

III. INPUT/OUTPUT ANALYSIS AND REPORT

A. Introduction

The proposed Ohio Hub passenger rail project has the potential to generate significant economic benefits for Ohio, both in the short run and in the long run. This section of the report identifies the potential economic benefits for communities located within the four corridors, or spokes, of the Ohio Hub. This includes line segments from Cleveland to Toledo, Cleveland to Erie, Cleveland to Youngstown and the 3C corridor from Cleveland to Columbus, Columbus to Dayton and Dayton to Cincinnati. We will also identify the economic benefits across the major industries that make up the core industrial structure of the state's economy.

The economic benefits occur as a direct result of a net increase in final demand (expenditures) during the construction phase of the project. They will also occur on an on-going basis following the construction phase of the Ohio Hub because of the continuous need for expenditures to operate and maintain (O&M) the system over time. The incremental increase in construction and O&M expenditures inject spending (final demand) into the economy and create a multiplier process that adds to a secondary increase in industrial output, income, and employment. Short run construction expenditure impacts end when the construction phase ends but O&M expenditure impacts continue on a reoccurring basis over the useful life of the system.

The construction and O&M expenditure impacts are classified as *short term economic benefits* in this study because our methodology assumes a static framework when calculating before and after results. Specifically, our economic impact study presents a "before/after" snapshot of the economy with and without the project under investigation, in this case the Ohio Hub. The methodology provides a means to calculate the net impact of the project on output, household earnings and employment, which, in turn, provides a measure of the net economic output, income and employment benefits citizens of Ohio can expect from the construction and operation of the project. As will be discussed, this study uses a regional input-output model to calculate the before-after effects of the Ohio Hub on Ohio's economy. An assumption of the analysis is that Ohio's economy has sufficient capacity to absorb the increase in output employment and income without displacing other industries and jobs.

Also, *long term economic benefits* will occur to the extent that the Ohio Hub system improves the overall connectivity and efficiency of Ohio's transportation system. An improvement in the efficiency of moving people, goods and labor among markets and communities has the potential to improve the investment and business climate of the state which, in turn, can lead to a higher rate of economic growth. The extent to which this occurs will depend upon the degree to which the proposed high speed passenger rail system is integrated into Ohio's overall air, highway and commercial rail transportation system, thus enhancing the efficiency of moving goods, people and information (through improved face to face communications) from place to place.

It will also depend on how well the Ohio Hub connects to population centers and interrelated business activities within Ohio.

These efficiency gains could attract new businesses to Ohio and provide opportunities for existing businesses to increase their sales both inside and outside of Ohio. Other long term benefits could include an increase in tourism, less highway congestion (and hence lower future highway capital expenditures) and less environmental pollution.

The assessment of the long-term economic benefits resulting from an improved multimodal transportation infrastructure for Ohio are referred to as dynamic, or long term, benefits.

1. Purpose of Report

This report was prepared for the Ohio Rail Development Commission by Gem Public Sector Services to help identify and measure the economic impacts that can reasonably be expected to occur from the construction and operation of the Ohio Hub¹. An important focus of this report is on how the short-run economic benefits will be allocated among the communities directly served by the Ohio Hub, as well as which industries in Ohio will be most affected. The community impacts are calculated in terms of the net increase in industrial output, personal income gains to households and the increase in industry employment associated with a rise in final demand. These are the primary “bread and butter” issues people are most concerned about when it comes to assessing the short-run economic benefits of industrial development at the state and community levels.

2. Objective of Report

This report presents an assessment of the gross and net economic impacts of Ohio Hub construction and operations expenditures on Ohio’s industrial output, household earnings and employment. The economic impact estimates are provided for the Akron, Cleveland, Cincinnati, Columbus, Dayton, Mansfield, Toledo and Youngstown MSA regions as well as for rural counties along the Ohio Hub and for the state of Ohio. The economic impacts are also provided for Ohio’s core industries.

In a previous study, TEMS, Inc., a transportation consulting firm, prepared an economic feasibility study of a number of engineering designs of the Ohio Hub system. In their study, a benefit-cost methodology was utilized to evaluate the cost and revenue implications of the Ohio Hub system [1] for each of the alternative engineering designs. According to TEMS, Option 1 presented the best benefit/cost and operating ratios among the alternative designs. Option 1 design was configured to provide 110 MPH passenger rail service along various segments of the four corridors of the Ohio Hub system.

¹ This is the second of a series of four reports on the Ohio Hub prepared by the Gem Public Services Group for the ORDC. The first report presented a critique of the methodology used by TEMS, a transportation consulting firm, to conduct an economic feasibility study of the Ohio Hub. The third report discusses the long term, or dynamic, benefits of the Ohio Hub. The fourth report presents a benchmark study of comparable types of high-speed passenger rail projects in the United States.

Their study concluded that this is the design that would be most competitive with air and passenger car service to and from the major cities along the Ohio Hub.

Benefits to the users were measured in terms of ticket revenue, time savings, utility to users and improvements in the efficiency of the transportation system, measured as a reduction in generalized cost of travel. The discounted benefits were compared to the discounted costs of constructing and maintaining Option 1 of the Ohio Hub. Based upon obtaining a benefit-cost ratio of 1.24 for the 110 MPH high-speed passenger rail service, which exceeds the standard set by the Federal Transportation Administration for similar high speed passenger rail projects, TEMS concludes that Option 1 of the proposed Ohio Hub system would be a viable economic project for Ohio to undertake.

This study, in contrast, utilizes an input-output model to analyze the gross and net economic benefits of the project in terms of gains in industry output, household earnings and employment for Ohio. The analysis of this report is based upon the assumptions that are included in Option 1 design. It assumes that construction of the 110 MPH high-speed passenger rail service, as described in Option I, will begin in 2008, or shortly thereafter, and be completed in 2017. When the system is fully operational by 2025, it is projected to serve 3.5 million passengers per year.

The difference between gross and net economic benefits will depend upon how the Ohio Hub is financed. If the Ohio Hub system is financed entirely with Federal dollars, or by investors outside the state of Ohio, gross and net economic benefits will be identical. On the other hand, to the extent that the Ohio Hub is financed by Ohio's taxpayers and investors, funds will be diverted from other uses within the state so the gross benefits will be offset by the lost benefits of alternative uses of the funds that would have occurred in the absence of the Ohio Hub project. Net benefits in this case could be significantly less than gross benefits.

In the Ohio Hub I/O impact study, we first proceed by assuming that the project is funded entirely by sources external to Ohio. This enables us to calculate the economic benefits of the project in their best light. Next, we consider an alternative financing structure based upon an 80%/20% funding formula. This formula presumes 80% federal government financing and 20% state and local financing. Under this formula, 20% of the total system cost of approximately \$3.5 billion will be borne directly by Ohio taxpayers and citizens. Expenditures financed from local tax and revenue sources would not increase net final demand since the funds would most likely have been spent in Ohio on other items and projects if the Ohio Hub is not built. In this case, only the remaining 80% of system costs would result in additional new demand being added to Ohio's economy and net direct expenditure benefits will only be 80% of gross expenditure benefits.

However, a third possibility is that Ohio may be able to receive credits from its existing rail grade separation program and thereby avoid the need to raise local funds to meet a 20% Federal matching requirement.

If this occurs, all of the infrastructure expenditures will add new final demand to the state's economy and create the maximum multiplier effect on industry output, earnings and employment.

The TEMS, Inc. and Gem Public Services Group studies provide alternative approaches to evaluating the economic feasibility and net economic benefits of the Ohio Hub project. The TEMS study uses benefit-cost analysis to suggest that the Ohio Hub project, if implemented, will enhance the economic welfare of Ohio's users and citizens. The Gem Public Services Group study uses an established input-output methodology to present the economic welfare benefits to Ohio in terms to an increase in industrial output, household income and employment. The two studies provide alternative perspectives in calculating the economic welfare benefits and serve as a cross check on the validity, or reasonableness, of the projections of economic benefits of the other. The advantage of the Gem Public Sector Services approach is that it measures the welfare benefits in terms of aggregate output, household earnings and employment impacts. It also allows for the disaggregation of the economic benefits among the regions and industrial sectors of Ohio's economy.

3. Report Outline

Following the introduction in Section A, Section B presents a description of the proposed Ohio Hub project. Section C discusses the economic impact methodology used in the analysis. The focus of the study is on the short run economic benefits associated with the construction and operational phases of the Ohio Hub. Of the four corridors that comprise the Ohio Hub, the 3C corridor connecting Cleveland, Columbus and Cincinnati is the backbone of the Ohio Hub. The other spokes in the hub are the Cleveland-Toledo, Cleveland-Erie and Cleveland-Youngstown corridors. An assumption of the analysis is that construction of the Ohio Hub infrastructure will begin in 2008 and end by 2017, suggesting a 9-year construction period. Another assumption is that the Ohio Hub system, once constructed, will become full operational by 2025 with an annual ridership of approximately 3.5 million passengers per year. These are the assumptions included in Option I of the TEMS report cited previously.

Section D discusses the short run economic impacts associated with the construction phase of the Ohio Hub system. The construction impacts are calculated for the state of Ohio and for the selected communities and regions along the various corridors of the Ohio Hub. Section E discusses the impact of the Ohio Hub on Ohio's key industries and its economic structure. Because industries are interrelated through purchases and sales of inputs and final demand, the construction and O&M expenditures will have ripple effects throughout Ohio's many industries. These inter-industry effects are captured, at least partially, by the use of I/O multipliers in the study.

Next, Section F presents an analysis of the short run economic impact of O&M expenditures to operate and maintain the Ohio Hub.

The impact analysis is based upon TEMS estimate of operating and maintenance expenditures, including a need for additional capital expenditures, for the year 2025 when the Ohio Hub is expected to be fully operational. The O&M expenditures will inject additional dollars into the state's economy and its communities over the life cycle of the system. These expenditures, in turn, will add additional industrial output, household earnings and employment to the state's economy. With good maintenance and upkeep the Ohio Hub system will have the potential to serve Ohio for many decades into the future.

Section G presents a brief discussion of the potential dynamic, or long term, economic benefits of the Ohio Hub. The dynamic impacts are considered to be speculative but they are presented to provide the reader with a plausible scenario of how the Ohio Hub might alter the state's industrial structure and, therefore, its future competitiveness and potential for higher long term economic growth. A case study analysis of the expected dynamic impacts will be discussed in detail in another section of this report.

Finally, a summary of the findings and a discussion of the implications of the proposed Ohio Hub for Ohio's economy and the future are discussed in Section H to conclude this section of the report.

B. Description of the Ohio Hub

As discussed, the Ohio Hub is designed to bring a fully operational high speed passenger rail service to Ohio. A fully operational system will consist of 504.4 in state miles of rail service along four major corridors: the 3C (Cleveland-Columbus-Cincinnati), Cleveland-Toledo-Detroit, Cleveland-Youngstown-Pittsburgh and Cleveland-Erie-Buffalo corridors. In Ohio, the four corridors link the cities of Akron, Cleveland, Cincinnati, Columbus, Dayton, Mansfield, Middletown/Hamilton, Toledo and Youngstown. The rolling stock will consist of between 24 and 28 trains each with a seating capacity of 194 to 300 people per train. The trains will traverse the state about 8 times per day and haul an estimated 3.5 million passengers per year. As stated, a previous study by TEMS found that when fully operational the Ohio Hub will generate revenue in excess of operating costs negating any long term need for public sector operating subsidies.

The total estimated capital cost of building the Ohio Hub is approximately \$3,772 million in 2005 dollars. Under the first impact scenario, it is assumed that 100% of the capital expenditures will be financed by the Federal government and outside investors. Under the second impact scenario, which is typical of regional rail transportation projects of this nature, the assumption is that only 80% of the expenditures will be financed by the Federal government and Ohio, Indiana, Michigan, New York and Pennsylvania will be responsible for the remaining 20% of the total cost. Ohio would be responsible for about 73% of the matching requirement and the other states in the Ohio Hub system would be responsible for the remaining portion of the total cost.

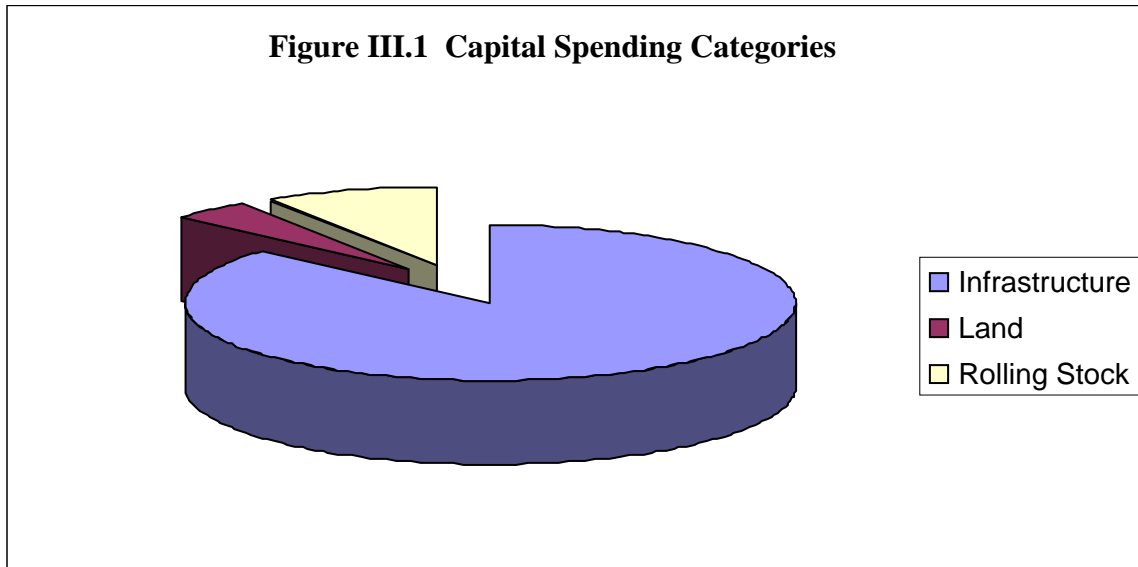
Even if a 20% match is required, once an environmental impact study is completed, Ohio may be in a position to use its grade separation program to meet the matching requirement, thus avoiding any need to divert current tax revenue to support the Ohio Hub project. Currently, the Ohio Rail Development Commission's (ORDC) goal is to bank sufficient credits toward the 20% state-funding requirement so that the entire project can be funded without a need to raise taxes or cut other state and local expenditures.

Nevertheless, to be conservative a required 80%/20% matching share is assumed as the alternative scenario for the project. To provide a comparison, impact calculations are also provided for a 50% matching requirement.

Table III.1 divides the total capital construction cost of the Ohio Hub into three major categories of expenditures: infrastructure, land acquisition and rolling stock. The budget categories are depicted in Figure III.1. Infrastructure refers to the cost of materials, design and construction of the Ohio Hub. This includes rails, switches, earth moving, bridges (over and under) and other items directly involved in the construction of the system. Land acquisition costs and the cost of procuring the rolling stock are the other aggregate expenditure categories, representing about 4% and 9% of total capital costs, respectively.

Infrastructure spending for the Ohio Hub accounts for 87%, or \$3,265.7 million, of the total capital cost of the project, of \$3,772.9 million. Land acquisition costs account for \$157.6 million of the expenditures, or about 4%, of the total capital budget. Rolling stock, which includes the purchase of 28 trains capable of providing high-speed passenger rail service, accounts for about 9%, or \$49.6 million, of the total capital budget. Each of these spending categories has a unique impact on the Ohio economy so they are presented separately. An assumption of the analysis is that land acquisition expenditures primarily transfer income to landowners and as such do not directly impact the local economy. Similarly, to be conservative expenditures for rolling stock are treated as a leakage from the local economy since vendors are located in other regions, states or countries. As such, the purchase of rolling stock will have little, if any, direct impact on the output of industries in Ohio.

Type of Capital Spending	Expenditure (millions)	Percent of Total
Infrastructure	\$3,265,703	87%
Land	\$157,618	4%
Rolling Stock	\$349,563	9%
TOTAL	\$3,772,884	100%

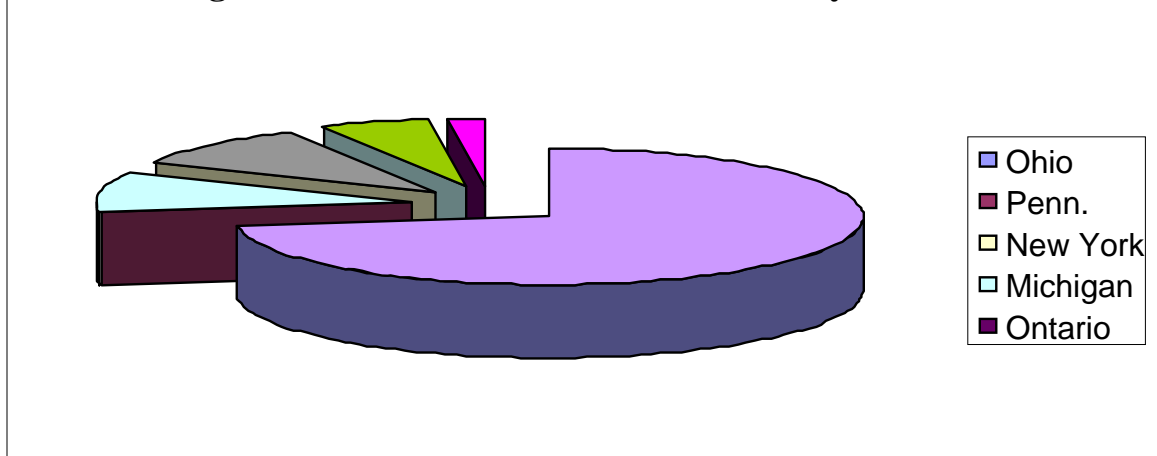
Figure III.1 Capital Spending Categories

The Ohio Hub infrastructure project extends beyond Ohio's borders into Pennsylvania, New York, Michigan and Indiana. Expenditures to connect the Ohio Hub to neighboring states and high-speed rail networks outside of Ohio, while vital to the success of the Ohio Hub, will not likely directly benefit the Ohio economy. To include them in the Ohio Economic Impact Study runs the risk of overstating the true short run economic benefits of the project to Ohio's citizens. To solve this problem, the capital expenditure shares are calculated for each of the states that are a part of the Ohio Hub. The shares by states were determined by TEMS for this project.

The portion of the total infrastructure cost of the Ohio Hub that will be shared with other states is presented in Table III.2 and depicted in Figure III.2. As indicated, about 73%, or \$2,380.3 million, of the total capital cost of building the Ohio Hub will occur within the borders of the state of Ohio. The remaining 27% of capital expenditures is allocated to the surrounding states of Pennsylvania, New York, Michigan, Indiana and Ontario.

Table III.2 Ohio Hub Infrastructure Cost Shares by State

State	Infrastructure Cost Millions (2005 Dollars)	% Share
Ohio	\$2,380.271	73%
Pennsylvania	\$315.736	10%
New York	\$327.369	10%
Michigan	\$178.772	5%
Ontario	\$63.555	2%
Total	\$3,265.703	100%

Figure III.2 Infrastructure Cost Shares by State

C. Economic Impact Methodology

An input output model (I/O model) based upon the RIMS II methodology is used in this study to calculate the economic impact of the Ohio Hub on Ohio's economy and its communities and industries. RIMS II is a regional input-output modeling system, developed by the U.S. Department of Commerce, Bureau of Economic Analysis, that employs a national industry-by-industry transactions table that shows the inputs that one industry requires from all other industries in the economy in order to produce one dollar of output. First, the national production function, as represented by the input-output model, is used to provide an initial estimate of input requirements of various industries. Next, location quotients are used to "localize" the national I/O model to reflect the region's mix of industries for the state of Ohio and regional communities within Ohio. The location quotients are used as a measure of the extent to which regional supply of an industry's output is sufficient to address regional needs. If the location quotient for a supplying region is greater than or equal to one, it is assumed that all requirements are provided locally (U.S. Department of Commerce, Bureau of Economic Analysis, Regional Multipliers: a User Handbook for Regional Input-Output Modeling System (RIMSII)).

The I/O model is based on the notion that purchases of goods and services provided by local industries have a total economic impact on the region in excess of the initial expenditures or final demand changes. In theory, new dollars are injected into the local economy, from whatever source, will circulate and re-circulate causing total expenditure and income flows among consumers, businesses and industries to rise.

For example, an increase in rail construction activity will raise final demand for rolling stock, rails, electrical switches and devices, bridges and tunnels, earth moving services and other intermediate inputs that go into the construction of a modern high speed rail system. The opposite will occur for industries experiencing a decline in final demand.

In summary, the direct and indirect (multiplier) impact of final demand changes on aggregate regional output, employment and household earnings are captured by the RIMS II multipliers for each sector of the local economy, individually and collectively.

1. RIMS II Multipliers

Table III.3 presents the RIMS II final demand multipliers for the construction sector for the state of Ohio, Akron, Cleveland, Columbus, Cincinnati, Dayton, Mansfield, Middletown, Toledo and Youngstown. The RIMS II multipliers suggest that construction of the Ohio Hub will directly impact the construction industry and create a series of “ripple effects” throughout the Ohio economy. As a result, output and jobs will expand across a wide range of industries as construction of the Ohio Hub proceeds. Notably, the effects are likely to be more significant in the larger urban areas, reflecting the broader and more diverse character of these economies.

Table III.3 RIMS II Construction Sector Multipliers for Ohio and Major Communities			
	RIMS II Final Demand Multipliers		
Regions of Influence	Output	Earnings	Employment
State of Ohio	2.5178	0.7756	22.91321
Ohio Hub Communities			
Cleveland MSA	2.1709	0.6345	18.6273
Columbus MSA	2.2917	0.6988	20.8539
Cincinnati MSA	2.3045	0.7292	22.1864
Dayton MSA	1.9595	0.5739	17.0663
Toledo MSA	1.9627	0.5678	16.9341
Youngstown MSA	1.8114	0.545	15.7435
Akron MSA	1.8838	0.4828	14.433
Mansfield MSA	1.6066	0.4389	13.1374
Other Ohio Hub Counties	1.4111	0.4151	12.1111

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Also, as factor income from wages, interest, profit and rental income increases, the final demand for consumption sector goods and services will rise. These “induced” demand effects will further increase output, household earnings and employment to the Ohio economy. Specifically, the multipliers in Table III.3 show how output, earnings and employment will be directly and indirectly impacted by each additional \$1 million in expenditures for the construction and operations of the Ohio Hub.

As an example, a \$1 million increase in construction spending in the Cleveland MSA will increase aggregate output in that region by approximately \$2.2 million and household income will rise by about \$634.5 million. Also, about 19 new jobs in the Cleveland region (defined as an increase in industry employment) will be supported by the additional construction expenditures.

Before the RIMS II methodology can be applied several adjustments to the data are necessary. The fact that the construction of Ohio's portion of the Ohio Hub will consume 73%, or \$2,380.3 million, of the total infrastructure construction budget for the Ohio Hub does not necessarily mean that Ohio will experience a direct economic benefit of this magnitude. The infrastructure costs depicted in Table III.2 and Figure III.2 are best thought of as gross economic benefits. Any financial liability the project may impose on Ohio's taxpayers and citizens must also be considered to determine the net economic benefits of the project.

The Ohio Rail Development Commission anticipates that the project will be funded by an 80%/20% Federal-state match. Moreover, they anticipate that upon the completion of a mandatory Environmental Impact Study, the 20% state match can be met by credits received from the grade separation program already underway and funds from other related transportation projects undertaken prior to launching the Ohio Hub. If this is the case, the capital construction costs of the Ohio Hub will be financed entirely from outside sources, for example the Federal government, and Ohio's economy would experience a one-time increase in direct construction benefits of approximately \$2,380 million. The aggregate expenditure benefits, which accumulate over the entire construction phase of the project, will result in secondary increases in household sector income and total employment. This study assumes that Ohio Hub construction will begin in 2008, or shortly thereafter, and end sometime in 2017. When completed the net benefits from new construction expenditures will disappear.

2. Capital Cost Allocation by Corridors

The rail mileage and capital cost allocations are presented in Table III.4 for the four Ohio Hub corridors and their component line segments. This provides an indication of how infrastructure expenditures will be distributed among regions and communities along the Ohio Hub corridors during the construction phase of the project. An assumption of our analysis is that capital construction expenditures will enter into the Ohio economy along each segment of the Ohio Hub in proportion to the capital cost of construction of each of the line segments. About \$25.6 million in capital expenditures, expressed in 2005 dollars) for the maintenance base facility to be located in the Cleveland area was added to infrastructure expenditures for the Cleveland MSA. An additional \$1.621 million in spending for maintenance base facilities was allocated to other counties along the Ohio Hub.

The Cleveland-Columbus-Cincinnati (3C) corridor is the largest and most significant spoke in the Ohio Hub system. The corridor will consist of 251 miles of high speed rail lines and pass through Ohio's three largest cities, Cincinnati, Columbus and Cleveland. The 3C corridor will consume a little over 50% of total capital outlays for the Ohio Hub system, or about \$1,199 million in capital outlays. The Cleveland-Berea-Toledo and the Cleveland-Youngstown-Pittsburgh corridors will absorb roughly \$491.569 million and \$435,763 million in capital outlays, respectively. The Cleveland-Toledo-Toronto corridor has only 61.6 miles of high speed rail lines located in Ohio, at a capital cost of about \$253.8 million.

Ohio Hub Corridors and Segments		(000's)		
		Miles	Capital Cost ¹	Cost/Mile
1	Cleveland-Erie Corridor	-	-	-
	Total	61.6	\$253,784	\$4,123
2	Cleveland-Berea-Toledo Corridor		-	-
	Cleveland-Berea ²	6.2	\$67,186	\$10,924
	Berea-Toledo	95.8	\$365,861	\$3,819
	Toledo-Alexis	7.3	\$32,776	\$4,490
	MSBE Base- Cleveland		\$25,746	-
	Total	109.3	491,569	-
3	Cleveland-Youngstown-Pittsburgh			
	Cleveland-Ravenna	35.1	\$232,584	\$6,627
	Ravenna-Warren	23	\$88,395	\$3,843
	Warren-Youngstown	18.4	\$78,597	\$4,271
	Youngstown-New Castle ³	7	\$36,187	\$5,194
	Total	83.7	435,763	-
4	Cleveland-Columbus-Cincinnati			-
	Cleveland—Berea ²)	6.2	\$67,186	\$10,924
	Berea-Columbus	121	\$526,803	\$4,353
	Columbus-Dayton	68	\$305,673	\$4,495
	Dayton-Sharonville	38.8	\$167,905	\$4,327
	Sharonville-Cincinnati	17	\$131,588	\$7,740
	Total	251	\$1,199,155	-
	Ohio Total	505.4	\$2,380,271	-

¹Capital spending to extend the Ohio Hub from Ohio to Detroit, Toronto and Pittsburgh is not included in this table.

² Berea serves both the Cleveland-Toledo and the Cleveland-Cincinnati corridors.

³About 44% of the total capital cost of the Cleveland-Youngstown-Pittsburgh corridor is allocated to Ohio.

Source: Calculated by Gem Public Services Group from TEMS reports.

3. Definition of Communities

One of the necessary steps in developing an impact model of a local economy is to define the affected local area. While the choice of the region depends upon the purpose of the study, the analysis is most accurate when the region is an integrated economic unit. If an area is too small, the impacts are likely to occur outside the locality.

In this study, census areas called Metropolitan Statistical Areas (MSAs), were chosen as the unit of analysis for defining communities (or regions). The economic impacts will be disaggregated by communities located along the four corridors that comprise the Ohio Hub.

The communities include Akron, Cleveland, Cincinnati, Columbus, Dayton, Mansfield, Toledo and the Youngstown. The concept of a “region” in this report refers to the definition provided by the U.S. Bureau of Economic Analysis (BEA), Washington, D.C., which defines Metropolitan Statistical Areas (MSAs) as one or more contiguous counties that exhibit certain characteristics of mutual interdependence of economic, political and social activities. These areas are appropriate for impact analysis because they represent areas with substantially integrated local economies as indicated by commuting ties, shopping patterns and employment interchanges. Each MSA is characterized by one or more principal cities. A consequence of the economic integration of MSAs is that there will be considerable “multiplier effects” within the metropolitan area as a result of original spending on the rail road infrastructure and operations. As a rule, the multiplier effects will be larger the larger the geographical unit under consideration. Thus, the state of Ohio, because of its larger more diversified economy, will have a larger impact multiplier than any of its cities or counties.

Counties are the basic building blocks of metropolitan statistical areas. The principal MSAs and their component counties for the Ohio Hub study are presented in Table III.5.

Table III.5 Ohio Hub Metropolitan Statistical Areas (MSAs) and Component Counties		
Area Name	Labor Force	Employment
Akron, OH Metropolitan Statistical Area (MSA)		
Portage County, OH	88,812	83,845
Summit County, OH	290,961	274,128
Total	379,773	357,973
Cincinnati - Middletown, OH-KY-IN MSA		
Dearborn County, IN	26,340	24,864
Franklin County, IN	12,071	11,018
Ohio County, IN	3,159	2,995
Boone County, KY	57,483	54,800
Bracken County, KY	4,477	4,191
Campbell County, KY	46,425	43,803
Gallatin County, KY	4,014	3,770
Grant County, KY	12,543	11,850
Kenton County, KY	84,411	79,988
Pendleton County, KY	7,555	7,127
Brown County, OH	22,045	20,552
Butler County, OH	185,325	175,476
Clermont County, OH	103,918	98,356
Hamilton County, OH	426,785	402,531
Warren County, OH	100,201	95,743
Total	1,096,752	1,037,064

Area Name	Labor Force	Employment
Columbus, OH, Metropolitan Statistical Area (MSA)		
Delaware County, OH	79,285	76,259
Fairfield County, OH	72,199	68,463
Franklin County, OH	604,384	572,302
Licking County, OH	81,124	76,456
Madison County, OH	19,859	18,701
Morrow County, OH	17,765	16,682
Pickaway County, OH	24,484	22,782
Union County, OH	23,920	22,755
Total	923,020	874,400
Cleveland-Elyria-Mentor, OH MSA		
Cuyahoga County, OH	669,568	629,301
Geauga County, OH	50,399	48,046
Lake County, OH	130,551	123,915
Lorain County, OH	152,191	143,413
Medina County, OH	91,252	86,988
Total		
Dayton, OH Metropolitan Statistical Area (MSA)		
Green County, OH	76,983	72,735
Miami County, OH	54,101	51,046
Montgomery County, OH	272,178	254,645
Preble County, OH	21,661	20,392
Total	424,923	398,818
Toledo, OH Metropolitan Statistical Area (MSA)		
Fulton County, OH	22,947	21,550
Lucas County, OH	224,346	208,868
Ottawa County, OH	21,604	19,930
Wood County, OH	67,025	63,260
Total	335,922	313,608
Youngstown-Warren-Boardman, OH-PA MSA		
Mahoning County, OH	118,217	110,872
Trumbull County, OH	106,583	99,383
Mercer County, PA	56,447	52,963
Total	281,247	263,218

Source: Counties USA <http://censtats.census.gov/usa/usa.shtml>

A modification from the traditional multiplier analysis is necessary because some MSAs, such as Youngstown and Cincinnati, include counties that are in other states. Any adjustment would have to recognize that spending impacts at the MSA level would benefit Ohio and non-Ohio communities located within the MSA where spending would take place. Once spending flows outside of Ohio, the direct and indirect (multiplier) effects of the out-of-state spending will not likely be captured by Ohio. Consequently, to correct for this potential upward bias, this study assumes that the economic benefits of Ohio Hub construction and operations would accrue to Ohio communities in proportion to their share of the MSA's total labor force.

In the case of the Cincinnati region, which includes counties in Ohio, Indiana and Kentucky, only the results of the Ohio portion of the CSMA will be included in the impact calculations. A similar adjustment is made for the Youngstown MSA region to account for expenditures that will occur in Pennsylvania. The net external benefits of the project that may accrue to Michigan, Indiana, Kentucky, New York and Pennsylvania are not included in this report.

4. Mileage Allocation

In order to estimate railroad construction spending along rail corridors and cities, rail mileage was first allocated to counties. TEMS's estimate of the mileage for each of the four corridor segments was allocated to each of the counties through which the Ohio Hub corridors pass. In order to avoid overestimation of construction activities, the TEMS mileage estimates served as a control total. Next, TEMS's estimate of per mile costs of constructing each line segment was multiplied by the mileage in each county to obtain total capital cost per county. The estimate of total capital cost for each MSA was obtained by aggregating capital spending assigned to each county within the MSA.

The estimates of rail capital construction costs per county and per MSA are shown in Table III.6

Ohio Hub Rail Segments		Rail Miles	Cost/Mile (000)	Capital Cost (000)
Cuyahoga/Summit	Summit	11.9	\$6,627	\$78,760
Portage/Summit to Ravenna	Portage	6.2	6,627	41,175
Ravenna to Trumbull	Portage	17.3	3,804	66,793
Total Akron MSA		35.4		186,728
Butler	Butler	18.3	4,327	79,426
Warren	Warren	3.7	4,327	15,851
Hamilton/Sharonville	Hamilton	2.3	4,327	9,970
Sharonville/Border	Hamilton	17.0	7,740	131,816
Total Cincinnati MSA		41.3		237,065
Cleveland/Berea	Cuyahoga	12.4	10,924	135,700
Berea/Cuyahoga	Cuyahoga	1.6	4,353	7,065
Lorain	Lorain	27.2	4,353	118,485
Cuyahoga from Berea	Cuyahoga	6.9	3,819	26,213
Lorain	Lorain	20.0	3,819	76,344
Cuyahoga	Cuyahoga	15.8	6,627	104,926
Cuyahoga	Cuyahoga	12.8	4,123	52,903
Lake	Lake	28.4	4,123	117,500
MSE Station in Cuyahoga ¹				25,746
Total Cleveland MSA		125.1		664,883
Delaware	Delaware	19.9	4,353	86,607
Franklin/Columbus	Franklin	12.0	4,353	52,462
Columbus/Madison	Franklin	11.5	4,495	51,705
Morrow	Morrow	21.9	4,353	95,329
Madison	Madison	16.4	4,495	73,750
Total Columbus MSA		81.6		359,853

Ohio Hub Rail Segments		Rail Miles	Cost/Mile (000)	Capital Cost (000)
Montgomery/Dayton	Montgomery	7.0	4,327	30,254
Dayton/Border	Montgomery	13.1	4,327	56,886
Greene	Greene	7.4	4,327	32,043
Total Dayton MSA		27.5		119,183
Total Mansfield MSA	Richland	15.6	4,353	68,073
Lucas to Toledo	Lucasto-Toledo	9.1	3,819	34,825
Ottawa	Ottawa	31.2	3,819	119,330
Toledo to MI border	Toledo-MI border	7.3	4,490	32,835
Total Toledo MSA		47.6		186,990
Trumbull/Port-Warren	Turnbull	7.6	3,843	29,177
Ohio Hub Rail Segments		Rail Miles	Cost/Mile (000)	Capital Cost (000)
Warren /Trumbull/Mahoning	Trumbull	11.4	4,271	48,868
Trumbull-Youngstown	Mahoning	4.2	4,271	17,873
Youngstown-PA border	Mahoning	7.0	5,194	36,418
Total Youngstown MSA		30.2		132,337
Ohio Hub MSA Total		404.2		1,955,113
Other Ohio Hub Counties				
Huron	Huron	14.4	4,353	62,710
Crawford	Crawford	7.0	4,353	30,526
Clark	Clark	25.9	4,495	116,646
Ashtabula	Ashtabula	27.2	4,113	112,016
Erie	Erie	26.6	3,877	103,148
Total Other Counties				425,046
Total Ohio Hub		505.4		\$2,380,271

¹TEMS estimated the cost of the maintenance base to be \$23,716 million in 2005 dollars. An additional \$2.030 million was added to support maintenance infrastructure costs consistent with TEMS estimate of total capital infrastructure spending in Ohio.

D. Short Run Construction Impact Analysis

Construction of the Ohio Hub will result in about \$3,265.7 million in new capital expenditures over the construction phase of the project, of which \$2,380.3 million, or about \$2.4 billion, will be spent in Ohio. This section will present the economic impacts for the state of Ohio and for each of the four corridor sections of the Ohio Hub.

1. State of Ohio Impacts

The expected economic impact of construction of the Ohio Hub on Ohio's economy is presented in Table III.7 for three degrees of external finance. For 100% external finance, the \$2,380.3 million in direct capital expenditures will raise aggregate output of the state's economy by approximately \$5,993 million. Household income will increase by \$1,846 million and a total employment will increase by 54,540 jobs. The Ohio Hub will support about 6,060 new jobs annually over the nine year construction cycle of the project.

Table III.7 suggests that the aggregate economic impacts will be sensitive to how the Ohio Hub capital constructions costs are ultimately financed. Obtaining 100% of the constructions funds from the Federal government, or other external sources, would provide the largest economic impact on the state's economy. If Ohio had to raise a portion of the capital construction funds from internal sources, for example by raising taxes or incurring local debt, the impacts would be correspondingly less. For example, having to raise 50% of the capital construction funds internally versus zero internal finance would reduce the economic output impact from \$5,993 million to \$2,997 million. For comparison, the calculations show the expected impact on output, household earnings and employment in the state of Ohio for 100%, 80% and 50% levels of external finance. As can be seen, output fluctuates between \$2,997 million and \$5,993 million; household income fluctuates between \$97.3 million and \$184.6 million and employment fluctuates in the range of 27,270 and 54,540 jobs, depending upon the degree of external finance.

State of Ohio			Economic Impact on State of Ohio (Millions)		
Type of Impact	RIMS II Multipliers	Capital Expenditures	100% External	80% External	50% External
Output	2.5178	\$2,380,271	\$5,993	\$4,794	\$2,997
Earnings	0.7756	\$2,380,271	\$1,846	\$1,477	\$923
Employment	22.91321	\$2,380,271	54,540	43,632	27,270

The benefits presented in Table III.7 are cumulative over the entire construction phase of the Ohio Hub project. The actual annual flow of the benefits during the construction phase is likely to closely follow the construction cycle of the project. TEMS anticipates that construction spending will rise sharply after the second year of the project, peak in the sixth year and then tail off beginning in the seventh year of capital construction. If this is the case, the annual flow of economic impacts will follow a similar pattern.

Table III.8 and Figure III.3 present the likely pattern of distribution of the aggregate economic benefits throughout the construction phase of the Ohio Hub project. The construction phase is anticipated to be approximately 9 years in duration following the initial start-up of construction. Several years of planning, studies and land acquisition will likely precede the ramp-up of the physical construction of the Ohio Hub. Our analysis assumes that these pre-construction expenditures in the first two years will have little direct impact on industry output in Ohio. For example, land acquisition costs will likely result in a transfer of income from the taxpayers to the landowners with little prospects of upstream multiplier benefits. Planning costs will increase demand for planning services and therefore will stimulate final demand in the services sector.

Although not unimportant, our impact analysis does not directly incorporate the economic benefits from planning and land acquisition. Actual construction begins in the third year and accelerates during the fourth, fifth and sixth years of construction.

Beginning in the seventh year, construction expenditures gradually decline until the end of the ninth year when the project is completed. Our assumption is that short run economic impacts, shown in the column on the right, will closely mirror the construction cycle of the Ohio Hub project.²

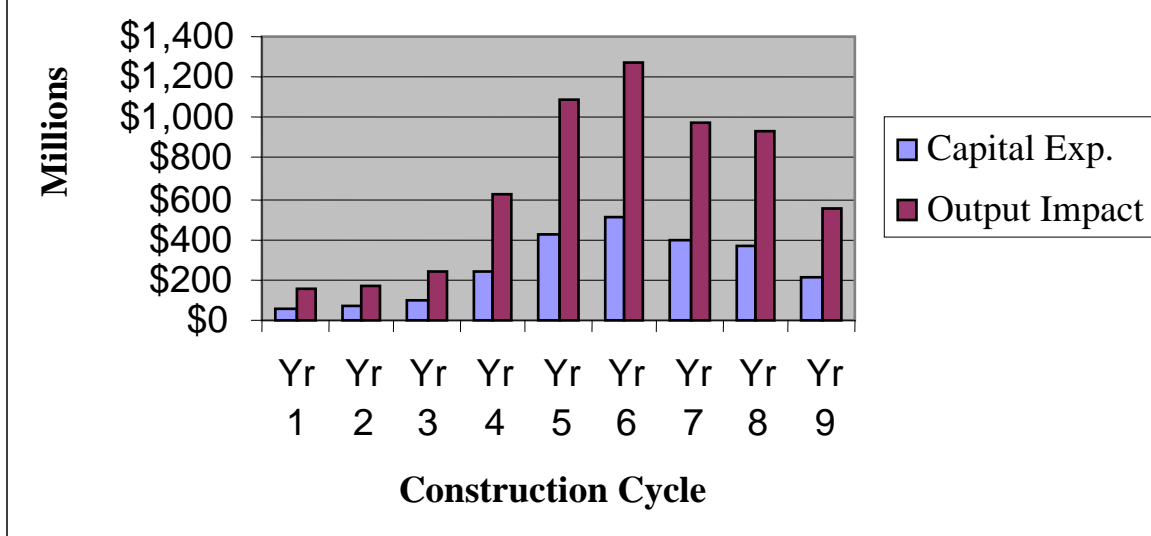
Year of Construction	Ohio Infrastructure Capital Expenditures (Millions)	Annual % Total Infrastructure Expenditures	Aggregate Output Impact of Ohio Infrastructure Expenditures (Millions)¹
1	\$ 60	0.025	\$151.07
2	\$ 67	0.028	\$168.69
3	\$ 95	0.040	\$239.19
4	\$ 245	0.103	\$616.86
5	\$ 431	0.181	\$1,085.17
6	\$ 505	0.212	\$1,271.49
7	\$ 390	0.164	\$981.94
8	\$ 369	0.155	\$929.07
9	\$ 217	0.091	\$546.36
Total	\$ 2,378	-	\$5,989.85

¹Ohio Hub infrastructure expenditures in 2005 prices.

The annual capital infrastructure expenditures in 2002 dollars were provided by TEMS. They were expressed in 2005 dollars by GEM Public Services Sector Group and presented in column 2. Column 3 presents the impact of infrastructure spending on the aggregate output of the Ohio economy. The aggregate output impacts were obtained by multiplying annual capital expenditures by the construction sector multiplier for the state of Ohio and placed in the last column. Fig. III.3 depicts the annual capital infrastructure spending pattern and their respective aggregate output impacts over the 9 year construction cycle of the Ohio Hub.

² The need for additional capital expenditures outlays for maintenance in out-years is factored into O&M expenditures for these out-years.

Figure III.3 Annual Construction and Output Benefits (2005 Dollars)



The first two years are primarily pre-construction activities such as engineering design, planning and land acquisition. In the third year of the construction cycle physical construction begins to quickly ramp-up and reach a peak by the sixth year. Likewise, annual construction impacts reach a peak of \$464.6 million in year six and begin to decline as construction activities subside. Over the construction cycle cumulative economic benefits are about \$5,993 million.

2. Community Impact Analysis

Table III.9 shows the economic impact calculations for the major Ohio MSA communities (MSAs) located within the corridors of the Ohio Hub and for the aggregate of the balance of the state. The balance of state represents counties in Ohio that will not be directly served by the Ohio Hub system once it is in place. Athens, Darke, Lancaster and Muskingum counties are examples of counties located in the balance of state region as defined in this study.

The rail miles and total capital construction costs allocated to each of the MSA communities are presented in the first two columns. The Rims II multipliers for output, earnings and employment are presented in the next three columns. The last three columns present the final demand impacts for the metropolitan areas. The aggregate impact for the state of Ohio is also presented for comparison.

Among the Ohio Hub communities, the Cleveland MSA will receive the largest share of the construction phase economic benefits, followed by Columbus and Cincinnati.

Cleveland's industrial output is expected to increase by about \$1,418.3 million, household income by \$414.5 million and employment by 11,210 jobs. Industrial output in Columbus and Cincinnati is expected to increase by \$829.2 million and \$554.1 million, respectively. The Toledo and Akron MSAs will gain about \$373.3 million and \$348.3 million in industrial output, respectively. The Youngstown and Dayton areas will experience an output gain of about \$256.9 million and \$237 million, respectively. The Mansfield MSA region is expected to experience an output gain of about \$110.5 million.

The sub-regions that we define as communities within the Ohio Hub corridors will collectively receive \$4,127.5 million in additional industrial output and \$1,216.8 million in household income, respectively. The remaining increase of \$590 million and \$173.6 million in output and earnings will accrue to other counties located along the Ohio Hub corridors but outside the core Ohio Hub MSA communities.

Communities not directly served by the Ohio Hub, defined in this study as the balance of State, will experience a gain in industrial output of about \$1,275.6 million and household earnings of about \$455.8 million. Employment gains of about 16,588 jobs will occur in the balance of Ohio.

Table III.9 Economic Impacts of Ohio Hub Capital Expenditures by Regions (2005 \$'s)							
	(Millions)	RIMS II Final Demand Multipliers			Economic Impacts		
Ohio MSA Regions	Capital Cost	Output	Earnings	Employment	Output (Mi.)	Earnings (Mi.)	Employment¹
Cleveland MSA ²	\$653.299	2.1709	0.6345	18.6273	\$1,418.247	\$414.518	11,210
Columbus MSA	\$361.835	2.2917	0.6988	20.8539	\$829.217	\$252.850	6,951
Cincinnati MSA ³	\$240.458	2.3045	0.7292	22.1864	\$554.136	\$175.342	4,914
Dayton MSA	\$120.946	1.9595	0.5739	17.0663	\$236.993	\$69.411	1,901
Toledo MSA	\$190.165	1.9627	0.5678	16.9341	\$373.236	\$107.975	2,966
Youngstown MSA ³	\$141.799	1.8114	0.545	15.7435	\$256.855	\$77.280	2,056
Akron MSA	\$184.883	1.8838	0.4828	14.433	\$348.283	\$89.262	2,458
Mansfield MSA	\$68.781	1.6066	0.4389	13.1374	\$110.504	\$30.188	832
Total MSA Regions	\$1,962.166	-	-	-	\$4,127.471	\$1,216.826	33,288
Other counties ⁴	\$418.108	1.4111	0.4151	12.1111	\$589.992	\$173.557	4,664
Total Four Corridors	\$2,380.274	-	-	-	\$4,717.463	1,390.383	37,952
Total State of Ohio	\$2,380.274	2.5178	0.7756	22.91321	\$5,993.047	\$1,846.138	54,540
Balance of State⁵	N/A	N/A	N/A	N/A	\$1,275.584	\$455.755	16,588
¹ Employment is calculated as full time equivalent positions.							
² Capital spending includes \$27.765 million to construct the Cleveland MSE BASE station.							
³ Approximately 77% of the Cincinnati MSA labor force and XX% of the Youngstown MSA labor force resides in Ohio, respectively.							
⁴ This category represents counties located outside Ohio Hub MSA counties but within at least one of the four corridors.							
⁵ The balance of state represents counties not included in the subset of Ohio Hub corridor counties as defined in this study.							

For the state as a whole, total industrial output will rise by \$5,993 million and earnings accruing to households in the state will increase by \$1,846.1 million. Employment is projected to increase by 54,540 jobs over the construction phase of the project, or by 6,060 jobs annually,

In summary, the economic benefits associated with the construction of the Ohio Hub are large and geographically dispersed throughout Ohio. The benefits in the form of output, income and employment are short run and because they are directly related to the construction phase of the Ohio Hub they will disappear when the construction phase ends. As said previously, the annualized benefits that are expected to accrue to each community are expected to rise rapidly beginning in the third year of the construction cycle and diminish in the latter stages of the construction cycle.

E. Ohio Industry Impacts Analysis

This section examines the dispersion of economic benefits from construction across the various industries in Ohio. The construction of the Ohio Hub will have a differential impact on the construction, manufacturing, services and other sectors of Ohio's economy. This section examines the overall impact of construction of the Ohio Hub on 20 industries in Ohio. These inter-industry effects occur because each industry is tied to other industries by the purchase and sale of intermediate goods and services among the industries that comprise Ohio's industrial structure.

1. Industry Output

The industry impacts of Ohio Hub construction are presented in Table III.10. The approximately \$2,380.3 million in construction spending to roll out the Ohio Hub will create an overall economic impact of \$5,992.8 million in aggregate industry output. The largest impact will be felt in the construction industry but other industries will expand as well since each industry purchases inputs and sells their outputs to other industries within the state.

Industry	Industry Impact Multiplier	Economic Impact (Millions)	% of Impact
1. Agriculture, forestry, fishing, and hunting	0.0111	\$26.42	0.4
2. Mining	0.0141	\$33.56	0.6
3. Utilities*	0.0319	\$75.93	1.3
4. Construction	1.0071	\$2,397.17	40.0
5. Manufacturing	0.4313	\$1,026.61	17.1
6. Wholesale trade	0.0978	\$232.79	3.9
7. Retail trade	0.1454	\$346.09	5.8
8. Transportation and warehousing	0.0684	\$162.81	2.7
9. Information	0.045	\$107.11	1.8

Industry	Industry Impact Multiplier	Economic Impact (Millions)	% of Impact
10. Finance and insurance	0.1167	\$277.78	4.6
11. Real estate and rental and leasing	0.1374	\$327.05	5.5
12. Professional, scientific, and technical services	0.0967	\$230.17	3.8
13. Management of companies and enterprises	0.039	\$92.83	1.5
14. Administrative and waste management services	0.0445	\$105.92	1.8
15. Educational services	0.0133	\$31.66	0.5
16. Health care and social assistance	0.1088	\$258.97	4.3
17. Arts, entertainment, and recreation	0.0108	\$25.71	0.4
18. Accommodation and food services	0.0419	\$99.73	1.7
19. Other services	0.0565	\$134.49	2.2
Total Output Impact	2.5177	\$5,992.81	100

The inter-industry effects for the construction sector are expressed as impact multipliers in the second column. The impact multipliers show the increase in output of the row industry as a result of a dollar increase in output of the construction sector. The construction industry itself will expand as a result of the direct construction spending (\$2,380.3 million) but also as a result of induced construction spending (\$16.9 million) that is needed to serve the expansion of output in other industries in Ohio's economy. Output in the manufacturing sector will expand by about \$1,026.6 million. In the retail and real estate sectors, output expands by \$346 million and \$327 million, respectively. The finance, health care, wholesale and professionals, scientific and technical services sectors will expand by \$277.8 million, \$259 million, \$232.8 million and \$230 million, respectively. These are significant economic benefits resulting from an increase in demand for construction services to roll out the Ohio Hub. The benefits are concentrated in the construction sector but because of the interdependencies among the industries they will be widely diffused across the entire industrial structure of Ohio's economy.

2. Employment Impact

As Table III.11 indicates, the increase in final demand of approximately \$2,380 million for construction sector services and output will increase total employment in the state by 49,904. The employment impact multipliers in the second column indicate the increase in employment in the row industry per each \$1 million in construction expenditures. The employment multiplier for the construction sector suggests that about 10 jobs would be created for each \$1 million in construction spending. Also, the \$1 million in construction spending would support about 1.6882 additional jobs in the manufacturing sector after the full multiplier effects are worked out. Although the largest share of the jobs is in the construction sector, many other sectors will experience a rise in employment too.

Specifically, construction of the Ohio Hub is expected to increase total employment in the construction industry by 21,953 jobs over the 9 year construction phase of the project.

Overall, for the state of Ohio construction of the Ohio Hub will increase employment by 49,904 jobs, or by 5,545 jobs annually. Of course, these are not permanent jobs since they will disappear when the construction phase of the project is over. Nor will the average annual level of employment be sustained over the entire construction phase of the project. The precise impact on average annual employment will depend upon the rate of construction expenditures each year of the project. A simple approximation would be to assume that project expenditures will occur in equal increments over a 9 year construction phase. This would suggest an average annual level of employment of 5,545 jobs during the construction phase of the project.

Industry	Employment Multipliers	Employment Impact	% Impact
1. Agriculture, forestry, fishing, and hunting	0.1147	251	0.5
2. Mining	0.062	136	0.3
3. Utilities*	0.0686	150	0.3
4. Construction	10.0123	21,953	44.0
5. Manufacturing	1.6882	3,702	7.4
6. Wholesale trade	0.6174	1,354	2.7
7. Retail trade	2.2781	4,995	10.0
8. Transportation and warehousing	0.5596	1,227	2.5
9. Information	0.2335	512	1.0
10. Finance and insurance	0.6103	1,338	2.7
11. Real estate and rental and leasing	0.2965	650	1.3
12. Professional, scientific, and technical services	0.8917	1,955	3.9
13. Management of companies and enterprises	0.2724	597	1.2
14. Administrative and waste management services	0.8337	1,828	3.7
15. Educational services	0.2897	635	1.3
16. Health care and social assistance	1.5255	3,345	6.7
17. Arts, entertainment, and recreation	0.2516	552	1.1
18. Accommodation and food services	1.317	2,888	5.8
19. Other services	0.8373	1,836	3.7
20.Total Ohio Employment Impact	22.7601	49,904	100

3. Household Earnings

Households in Ohio will also experience economic benefits as a result of the Ohio Hub. Household earnings benefits accrue in the form of increased earnings and income to factors of production that enter into the production of goods and services. Thus, the expansion of industry output as indicated in Table III.10 and the increase in employment indicated in Table III.11 are also reflected in a rise in household earnings.

The increase in household earnings generated during the construction phase of the project is presented in Table III.12. As indicated, 47% of the increase in household earnings of about \$1,843 million, or about \$1.843 billion, will accrue to households directly related to the construction sector. The induced expansion of manufacturing output will account for a 10.3% of the gains in household sector earnings. Expansion in the health care (6.7%), retail trade (6.2%), professional services (5.5%), wholesale trade (3.9%), and finance/insurance (3.7%) sectors also contribute significantly to expansion in household earnings, respectively.

Of course the aggregate industry effects on household earnings, as was the case for output and employment impacts, will be phased in incrementally over the construction cycle and they will end when the nine year construction phase of the Ohio Hub is over.

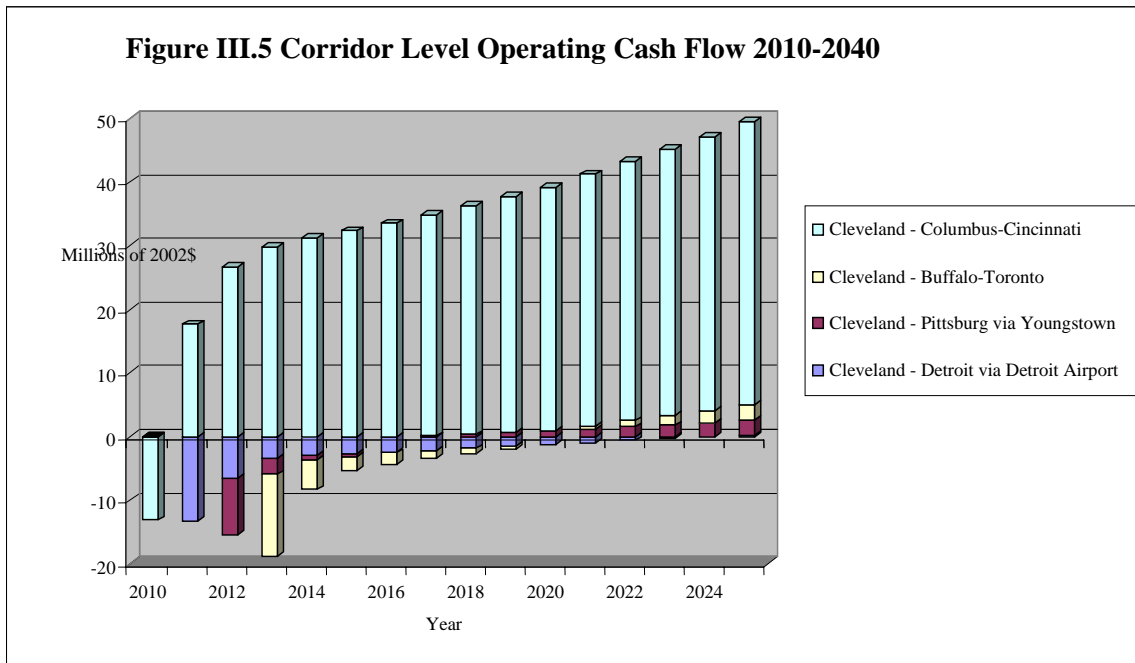
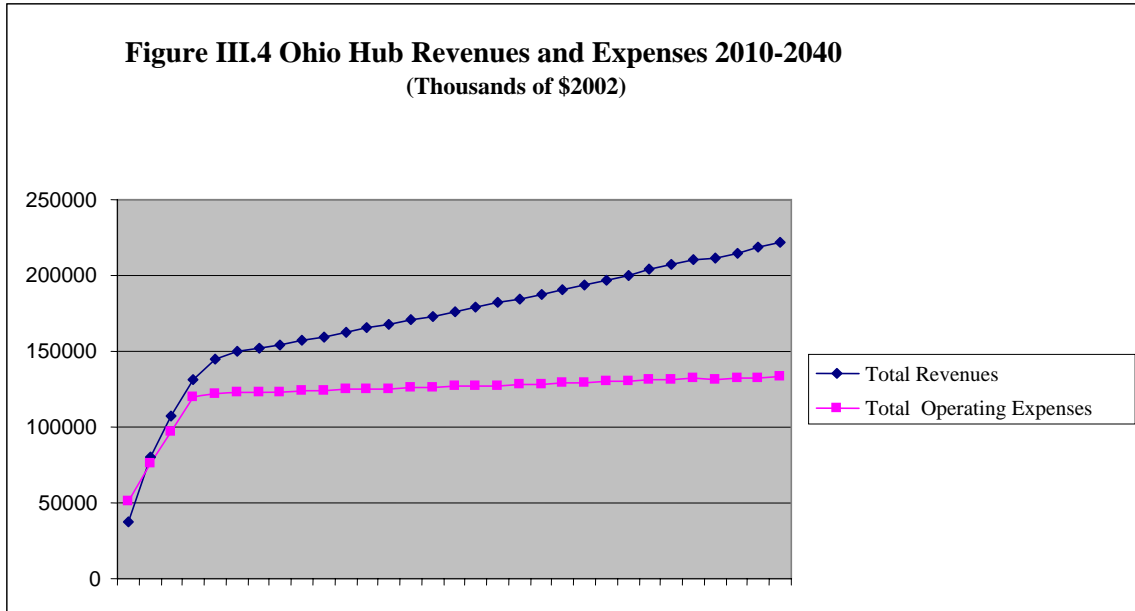
Industry	Household Earnings Multiplier	Earnings Impact (Millions)	% Impact
1. Agriculture, forestry, fishing, and hunting	0.0014	\$ 3.33	0.2
2. Mining	0.0031	\$ 7.38	0.4
3. Utilities*	0.0055	\$ 13.09	0.7
4. Construction	0.3641	\$ 866.66	47.0
5. Manufacturing	0.0794	\$ 188.99	10.3
6. Wholesale trade	0.030	\$ 71.41	3.9
7. Retail trade	0.0479	\$ 114.01	6.2
8. Transportation and warehousing	0.0206	\$ 49.03	2.7
9. Information	0.0116	\$ 27.61	1.5
10. Finance and insurance	0.0284	\$ 67.60	3.7
11. Real estate and rental and leasing	0.0073	\$ 17.38	0.9
12. Professional, scientific, and technical services	0.0426	\$ 101.40	5.5
13. Management of companies and enterprises	0.0185	\$ 44.04	2.4
14. Administrative and waste management services	0.0174	\$ 41.42	2.2
15. Educational services	0.0059	\$ 14.04	0.8
16. Health care and social assistance	0.0521	\$ 124.01	6.7
17. Arts, entertainment, and recreation	0.0043	\$ 10.24	0.6
18. Accommodation and food services	0.0159	\$ 37.85	2.1
19. Other services	0.0183	\$ 43.56	2.4
20. Total Household Earnings Impact	0.7743	\$ 1,843.04	100.0

F. Operations & Maintenance Expenditure Impacts of the Ohio Hub

This section addresses the issue of the short-run economic impact of on-going operating and maintenance expenditures to support the Ohio Hub system. The assumption in this section is that the Ohio Hub is up and running at a level of usage projected by TEMS in their original benefit-cost study of the Ohio Hub. The TEMS study projected a ridership of about 3.5 million annually for a revenue potential of approximately \$400 million annually by 2025.

1. 2025 Revenues and Expenses

Ohio Hub revenue and expenses for 2010-2040 are depicted in Figure III.4. The operating cash flow for the four corridors of the Ohio Hub is presented in Figure III.5. The 3C corridor development begins the first three years with a negative cash flow but net cash flow turns positive by year 2011 and continues to rise until 2025, beyond which it remains constant. By 2025, annual O&M expenditures will rise to about \$134.033 million, annually. The Cleveland-Toledo (Detroit), Cleveland-Youngstown (Pittsburgh) and Cleveland-Erie (Buffalo) corridors sustain a negative net cash flow for the first 5 to 7 years of operations but by the ninth year they too achieve a positive net cash flow. It is clear from the net cash flow analysis that the 3C corridor is the backbone of the Ohio Hub and that its early success is critical to the achieving a positive net cash flow over the life of the Ohio Hub.



Source: TEMS, Inc.

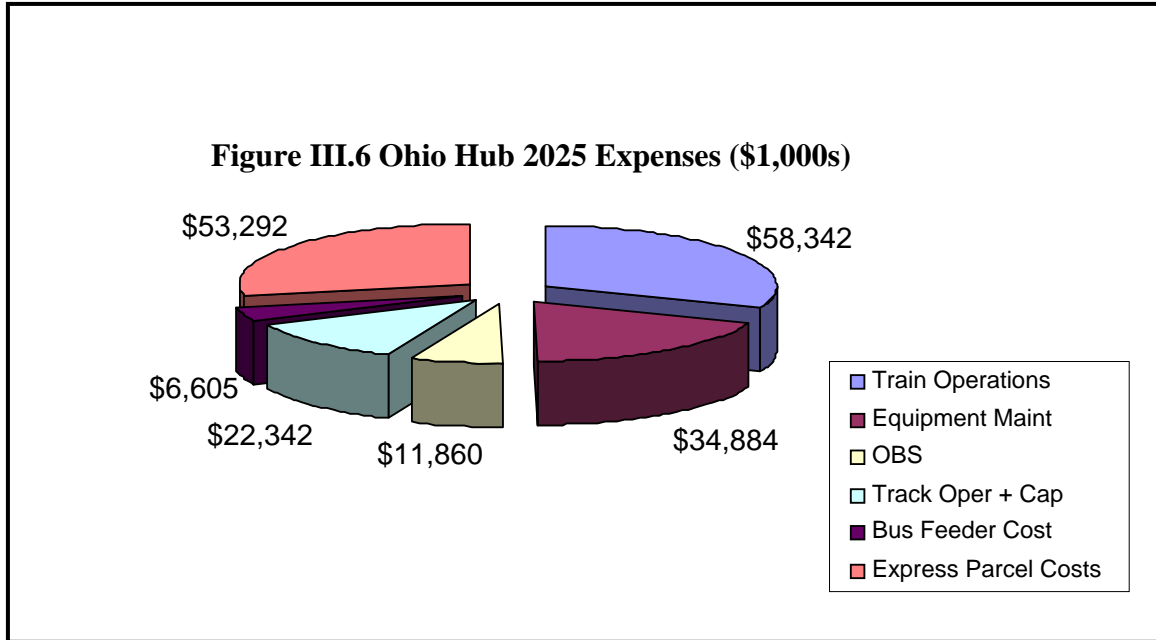
The cost of operating and maintaining the Ohio Hub in 2025 (defined in 2005 dollars) is presented in Table III.13 and depicted in Figure III.6. Train operations will cost about \$58.342 million annually and represents 31.1% of O&M expenditures. This consists of expenditures for energy and fuel, the train crew, service administration, sales and marketing, station costs, insurance liability cost and operational profit. Other costs include equipment maintenance (\$34.884 million), track operations plus out-year capital costs for rail upkeep (\$22.342 million), OBS (\$11.860 million) and Bus Feeder Cost (\$6.605 million).

Table III.13 2025 Operating & Maintenance Expenditures (2005 Dollars)		
Operation & Maintenance Costs	(000s)	Percent Cost Shares
A. Train Operations Cost		
Energy & Fuel	\$8,542	5.9
Train Crew	\$13,979	9.6
Service Admin	\$11,848	8.1
Sales and Marketing	\$10,185	7.0
Station Costs	\$5,401	3.7
Insurance Liability	\$7,623	5.2
Operational Profit	\$5,758	4.0
Total Train Operations	\$63,336	43.5
B. Other Costs		
Equipment Maintenance	\$37,870	26.0
Track Operations + Cap	\$24,254	16.7
OBS	\$12,875	8.8
Total Other Cost		51.5
C. Bus Feeder Cost	\$7,170	4.9
Total Costs	\$145,506	100.0

(1) The Ohio Hub plan includes an express package intercity delivery service as a profit center in the high-speed passenger rail system but the expected cost and revenue from this commercial service are not factored into our calculations of operations & maintenance expenditures.

2. Economic Impact of Operations & Maintenance Expenditures

The Ohio Hub O&M expenditures (000s) for 2025 inclusive of Express Parcel costs are presented in Figure III.6. The remainder of this section will estimate the net aggregate economic impact of the annual Ohio Hub operating and maintenance expenditures on industry output, household income and employment in the Ohio economy. Since the system is expected to be fully built and operating by 2025, year 2025 is chosen as the base year for calculating economic impact of annual O&M expenditures. The benefits are calculated in 2005 dollars.



Source: TEMS. Inc.

Ohio Hub O&M expenditures are expected to rise to about \$145.5 million annually by 2025 and remain at that level indefinitely. At this point the Ohio Hub is expected to be fully operational and serving about 3.5 million riders per year. According to the TEMS, Inc., the operating ratio will be positive for the entire system and thus the system will be self-financing and without a need for public subsidies. An assumption of our short run impact analysis is that the Ohio Hub O&M expenditures of \$145.5 million (in 2005 dollars) will be sustained at the 2025 level over the remaining years of the system. These expenditures will cover the cost of labor, materials, fuel and supplies and equipment to operate and maintain the Ohio Hub. It also includes costs to employ train operators, mechanics, service personnel and business services to provide high speed passenger rail service.

Thus, the increase final demand for high speed passenger rail service will, in turn, create multiplier effects that will lead to a secondary increase in output, earnings and employment in the state.

Table III.14 presents the calculations of secondary increases in output, earnings and employment associated with operating and maintaining the Ohio Hub at its 2025 level of operations. RIMS II output, earnings and employment impact multipliers are presented in the first two columns for the rail passenger service sector. The output multiplier suggests, for example, that a \$1 million increase in final demand for passenger rail services will result in an additional \$1.9914 million increase in industrial output in the sectors that serve the passenger rail sector. The \$1 million increase in final demand will also create \$.5075 million in additional household earnings and increase industry employment by 12 new jobs.

**Table III.14 Impact of Ohio Hub O&M Expenditures
(2005 Prices)**

Impact Indicators	O & M Multipliers¹	Aggregate Impact²
Output	1.9914	\$ 289.761
Earnings	0.5075	\$ 73.846
Employment	12.1039	1761

¹The detailed industry multipliers for passenger rail services are used to estimate aggregate output, earnings and employment impacts.

²Output and earnings impacts are expressed in millions.

Annual O&M expenditures are estimated to be about \$145.5 million in 2025 when the Ohio Hub becomes fully operational, and will remain at this level indefinitely. In this case, our impact analysis suggests that Ohio's aggregate industry output will rise by approximately \$289.8 million in 2025 and remain at this level as long as the passenger rail services is provided at the assumed level. The increase in household earnings is projected to be about \$73.8 million, annually, and about 1,761 jobs will be created throughout Ohio to provide the Ohio Hub service. Over a 40 year period, the cumulative industry output resulting from the O&M expenditures will be approximately \$2,897.6 million and cumulative household earnings will be \$738.5 million.

Unlike the construction benefits the annual economic benefits of O&M expenditures will be reoccurring over the life cycle of the Ohio Hub. Also, since the maintenance and crew bases will be likely be near Cleveland, Cincinnati and Columbus, it is reasonable to expect that the majority of the O&M economic benefits will be largely confined to these regions.

G. Dynamic Benefits

The construction and O&M expenditure benefits identified in this study are classified as short run economic benefits since their estimation is based on a methodology that assumes constancy of the local spending multipliers. To the extent that the Ohio Hub system improves the overall connectivity and efficiency of Ohio's transportation system, long term economic benefits will likewise occur.

This section briefly addresses the potential of the Ohio Hub to generate long term economic benefits for citizens of Ohio.

Long-term economic benefits will occur to the extent that the Ohio Hub improves the competitiveness of industries and workers. For example, an improvement in the efficiency of moving people, goods and labor among markets and communities has the potential to improve the investment and business climate of the state which, in turn, can lead to a higher rate of economic growth. The extent to which this occurs will depend upon the degree to which the proposed high speed passenger rail system is integrated into Ohio's overall air, highway and commercial rail transportation system, thus enhancing the efficiency of moving goods, people and information (through improved face to face communications) from place to place. It will also depend on how well the Ohio Hub connects to population centers and interrelated business activities within Ohio.

These efficiency gains could attract new businesses to Ohio and provide opportunities for existing businesses to increase their sales both inside and outside of Ohio. Other long term benefits could include increased tourism, less highway congestion (and hence lower future capital expenditures) and less environmental pollution.

The Gem Public Sector Service Group conducted case studies of how these dynamic effects may occur in selected transit stops along the Ohio Hub. The results of the case studies are presented in section IV of this study. The dynamic effects are considered to be more speculative but they presented to suggest a plausible scenario of how the Ohio Hub might alter the state's industrial structure and, therefore, its long term growth dynamics.

H. Summary and Implications

This report examined the short run economic benefits (impacts) of the proposed Ohio Hub high speed passenger rail service being planned for Ohio. The report focused upon the construction impacts as well as the on-going O&M expenditure impacts associated with operating and maintaining the high speed passenger rail service after the system becomes operational. The study's findings suggest that the economic benefits are significant and will serve as an aggregate demand stimulate to counties and cities along the Ohio Hub as well as many of Ohio's industries. Opportunities at the community level also exist for transit oriented development but the benefits of these long-term investments are not addressed in this report.

The finding that the economic benefits are substantial does not in and of itself justify the nearly \$3.5 billion investment that will be necessary to build the Ohio Hub infrastructure. Our I/O study identifies the benefits but it falls short of a complete benefit-cost analysis that would be necessary to determine the economic feasibility of the Ohio Hub project. However, our analysis complements the economic feasibility analysis conducted by TEMS, Inc., which reported a benefit/cost ratio of 1.24. A complete economic analysis would compare the expected rate of return on the Ohio Hub project, as reflected in the size of the benefit/cost ratio, with rates of return on alternative uses of the \$3.5 billion, of which there are many. Nevertheless, our study demonstrates that the Ohio Hub has significant potential to benefit Ohio's citizens and help to alter the long-term growth of the economy. This is particularly true to the extent that the initial capital construction costs are financed by Federal programs or by other outside sources of investment capital.