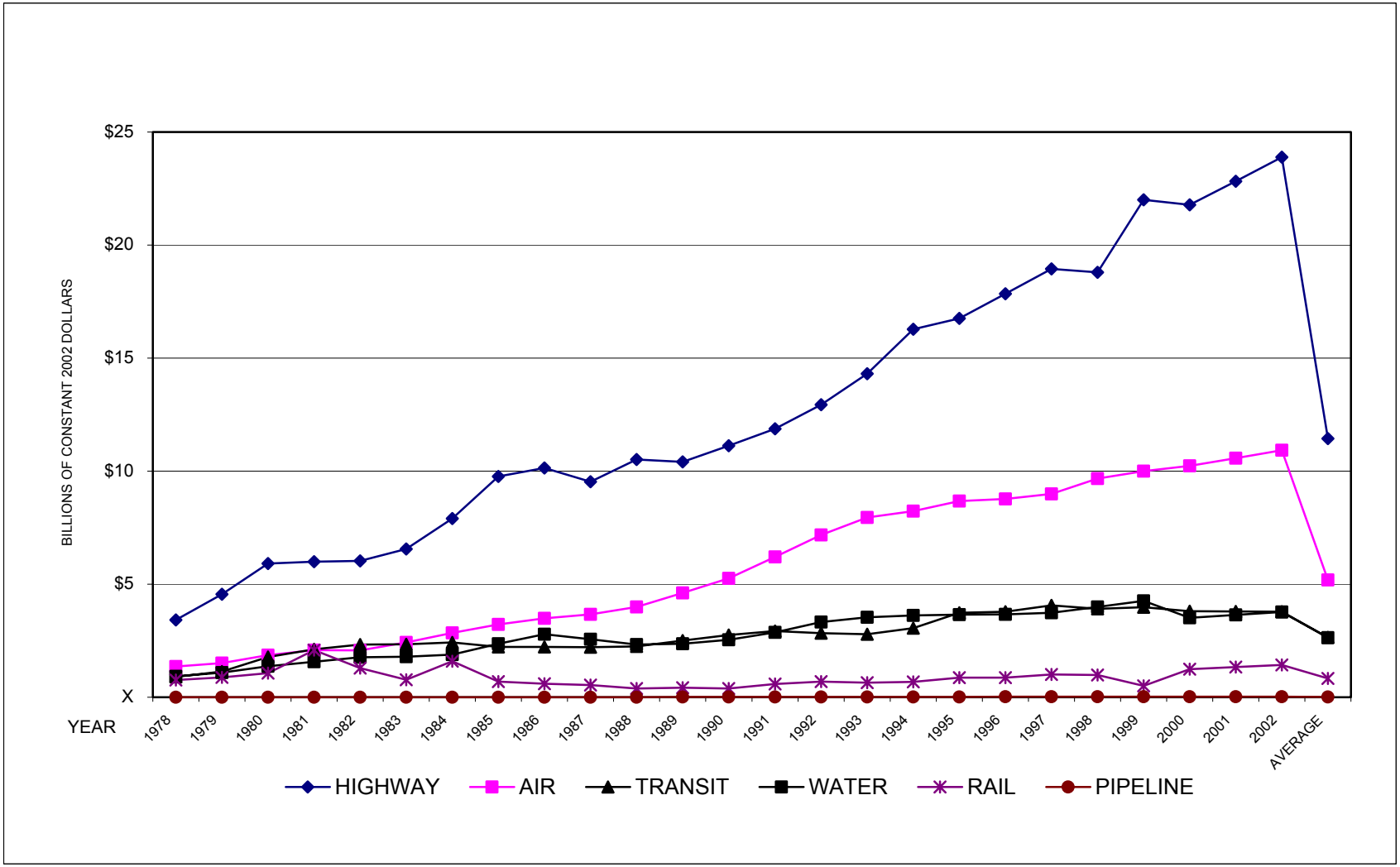


Figure 4. Federal Government Transportation Expenditures by Modes (Percent)

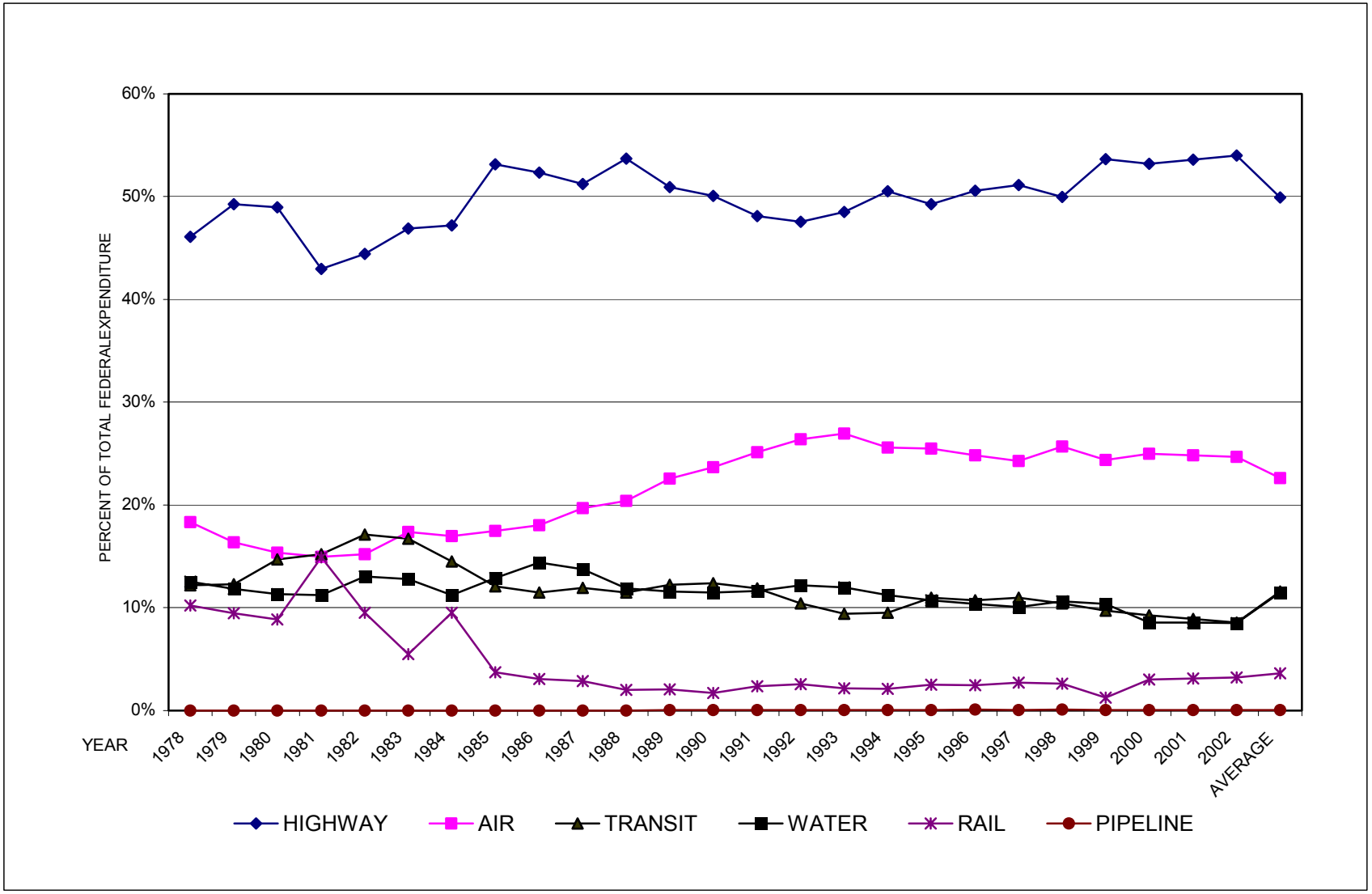


Figure 5. Total Federal, State and Local Government Transportation Expenditures by Modes (Amounts)

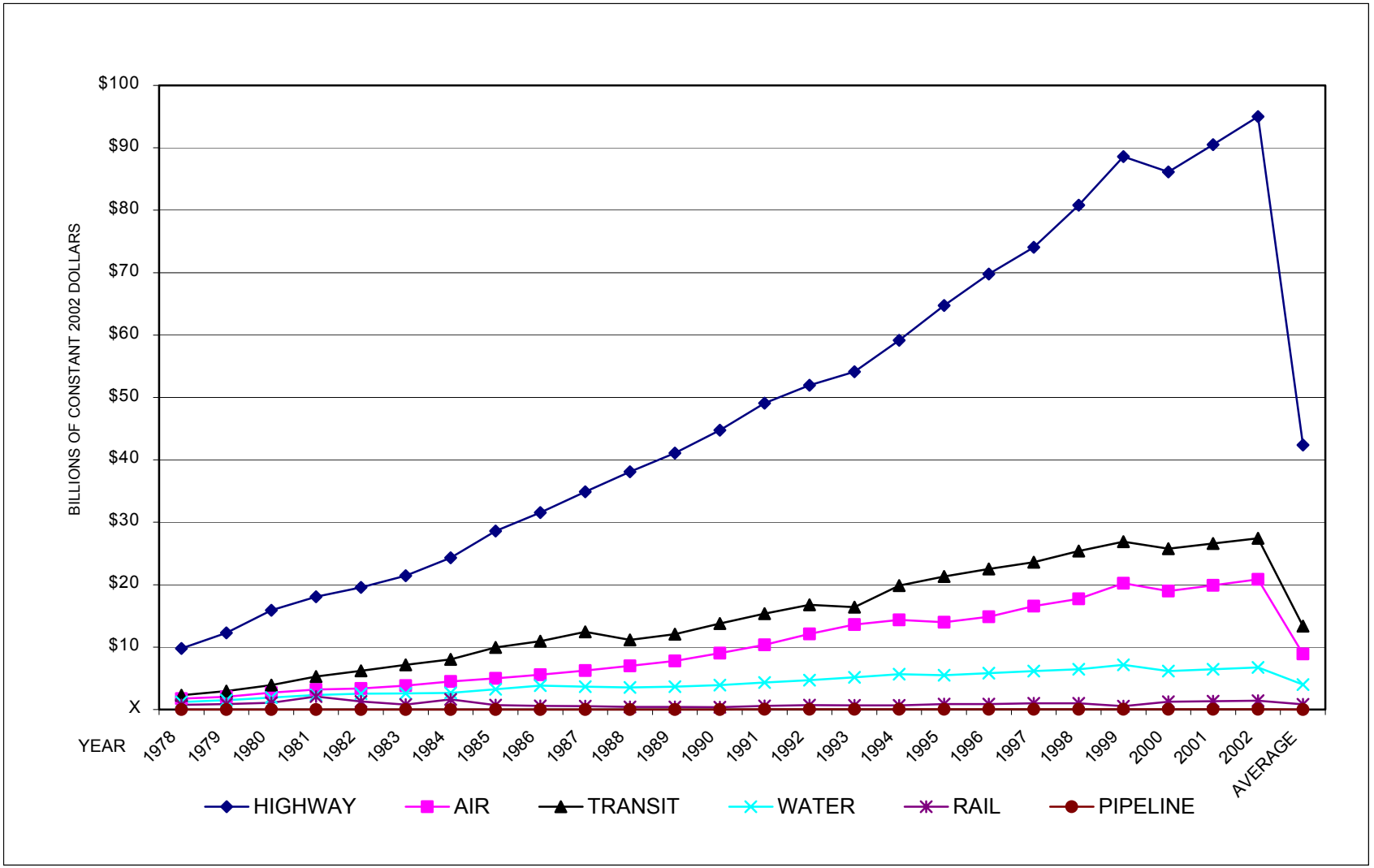
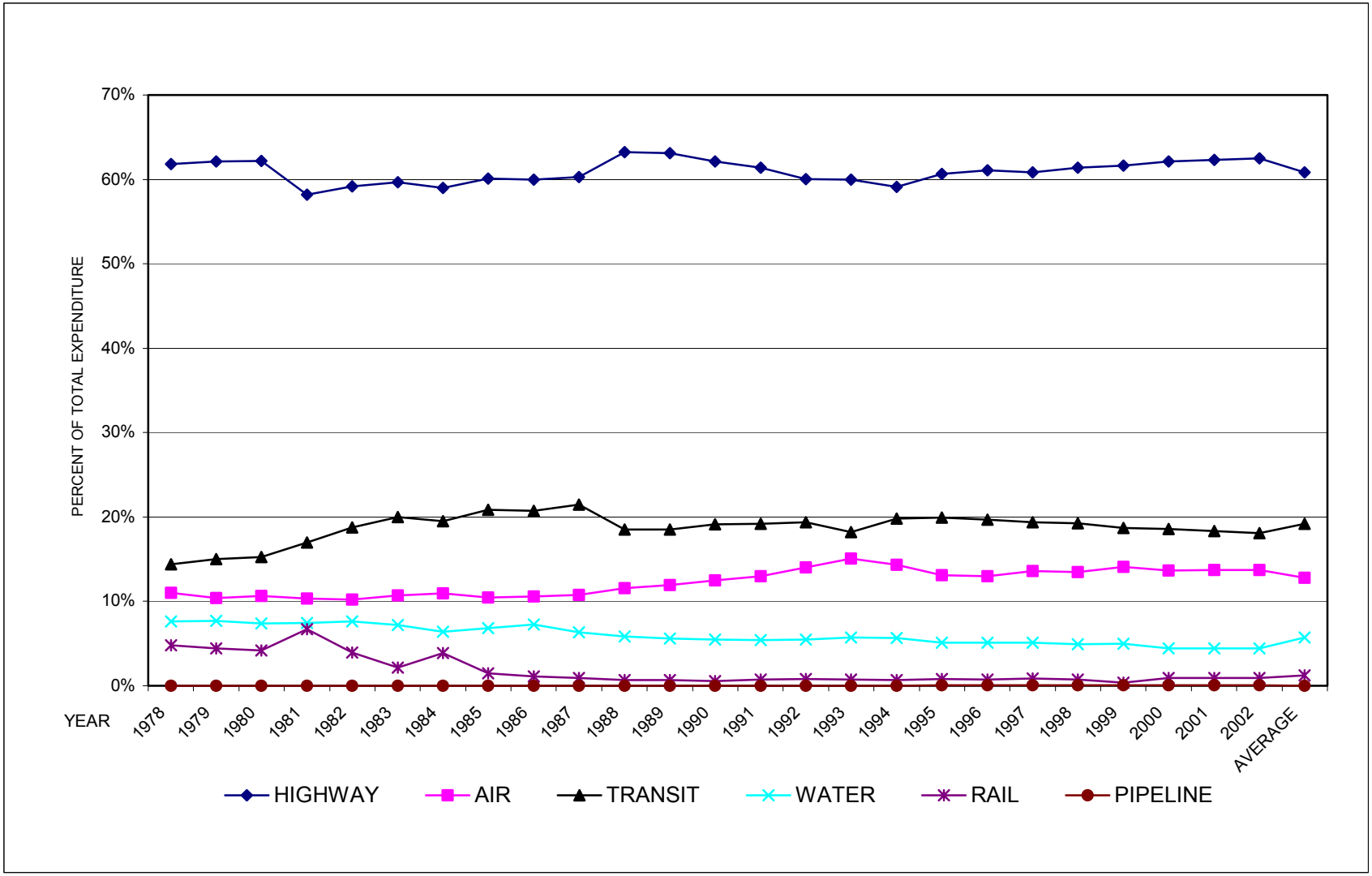


Figure 6. Total Federal, State and Local Government Transportation Expenditures by Modes (Percent)



Total expenditures for rail, by comparison, have declined from $0.8 to $0.5 billion by 1999, and seemed to increase up to $1.6 billion by 1984, but it has remained under 1.0% of total transportation expenditure since 1985. The amount of water mode expenditures have increased from $1.2 to $7.1 billion with an annual average increase of 8.8% over the period of review, but this percentage of total expenditure has slightly decreased from 7.6% to 5.7%.

Total transportation spending for the twenty one years under review is $1,532.9 billion in constant 2002 dollars. Of that amount $932.7 billion or 61.8% was expended for the automobile-highway mode, $294.3 billion or 19.2% for transit, $195.9 billion or 12.8% for air, $18.4 billion for 1.2% for rail mode, and $87.5 billion or 5.7% for water modes. Small incidental percentages also were expended for pipeline and other miscellaneous transportation related activities. For pipeline mode, $0.4 billion or 0.03% of total expenditure amount was expanded.

Transportation Subsidies By Mode

Federal, state and local governments provide substantial financial subsidies to all forms of transportation in the United States. Subsidy in the transportation finance context relates to the difference between direct public outlaw for transportation facilities and services and the amount of budget receipts or tax and user fees received directly for the particular mode under consideration. Figure 7 is a comparative graph of federal transportation mode subsidies in constant 2002 dollars over the 1978 to 1999 period for highway, water, transit, and rail and air modes. [23]

[23] Railroad activity generates revenues in the form of fuels and property taxes, but these are not treated as transportation-related revenues in this report. Fuel taxes collected from railroads are channeled into the general fund for deficit reduction and hence do not fall under the definition of transportation-related revenues. State and local governments collect property taxes from the rail mode, and some of these proceeds may be used to finance transportation activities. That portion of the state and local governments' property tax revenue, which is used for transportation, is not accounted for in this report because of lack of data. For a similar reason, transportation-related property taxes for other modes are also not covered. Amtrak, the passenger railroad service, generates revenues from passenger fares, but since Amtrak is not an entity of the federal government its revenues are not treated as transportation-related revenues.

Figure 7. Federal Transportation Subsidy by Modes (Amounts in 2002$)

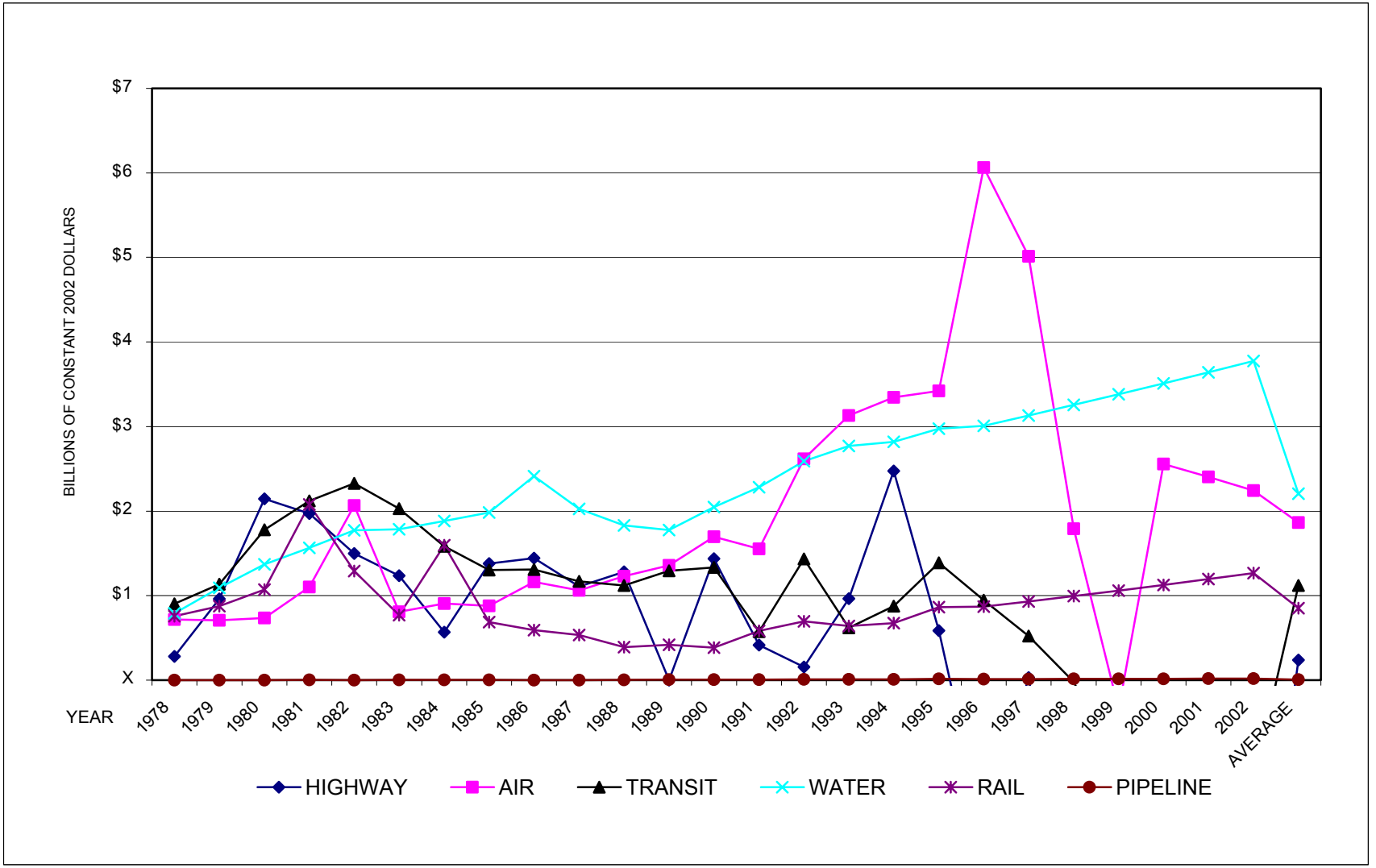


Figure 8 shows that federal transportation related subsidies (as a percent of total government subsidies) have dramatically declined for all transportation since 1982. By comparison, state and local transportation subsidies have the experienced steep increases for all modes since 1978. In constant 2002 dollars federal highway subsidies in 1980 were $2.1 billion, and continuously decreased through 1999 due to tax increases over the period. However, federal highway transportation subsidies have been eliminated and replaced with tax revenue surpluses at the federal level only.

Figure 9 shows that the largest single subsidy is for the transit mode.[24] Total subsidy for the transit mode from 1978 to 1999 is $182.4 billion in constant 2002 dollars. Of that amount $24.6 billion or 13.5% of total subsidy for transit is from federal and $157.7 billion or 86.5% of total subsidy for transit is from state and local government. Total subsidy for transit has increased on average annually by 11.5% to $14.7 billion in 1999. The twenty one years annual subsidy average for the transit mode is $8.3 billion.

The second largest subsidy is for the highway mode. Total subsidy for the highway mode over twenty one year period is $149.0 billion in constant 2002 dollars. Total subsidy for highway has increased on average annually by 13.2% from $0.5 billion in 1978 to $6.3 billion in 1995. The twenty one year annual subsidy average for the highway mode is $7.6 billion.

The water transportation mode has received annual subsidies ranging from $0.8 in 1978 to $4.1 billion by 1999. Average water mode subsidy over the period is $2.5 billion. The rail and air modes have each received almost identical total amount of subsidies over the 1978-1985 period. However over the period 1986 through 1995 the rail mode received far less than half of the subsidy received by the air mode from the federal state and local governments. These subsidies include funding for both passenger and freight goods movements for both the rail and air modes. A major component of the rail expenditure has been almost $3 billion in corridor upgrades in the Northeast, Corridor between Washington and New York. These upgrades facilitate both passenger and freight rail traffic.

[24] All figures show the financial estimation of the projected periods 2000-2002.

Figure 8. Total Federal, State and Local Government Transportation Subsidy by All Modes (Percent)

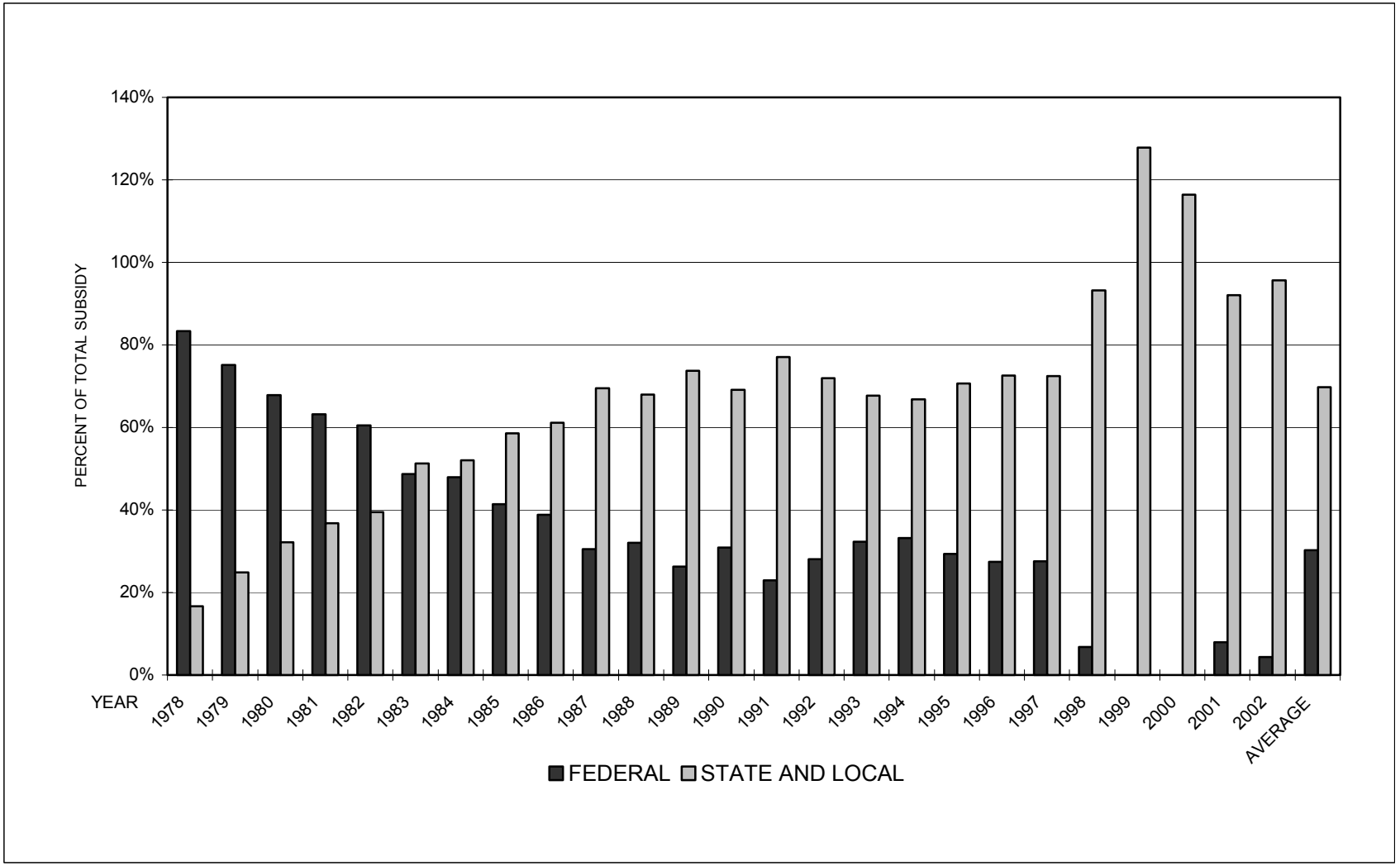
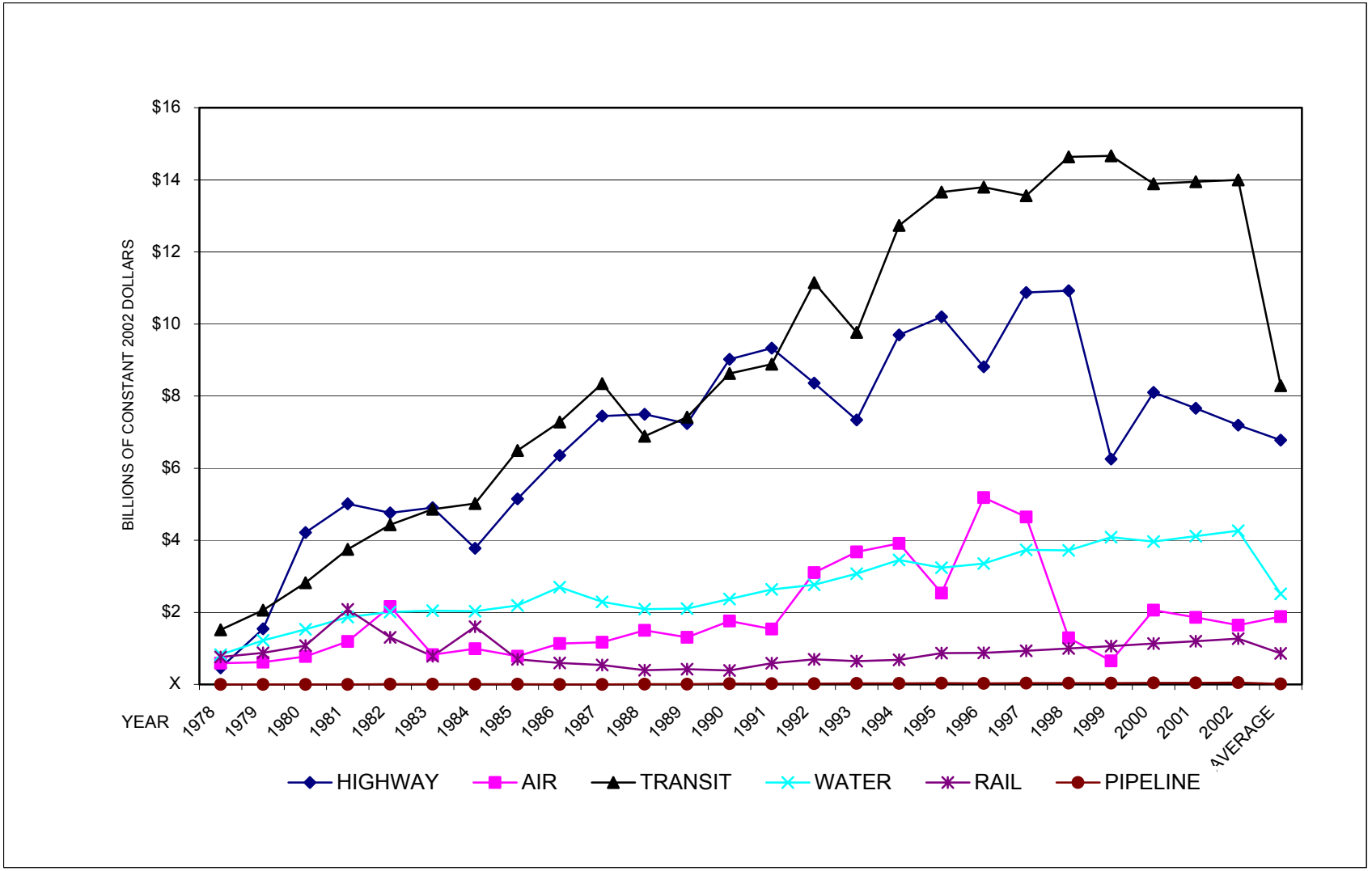


Figure 9. Total Federal, State and Local Government Transportation Subsidy by All Modes (Amounts)



Rail received approximately $0.8 billion in 1983 and has not significant changed to $0.9 billion in 1996, while the air mode has received almost $0.8 billion in 1985 and has increased to $4.6 billion in 1997 and declines thereafter.

Federal, State And Local Government Revenue To Expenditure Coverage Ratios

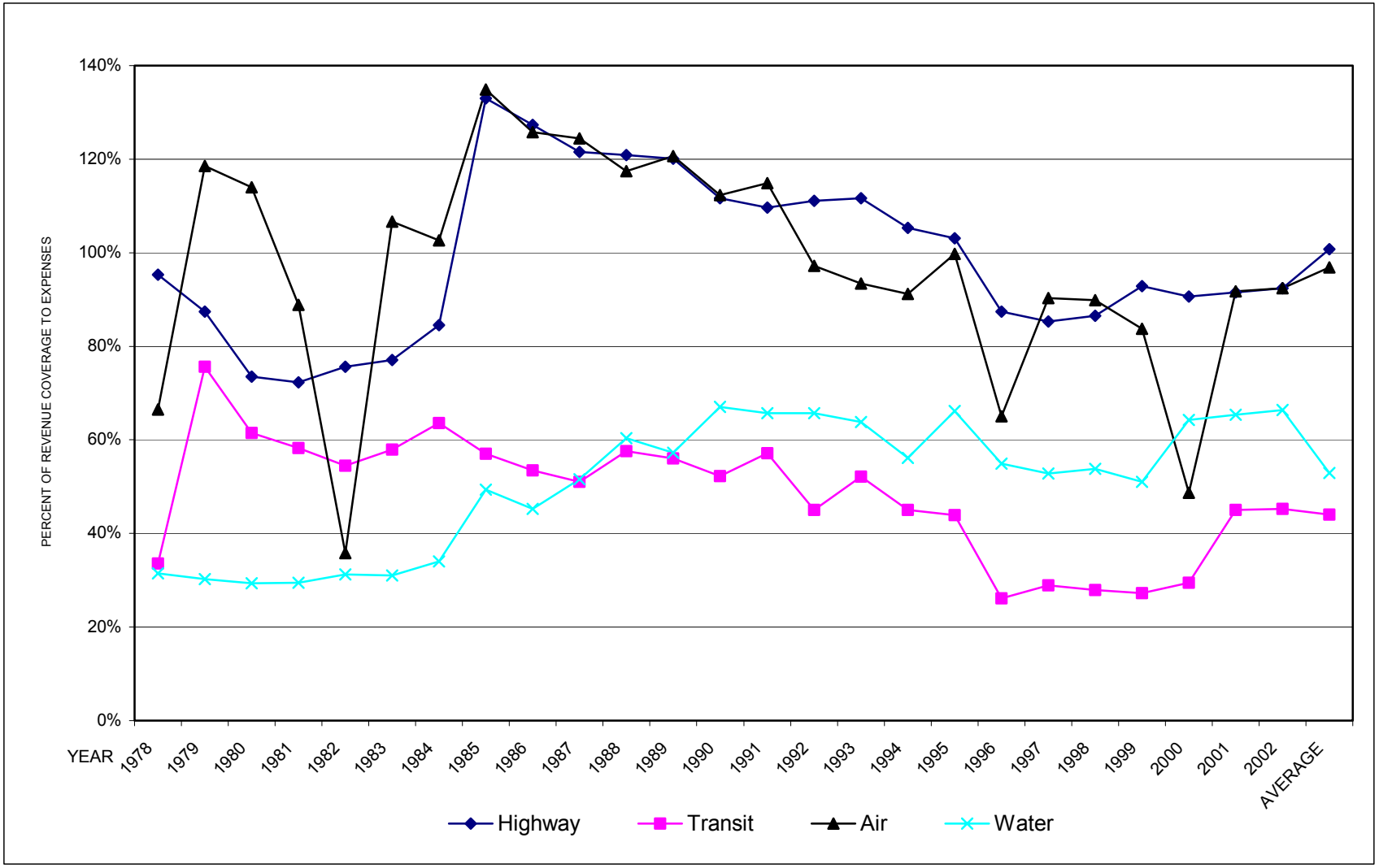
Nationally, the total federal, state and local government expenditures for all modes relative to user taxes and revenues have varied widely from 73.8% in 1978 to a high of 85.0% in 1985 with the 1995 level standing at 70.3%. Figure 10 provides a comparative graph of the ratio of user fees and taxes collected to total expenditures for federal, state and local governmental agencies in the U.S. over the 1978-99 period for all modes. [25] The rail mode is excluded from this analysis because no user fee or tax is collected for public distribution for rail as is the case for each of the other modes.

Earlier analysis indicated that the federal government collected a surplus on the highway mode in the latter part of the 1980s and the early part of the 1990s, and that no federal subsidy is required for operating the highway transportation system. Quite the contrary is the case when state and local government funds are aggregated for each mode. The highway mode is substantially subsidized when total funding is examined as are all the other modes.

The highway mode coverage ratios ranged from a low of 72.3% in 1981 requiring a subsidy of almost 30% in that year to a high of 133.0% in 1985. On average over the 1978-99 period the highway mode required a 7.6% subsidy (Figure 10). In other words, for every one hundred dollars spent in the United States over this period for highway land purchase, construction, or maintenance, 7.6% or $7.60 came from sources other than gas tax or other user based fees. These other subsidizing tax sources can flow from any other source of general tax revenue such as corporate and individual income tax, sales tax and so forth.

[25] All figures show the financial estimation of the projected periods 2000-2002.

Figure 10. Federal, State and Local Government Transportation Coverage Ratio to Expenditures for All Modes (Percent)



Considerably lower transit and water mode coverage ratios are evident by reviewing Figure 10. Transit coverage ratios vary from a low of 33.5% to a high of 63.6% with an average over the twenty one year period of 48.8%. Water transportation modes by comparison range from a low of 29.4% to a high of 67.0% and average 56.2% over the twenty one year evaluation period. These coverage ratios indicate for every one hundred dollars expended on water and transit modes, $43.8 to $51.2 of total costs come from external non-user based revenue sources.

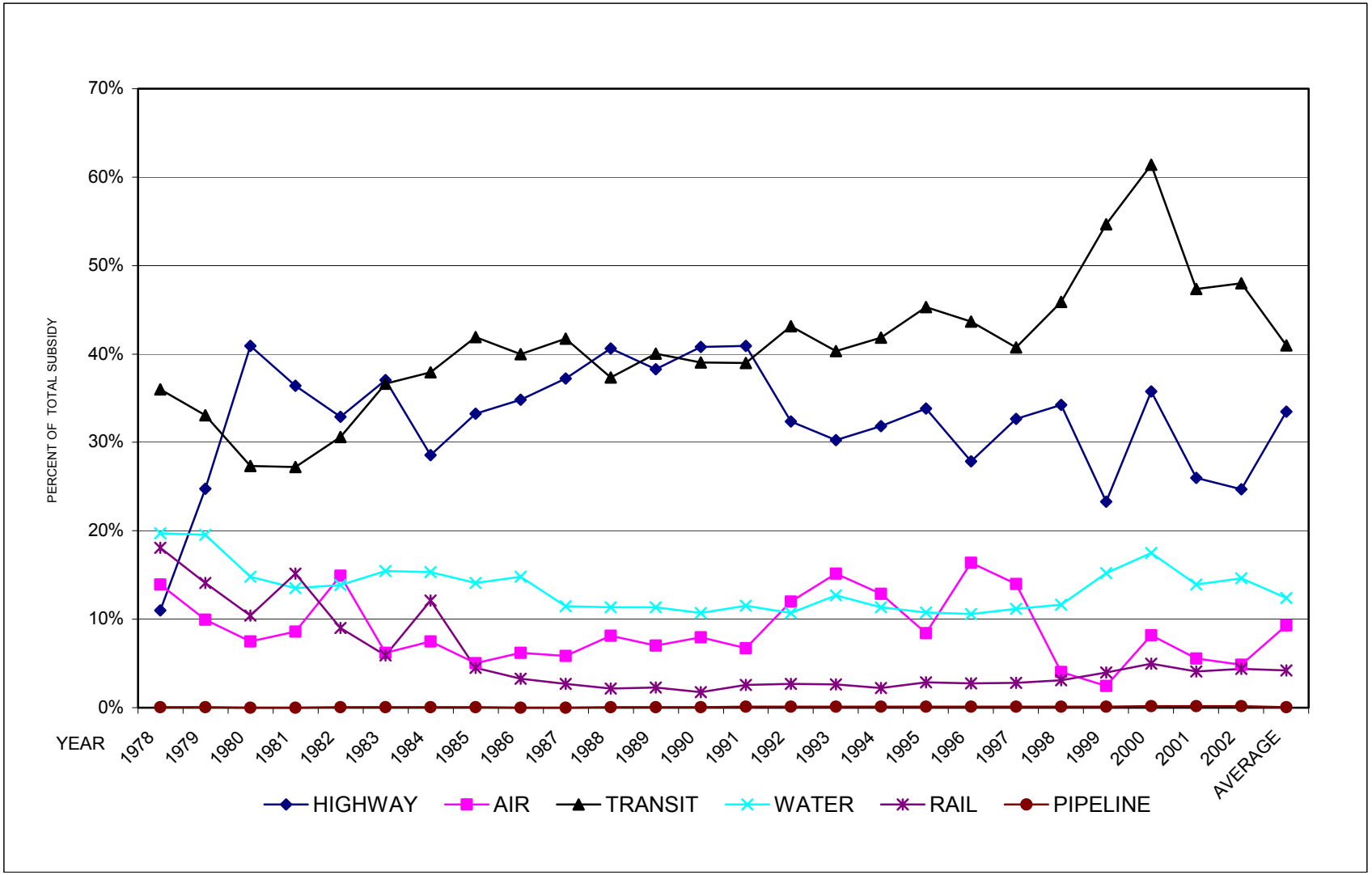
While the coverage ratio for transit mode is much lower than that of the highway mode, the amount actually paid in annual subsidies to the two modes from the public sector is very close. Figures 9 and 11 provide comparative graphs of federal, state and local government annual percent and total transportation subsidies (constant 2002 dollars) respectively for each of the five major transportation modes within the United States. [26]

Over the period 1978 through 1999 federal state and local governments subsidized highway construction and operation between $0.5 and $10.9 billion annually in constant 2002 dollars. On average annual federal, state and local highway subsidies exceeded $6.7 billion with total subsidies in excess of $149.0 billion. See Figures 9 through 11.

Comparably the transit mode received between $24.6 and $157.8 billion annually in federal, state and local governmental subsidies with an average of $8.3 billion and total subsidy levels of $182.4 billion. In other words the highway and transit modes received total subsidies that differed by 18% over the 1978-1999 time period.

[26] All figures show the financial estimation of the projected periods 2000-2002.

Figure 11. Total Federal, State and Local Government Transportation Subsidy by Modes (Percent)



By contrast, the air mode received an annual subsidy ranging from $0.6 to $4.6 billion annually with an average of $1.9 billion and a total of $41.3 billion over that period. The rail modes, both freight and passenger received an annual total subsidy ranging from a high of $2.1 to a low of $0.4 billion with an average of $0.9 billion and a total of $18.9 billion over the period. As mentioned earlier, a considerable part of this rail subsidy was for the extraordinary onetime rail corridor upgrade expense of the New York Northeast Corridor. Finally, the water mode received an annual subsidy ranging from a high of $4.1 billion down to a low of $0.8 billion with an average of $2.5 billion and a total of $55.3 billion over the 1978-1999 period.

In total all modes received a public subsidy of $445.4 billion with highway receiving 33.6%, transit receiving 41.1%, air receiving 9.3%, rail receiving 4.3%, and water receiving 12.5% of total public sector subsidies over the twenty one year period of review.

Findings

Clearly all modes receive considerable subsidies or, external sources of financing from tax or non-user based fees in each year under review. The magnitude of the subsidies varies widely between the modes for each year under review. Over the past fifty-seven years (the post World War II era) federal, state and local governments in the United States have focused primarily on development of world class highway and air transportation systems to the detriment of development of state-of-the-art rail modes.

One result of not developing and implementing these considerable technological advances in the rail mode in the United States was the loss of "modal competitiveness" and large scale defection of potential rail transportation users to the air, auto modes and truck and air transport for high end high value cargo. This also resulted in the lost opportunity for capturing significant user based rail fees or taxes within the United States.

By contrast, public and private sectors in Europe and Asia pursued a far more aggressive program of rail technological development and modal capital investments. These investments have resulted in greater equity between the modes, higher levels of modal competitiveness and associated patronage levels and freight movement across multiple markets. This ultimately results in greater balance of coverage ratios between auto, air and rail and far lower subsidies for all modes.

Conclusions

Each mode respectively contributes to economic growth, productivity, and movement of goods, service and people within the economy and thereby plays a vital and complimentary role in the national and world economy. Just as all complimentary communication systems within society serve as the nerve impulses to the economy, a country's diverse transportation system serves as that nation's muscle in the transmission of goods and services between consumer and producers. A balanced public investment in each of these vital communication/transportation economic linkages is indispensable to successful and efficient development of a modern economy. Failure to sustain that investment, or overly rely and invest in one mode creates constraints to balanced economic growth and retards efficiency. Such has been the over dependence and dominant investment in highways (and the consequent growth in auto and trucks) within the United States economy in the post WWII era to the detriment of a modernized rail system across this country.

Considerable growth in private sector commerce and profitability has resulted from large-scale public investments in all modes of transportation. The water transportation mode provides an excellent example of this linkage between economic development and transportation systems. For example, the 60% to 70% subsidy to water transport mode results in far more efficient transport of bulk commodities, finished goods and raw materials which in turn keeps the cost of production and manufacturing, and ultimately the delivery of consumer goods and services, quite low relative to what they would be without these public investments.

For example, the delivery of bulk crude oil and coal and other fossil fuels powering electrical generation stations through publicly maintained waterways fuel both the domestic and international economies and private and public sectors within the United States. Movement of billions of tons of agricultural, mining and other bulk commodities through our waterway systems assures our public and private sectors of timely, reliable and relatively low cost consumer and manufacturing goods. These goods and services movements then become the underpinning of our economy just as persons

and materials movements along our highway, air and rail way systems are instrumental for provision of other goods and services sectors of our economy.

Large scale sustained investments in all of these modes is a prerequisite to continued global super power economic status. Under investment or retarded and unbalanced infrastructure investments in the U.S. transportation modal system will lead to further stagnation, inefficiency and greater reliance on external sources of energy to drive our economy. This ultimately will result in further losses of U.S. national and international markets and accelerate erosion of international global competitiveness for the American economy. So these public sector "subsidies" are a condition precedent for existence of high quality economic growth and competitiveness everywhere in the world. So also is a balanced investment within each economy between these transportation systems. The timing is now ripe to "catch up" on balanced technologically advanced rail investments within the United States economy in the early decades of the twenty first century so that the US can be on even competitive footing with the other major global developed and emerging economies of Europe and Asia.