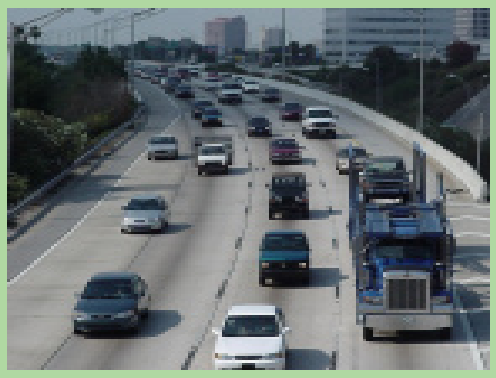
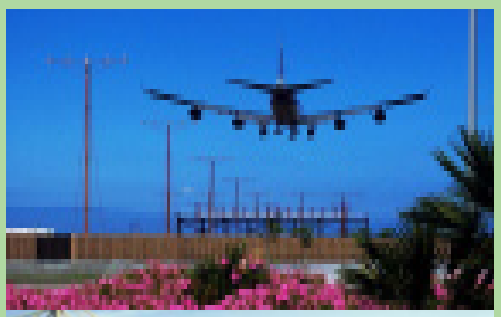
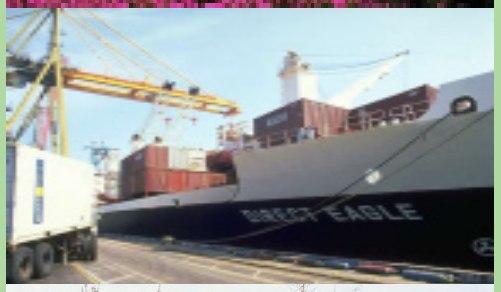


Macroeconomic Impacts of the Florida Department of Transportation Work Program





Prepared for

Florida Department of Transportation

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Cambridge Systematics, Inc.

August 2006

Macroeconomic Impacts of the Florida Department of Transportation Work Program 2006 Update

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Introduction

This document provides a synopsis of key findings and data results from the update to the February 2003 report, "Macroeconomic Impacts of the Florida Department of Transportation Work Program". Similar to the earlier study, this analysis finds that transportation investments in Florida's five-year Work Program return more than $5 in travel and economic benefits to Florida residents, indicating that transportation remains a good investment. In addition, we compare results from this latest analysis to the previous work completed about four years ago. The focus of the entire memo is on the current Florida Department of Transportation (FDOT) five-year Work Program (fiscal years 2006/07 to 2010/11) as detailed in the March 10, 2006 Program and Resource Plan.

Summary of Findings

- Over the next 25 years, the Work Program is estimated to produce over $147 billion in user and economic benefits to Florida residents and businesses. Compared to a cost of $26.3 billion (present value terms), this produces a benefit/cost ratio of 5.6. This means that every dollar invested in the five-year Work Program generates approximately $5.60 in benefits.

- By the year 2030, Work Program investments are expected to lead to approximately 68,000 permanent jobs, and produce an annual macroeconomic impact to the state of $6.7 billion in personal income, $7.5 billion in gross state product (GSP), and $11.8 billion in increased output for Florida businesses.

- Non-business oriented travel also greatly benefits from Work Program investments – annual gains in terms of travel time savings, reduced operating costs, and fewer accidents are estimated to average over $8 billion a year over the next 25 years. Non-business travel includes the majority of trips such as commuting, visiting friends/family, or recreation.

- Florida DOT Work Program investments over the next five years are estimated to increase the per capita income of Florida residents by reducing transportation costs and increasing job opportunities. For example, per capita income is estimated to increase by $86 per person in 2011 (the last year of the Work Program) due to transportation investments and economic productivity.

- While this updated analysis and the methodologies used are very similar to the previous Macroeconomic Study published in February 2003, key differences include:

  - Increased overall level of spending as the discounted present value of investments in the Work Program now total $26.3 billion compared to $21.5 billion in the previous study. This reflects the significant increase in transportation funding enacted by the Governor and Legislature during the past few years, most notably in the 2005 Growth Management law.

  - Increased investment in non-highway modes as funding has increased significantly in recent years for modes such as freight rail, seaports, and transit. This reflects the Department's adoption of the Strategic Intermodal System (SIS) Plan and initiation of the

New Starts transit initiative. Accordingly, new methods have been used to measure benefits for freight rail and seaport investments (seaports were not included in the earlier macroeconomic analysis while freight rail investments have grown substantially and required new methods).

- Costs to construct highways and other transportation facilities have been increasing rapidly over the past couple of years, meaning that the average cost per lane mile, for example, is also increasing. Still, this analysis demonstrates that transportation is a good investment in Florida and that the strategic investments of the state appear to be yielding strong benefits even in the face of cost increases.

Methodology

The basic methodology is depicted in Figures 1 and 2 and is consistent with the previous study. Investments in transportation have a direct impact on travel time, vehicle operating cost and accident costs. These cost savings represent direct economic benefits to both personal travel and business-related travel including freight. For the business-related portion of these benefits, the resulting reduction in the cost of doing business leads to macroeconomic benefits measured by increases in personal income for Florida residents, employment, and gross state product. Estimating these macroeconomic impacts is the focus of this study.

Figure 1. Macroeconomic Analysis Framework

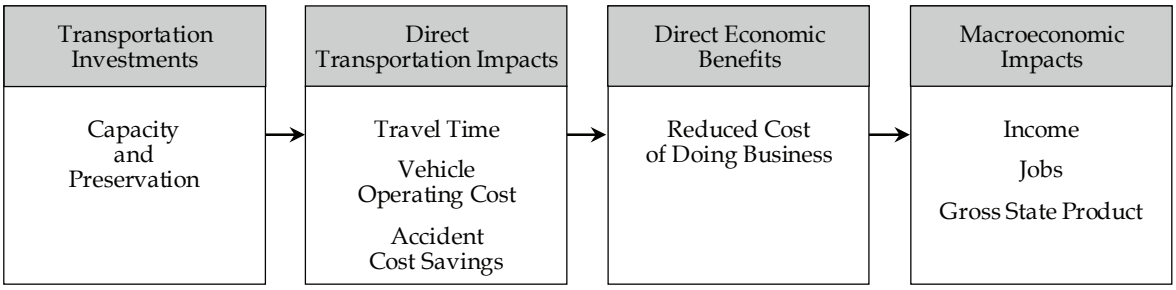

Figure 2. Macroeconomic Analysis Tools

In this updated analysis, tools such as the Highway Economic Requirements System (HERS) and National Bridge Investment Analysis System (NBIAS) are used in an identical manner as the previous study to estimate the direct transportation benefits (travel time, costs, safety) of highway and bridge investments that add capacity and/or preserve existing facilities. Various statistical modeling and interview techniques (especially for the seaport research) were applied to estimate transit and rail ridership effects, port capacity enhancements (e.g., increased tonnage,

cruise passengers, TEUs), and freight rail benefits. Data inputs and methodologies of the recently developed freight rail benefit/cost tool used by the Rail Office were applied to measure diversion from truck to rail and reductions in shipping cost.

Highway Economic Requirements System (HERS) Model – The HERS model estimates the highway user benefits from investment programs that affect either highway system performance or usage. The model has been used in a number of states, and at the national level, to estimate the direct economic benefits of highway investments. The U.S. General Accounting Office has evaluated the HERS model approach and found it an appropriate tool to estimate highway program investments at both the federal and state level. The HERS model also is used to examine the benefits of increasing transit and passenger rail ridership, and increasing the share of freight rail mode share (i.e., removing trucks from the highway). These analyses pivot off of transit and rail investments that not only benefit users of those modes, but also the remaining highway users through lesser traffic congestion and costs.

The HERS model estimates three types of direct highway user benefits, which can be quantified in monetary terms.

1. **Travel Time Savings –** Travel time savings reflect the dollar value of the reduction in vehicle-hours of travel that is associated with improved highway conditions. Travel time savings result from reduced congestion due to increased highway capacity or reduced vehicle miles of travel (i.e., from diversion to transit and rail), improved roadway geometry, and improved pavement condition. The model assigns different values of time for personal auto, business auto, and truck trips. Reduced inventory holding costs and the benefits from reductions in non-recurring incident delay are also captured in the travel time benefits.

2. **Vehicle Operating Cost Changes –** Vehicle operating costs include fuel, tires, lubricants, and maintenance. These costs are affected both by travel time and the general wear and tear on vehicles from substandard pavement conditions.

3. **Safety Effects –** Investments can reduce the crash rate on a highway system by reducing congestion and improving roadway geometry. Conversely, improving highway conditions could increase the number of accidents by inducing more total travel on the highway network or increase accident severity if speeds increase significantly.

Bridges – The HERS model and HPMS highway data do not include information regarding bridges. So, a model similar to HERS is used for bridges to capture the benefits of bridge investments – the National Bridge Investment Analysis System (NBIAS). This system contains Florida-specific bridge data and allocates investments from the Work Program to Florida bridges to generate program-level benefits. Similar to the highway analysis, NBIAS benefits are then used as inputs to REMI to generate macroeconomic impacts.

Regional Economic Models, Inc. (REMI) – The REMI model is a regional economic simulation model that can be used to estimate the macroeconomic impacts of policies or investments that change some aspect of the business climate in the region. The REMI model used in this study is a statewide model, with 70 industry-sector detail – the same model used by the Florida Legislature. REMI generates control forecasts and simulates policy changes based on a series of linked socioeconomic variables representing industry output, demand for goods and services, labor

supply, wages and prices, and industry market shares. It is the most widely used and accepted economic impact tool in the country, with unique capabilities for transportation analyses. For this study, the estimates of direct business travel benefits (business auto and truck) generated by the HERS model were translated into reductions in the cost of doing business and input into REMI to estimate macroeconomic impacts.

In addition to using the REMI model to estimate macroeconomic impacts, the recently completed Seaport Office economic research project used the MARAD port economic impact kit to estimate the economic benefits of increasing seaport capacity.

Work Program Investments

The five-year Work Program is presented in Table 1, highlighting the various categories of Product expenditures which represent the primary investments in transportation system capacity

Table 1. Five-Year FDOT Work Program

FDOT Work Program Investments (in millions of current dollars)	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	Total 2006/2007 to 2010/2011	Percent of Total Product
PRODUCT							
Highway							
A. Intrastate Highways	$1,833	$1,628	$1,323	$1,404	$1,625	$7,812	30.9%
B. Other Arterials	$1,460	$756	$622	$571	$752	$4,161	16.5%
C. Right-of-Way	$646	$521	$517	$602	$648	$2,934	11.6%
Highway Capacity	***$3,939***	***$2,905***	***$2,462***	***$2,577***	***$3,025***	***$14,907***	59.0%
J. Resurfacing	$911	$900	$886	$811	$789	$4,297	17.0%
K. Bridge	$328	$187	$222	$259	$279	$1,273	5.0%
Highway Preservation	***$1,238***	***$1,087***	***$1,108***	***$1,069***	***$1,068***	***$5,570***	22.1%
Total (Highway)	***$5,177***	***$3,991***	***$3,570***	***$3,646***	***$4,092***	***$20,477***	81.1%
Public Transportation Capacity						$0	0.0%
D. Aviation	$172	$167	$214	$143	$149	$844	3.3%
E. Transit	$419	$314	$305	$326	$322	$1,685	6.7%
F. Rail	$181	$133	$166	$199	$197	$876	3.5%
G. Intermodal Access	$239	$232	$53	$69	$40	$634	2.5%
H. Seaports	$47	$71	$51	$52	$58	$278	1.1%
Total (Public Transportation Capacity)	***$1,058***	***$916***	***$788***	***$789***	***$766***	***$4,318***	17.1%
I. Safety	$84	$90	$92	$103	$96	$466	1.8%
Total (Product)	***$6,319***	***$4,997***	***$4,450***	***$4,538***	***$4,955***	***$25,260***	100.0%
OTHER						$0	
Product Support	$1,554	$1,368	$1,207	$1,179	$1,311	$6,618	
Operations and Maintenance	$829	$812	$826	$839	$849	$4,155	
Administration	$146	$174	$168	$173	$179	$840	
Total (Other)	***$2,529***	***$2,354***	***$2,200***	***$2,192***	***$2,339***	***$11,613***	
TOTAL	**$8,848**	**$7,351**	**$6,651**	**$6,730**	**$7,294**	**$36,873**	

Source: FDOT March 10, 2006 Program and Resource Plan Summary.

and preservation. Although the amount of investment in public transportation modes has increased substantially, the percentage of all Product investments directed towards highways has actually increased from 79.6 percent in the previous study to 81.1 percent. It's also worth noting

that the highway share includes intermodal connectors to seaports, airports, and other transportation hubs. Though defined as highway improvements for the purposes of this document, these investments clearly have multi-modal benefits.

Though the economic analysis in this study does not include aviation or intermodal access (similar to the February 2003 report), it does cover 91 to 94 percent of all Product investments (depending on the year). We also include the Product Support, Operations and Maintenance, and Administration expenditures in the benefit/cost analysis in proportion to the amount of Product investment covered. The incorporation of the additional modes not covered in this analysis will be assessed by FDOT for future updates.

Results

Detailed economic and transportation benefit results can be found in Tables 2, 3, and 4 and Figure 3. In all cases, the sources of information are from the HERS, NBIAS, REMI and MARAD Port Economic Impact Kit models, and Cambridge Systematics.

Table 2. Transportation and Economic Benefits 2010 to 2030

Benefits (2006 dollars)	2010	2015	2020	2025	2030
Non-business transportation user benefits	$6,974	$7,762	$8,265	$8,829	$9,432
Personal Income	$3,254	$4,506	$5,255	$5,957	$6,749
Total Benefits by Year	**$10,228**	**$12,268**	**$13,520**	**$14,786**	**$16,181**

Table 2 displays total transportation and economic benefits by year due to the Work Program. Non-business transportation benefits simply refer to transportation efficiency benefits to trips (mainly auto and transit) not directly related to commercial activities, which is still the majority of all trips. Personal income benefits are derived from the economic impact modeling and represent the benefit to Florida residents of increased business productivity and activity. Total benefits grow from $10.2 billion in 2010 to $16.2 billion in 2030 largely based on continued traffic growth and the long useful life of transportation facility improvements.

Table 3. Macroeconomic Impacts of FDOT's Work Program

Benefits (2006 dollars)	2010	2020	2030
Personal Income	$3,254	$5,255	$6,749
Gross State Product	$3,361	$6,136	$7,554
Output	$5,534	$9,677	$11,781
Employment	43,165	64,114	67,930

Major macroeconomic impact categories are shown in Table 3 for 2010, 2020, and 2030. Gross state product (GSP) impacts measure the value-added by Florida businesses and typically are higher than personal income impacts, and are estimated to reach $7.5 billion in 2030. Output measures all increased business production (including suppliers of intermediate goods) and grows from $5.5 billion in 2010 to $11.8 billion in 2030.

Figure 3. Employment Impacts of FDOT's Work Program 2007-2035

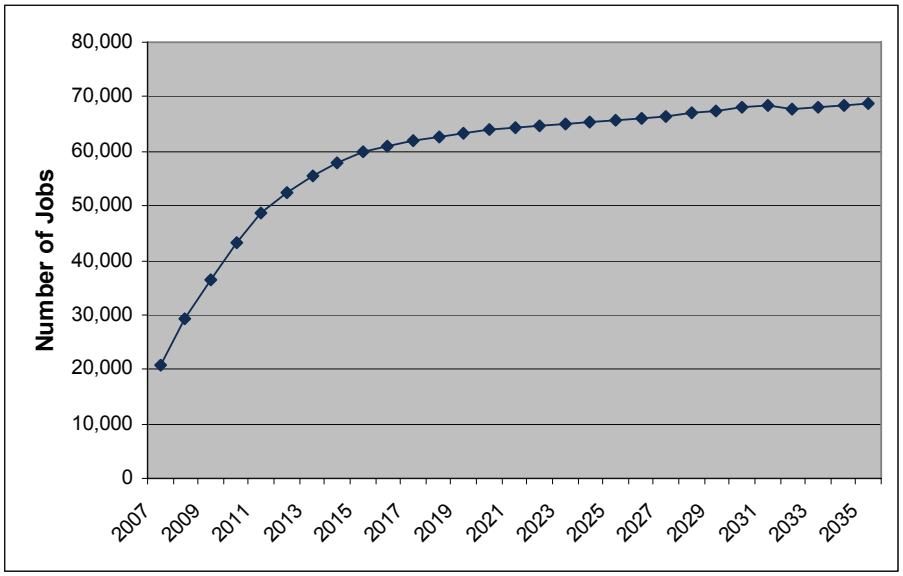

Figure 3 shows employment impacts over time, which quickly rise during the five years of the Work Program (as additional investments are implemented) and steadily grow based on changes in traffic and economic spillover effects (e.g., lower transportation costs helps businesses expand market share and hire workers). Total job impacts start at 20,800 in the first year of the Work Program (WP), rise to 48,800 in the last year of the WP and climb to 67,900 additional employees by 2030 (compared to a scenario without any WP investments). The job impacts all stem from reductions in transportation costs and increased productivity. They do NOT reflect the economic

Table 4. Job Impacts by Industry in 2020

Farm, Forestry & Fishing	535
Mining & Utilities	220
Construction	5,560
Manufacturing	2,920
Transportation & Warehousing	6,150
Information	965
Wholesale Trade	1,700
Retail Trade	8,270
Finance, Insurance, Real Estate	5,700
Services	27,085
Government	5,035
TOTAL JOBS	**64,115**

contribution of construction spending effects. Though the jobs and wages attributable to transportation expenditures by FDOT do contribute directly to the economy, the magnitude of those effects is simply based on the level of expenditures (i.e., higher costs = higher job impacts). Unlike this evaluation, that type of analysis would not reflect the transportation system efficiency gains of FDOT investments.

Similar to Florida's mix of industries, job impacts are largest in the various services sectors of the economy, particularly health care; professional and technical services; and administrative and temporary services. Other industries with large employment impacts include retail trade; transportation and warehousing; construction; finance, insurance, and real estate; and manufacturing.

The job impacts by industry do take into account multiplier effects as measured by the REMI model. Multiplier effects are derived from the direct effect of lower transportation costs for Florida's businesses, and consist of induced and indirect effects. Indirect effects are the result of increases in demand for industry goods and services in the expanded production of the economy. For example, as the transportation and warehousing industries expand due to lower costs and greater market share, they purchase goods (buildings, equipment, vehicles, etc.) to facilitate their expansion. Induced effects are caused by the re-spending of wages earned as Florida businesses expand and hire more labor. Increases in wages result in higher levels of consumer spending on retail, personal services, restaurants, and assorted other industries.

As stated earlier, the productivity and cost savings benefits of transportation investments lead to higher per capita income in Florida. The per capita income effect peaks in 2010 at $88 per person, and tapers to $37 per person by 2020. This effect tends to diminish over time as new population enters the state to compete for the jobs created through transportation enhancements. Though this effect may seem modest per person, it is quite significant for a state with a population as large as Florida.

Benefit/cost analysis results shown in Table 5 include a present value personal income benefit of $54.2 billion, a non-business transportation benefit of $93.5 billion and total present value benefits (through the year 2035, discounted at 7 percent) of $147.7 billion. Although the five-year WP is almost $37 billion in year of expenditure dollars, when discounted to present value (2006), it totals $26.3 billion – thus producing a net present value of $121.4 billion and a benefit/cost ratio of 5.6. This analysis assumes a standard inflation rate (approximately three percent annually). Future updates could consider the effects of higher rates of inflation for transportation construction projects.

Table 5. Benefit/Cost Analysis of FDOT Work Program
(billions of 2006 dollars, 2006-2035)

BENEFITS	
PV of Personal Income	$54.2
PV Non-Business Transportation	$93.5
Total Discounted Benefits	$147.7
COSTS	
PV of Total Costs	$26.3
NPV (Benefits Minus Costs)	$121.4
B/C Ratio	5.6

Comparisons to Previous Macroeconomic Study

This section provides a few notes to compare the updated analysis to previous results. Most notably, the overall benefit/cost ratio finding is almost identical. In this updated analysis, it is estimated to be 5.6 compared to 5.5 in the earlier report. For a variety of reasons (e.g., changes to

the HERS and REMI models, different mix of modal investment, changes to data inputs) it is impossible to do a direct comparison of the previous analysis to this update. However, the key finding that FDOT transportation investments return over $5 for every $1 invested still holds. Still, it may be instructive to consider some of the changes since the earlier study.

- The inclusion of the seaport economic research results helps to increase the benefit/cost ratio since the seaport economic benefit/cost research study produced a benefit/cost ratio of 6.9. Still, seaport investments (more narrowly defined in this WP analysis), account for a relatively modest share of total of Product expenditures (1.1 percent). However, some seaport-related investments, such as the I-4 Crosstown Connector in Tampa, are included within the highway calculations in this assessment.
- Transit ridership projections from the previous study underestimated actual transit ridership, thereby underestimating transit-related benefits. The updated statistical analysis of transit ridership includes recent years of high ridership and also higher projections of future ridership (corresponding to higher levels of transit investment). Consequently, the benefits of transit investments have increased.
- The value of freight rail investments in the WP has grown substantially from about $5.5 million annually in the 2002 WP to approximately $55 million per year in the 2006 WP. New methodologies developed by the Rail Office, in partnership with data collection from the railroads, help to estimate substantial benefits in terms of truck to rail diversion and reduced shipping costs.
- Keeping the benefit/cost ratio a bit more modest, project costs have increased with transportation construction costs generally out-pacing overall inflation and revenue collections. Consequently, costs per project (e.g., costs per lane mile) are rising and thus it costs more to produce the same level of transportation capacity/mobility effect as it did a few years ago. The level of benefits measured in this study do reflect rising costs to some extent, though current research on this topic by FDOT can shed light on this issue for future applications.

Although the direct transportation benefits estimated are higher in this updated analysis (e.g., present value of non-business benefits are $93.5 billion compared to $74.4 billion), the employment impact results are actually lower. In the final year of the analysis, job impacts are almost 20,000 lower in the updated analysis (78 percent as high). However, personal income, GSP and business output are all larger in the current analysis (e.g., GSP is 22 percent higher). This implies that the personal income and wage benefit per employee is greater than previously estimated. The primary reason for this is related to the growth in labor productivity over the past few years and projected for the future. Higher levels of labor productivity (documented frequently in recent years by the Federal Reserve Bank) indicate that industries can produce higher volumes of goods and services per employee. Higher levels of labor productivity typically also result in higher average wages but may not require firms to hire as many employees. The current REMI model incorporates these recent trends and projects higher levels of labor productivity than earlier versions, thus producing simultaneously a larger income and GSP benefit, but a smaller job impact.