Oregon
Transportation
Plan Update

**Background Paper**

# Transportation and Economic Growth

April 8, 2004

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# Oregon Transportation Plan Update
# Transportation and Economic Growth
# Background Paper

Economic growth and development are inherently tied to transportation. It was the famous Oregon Trail that first allowed significant migration of settlers from the Eastern United States to reach Oregon in the mid 1800s. It was the ocean shipping connections that initially tied Oregon closely to the California economy. By the late 1800s transcontinental railroads were carrying Oregon timber throughout the country and bringing back a vast array of manufactured goods. In the early 1900s Oregon led the nation in road building, recognizing that "getting the farmer out of the mud" and better connecting cities and towns was key to economic expansion.

Today, interstate highways, two transcontinental railroads, inland waterways, ocean ports and international airports connect Oregon to markets and resources throughout the world. An increasingly complex world of high tech manufacturing, integrated supply chains, and diverse work forces the state to pay close attention to the local and regional efficiency and reliability of its transportation system. Congested highways and rail lines can reduce reliability and delay shipments. Congested traffic and inadequate public transportation can raise the cost of labor. Deteriorating highways, rail lines and other transportation infrastructure can limit development opportunities outside of concentrated urban centers.

The purpose of this paper is to review trends affecting transportation and economic development, and consider potential policy responses to those trends. Oregon's population and economy have changed substantially over the past decade and will continue to change in the future. National and state trends are impacting transportation and economic development policy.

The remainder of this paper is organized into two parts. In the first part, state and national economic trends are discussed with attention to their impacts on transportation. The second part considers transportation policy as it relates to economic development, beginning with observations about existing policy and ending with a series of policy recommendations for the Oregon Transportation Plan (OTP) update. An appendix to the paper provides a more detailed framework for considering specific transportation and economic development strategies in state and regional planning.

## State and National Economic Trends

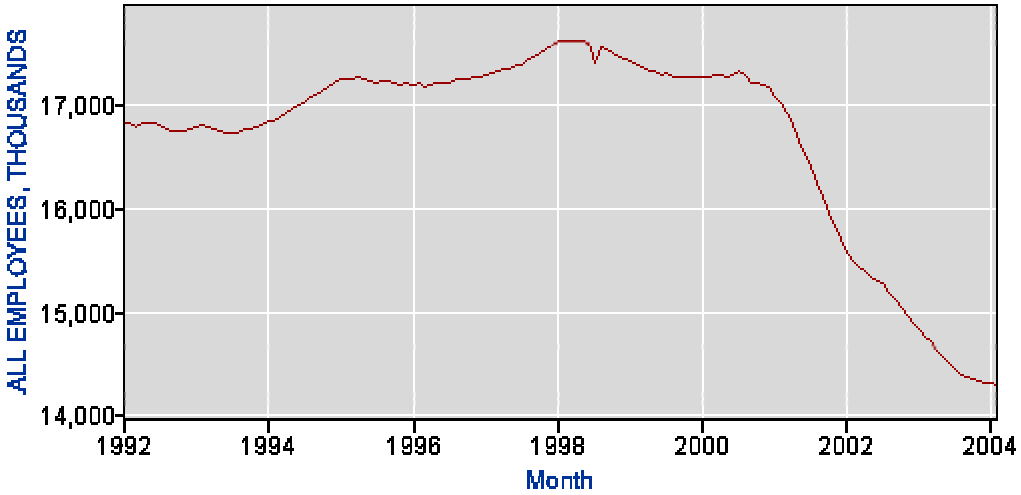
### National Economic Trends

The OTP was published in 1992. National economic trends that have occurred over the past decade impact both transportation and economic development polices as well as their interrelatedness. National economic trends have been characterized by shifts from manufacturing to services and from materials processing to information processing. The U.S. economy has also continued to globalize.

Through the 1990s and into the 21st century there has been a continued shift from a manufacturing economy to a service economy. The percentage of the U.S. gross domestic product (GDP) from manufacturing has declined from 17.1 percent in 1992 to 14.1 percent in 2001. Conversely, the GDP attributable to services has increased from 19.3 in 1992 to 22.1 in 2001 (U.S. Bureau of Economic Analysis, 2004).

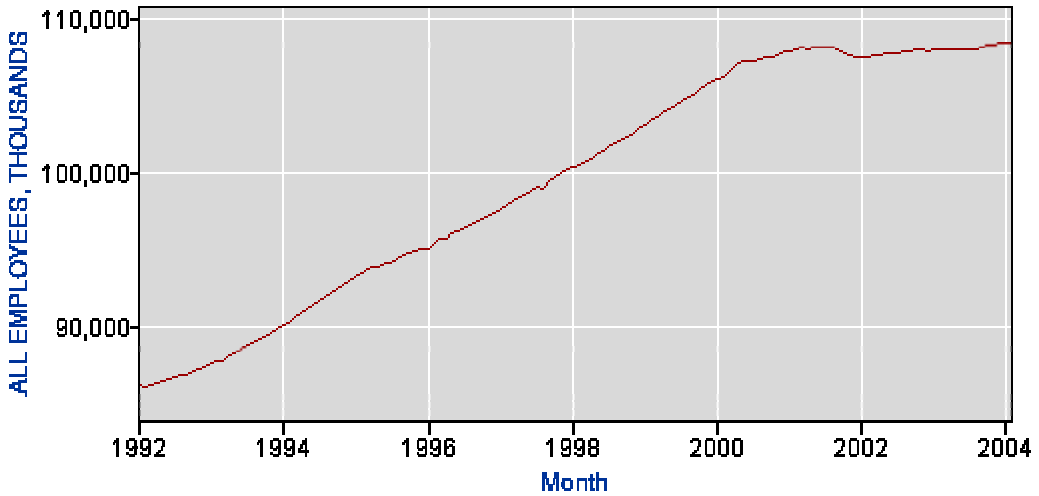
U.S. employment data reflects this trend: manufacturing employment was relatively stable between 1992 and 2001, but has dropped substantially since 2001. Service employment on the other hand grew substantially between 1992 and 2001, declined in 2001 but has been relatively stable from 2002 to the present. Figures 1 and 2 below illustrate these shifts in employment.

**Figure 1 – U.S. Manufacturing Employment (Seasonally Adjusted) 1992-2003**




Source: U.S. Bureau of Labor Statistics

**Figure 2 – U.S. Service-Providing Industry Employment (Seasonally Adjusted) 1992-2003**




Source: U.S. Bureau of Labor Statistics

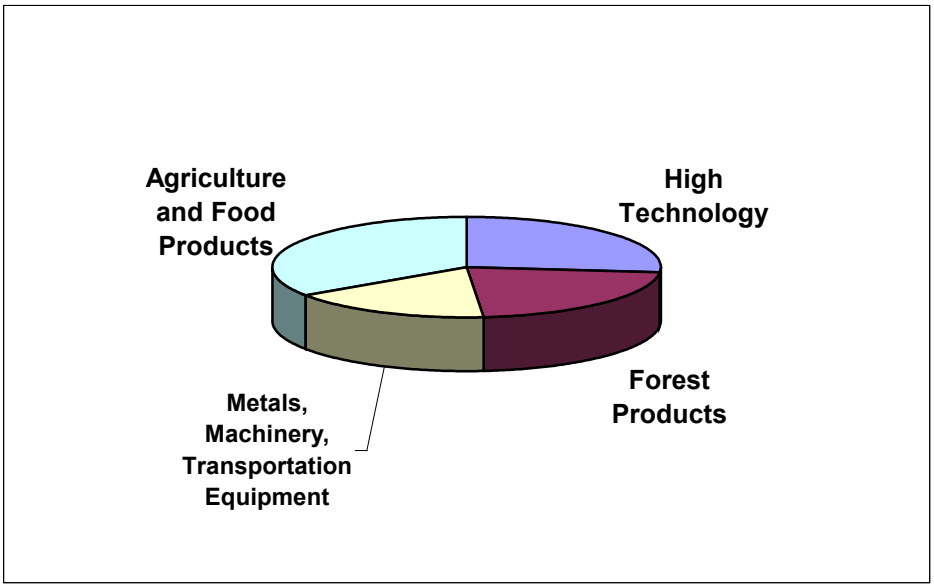
U.S. manufacturing employment is forecast to grow at annual rates of about one to two percent between 2004 and 2006, and then decline through the remainder of the decade. Non-manufacturing employment is expected to continue growing at annual rates of 1.5 to three percent between 2005 and 2009, continuing the trend of higher growth in the non-manufacturing sectors of the economy. These national forecasts are compared to those for Oregon in the following section.

## Oregon Economic Trends

Several key shifts in Oregon's economy have also occurred over the past decade, frequently reflecting the national trends. Oregon's economy is continuing to diversify, with the increasing importance of high technology industries.

- **Traded Sector Industries**
  The Oregon Business Plan identifies key "traded sectors" of the state's economy. Traded sector industries are those clusters of industries that sell their goods and services in competition with businesses in other states. Traded sector industries provide approximately 262,000 Oregon jobs (Figure 3). Trends in Oregon's traded sector industries are viewed as indicative of overall shifts in Oregon's economy and as keys sources of Oregon's economic success.

**Figure 3 – Oregon's Traded Sector Industries**




Source: Oregon Business Plan

High technology is Oregon's largest industry with 70,000 jobs, the largest share of state export revenue, and more than 10 percent of U.S. semiconductor output. Employment has grown 5.6 percent annually the past decade. Average wages are more than $58,000 annually.[1] Because of the high value and global nature of this industry, fast reliable surface transportation and access to international air service are critical.

The metals, machinery, and transportation equipment sector has experienced a 3.7 percent annual growth rate in employment over the past decade, out performing the industry nationally. It is responsible for $1.5 billion in exports. This industry uses a variety of trucking and rail services. Many of these businesses use "just-in-time" manufacturing strategies in which warehouse inventories are minimized and components scheduled to arrive within a narrow window of time. This has accentuated the need for reliability and management of the supply chain.

The agriculture and food products sector accounts for $1.4 billion in annual exports. Average wages are about $16,000 annually, due to high levels of part-time work. Oregon's output growth in agriculture has tracked national averages during the past decade. The forest products sector remains a major component of Oregon's economy, but has experienced an annual decline in employment of about 2.5 percent over the past decade. Forest and agriculture products continue to rely on a combination of rail, trucking, barge and ocean shipping to transport goods to market.

[1] The Oregon Business Plan, www.oregonbusinessplan.org

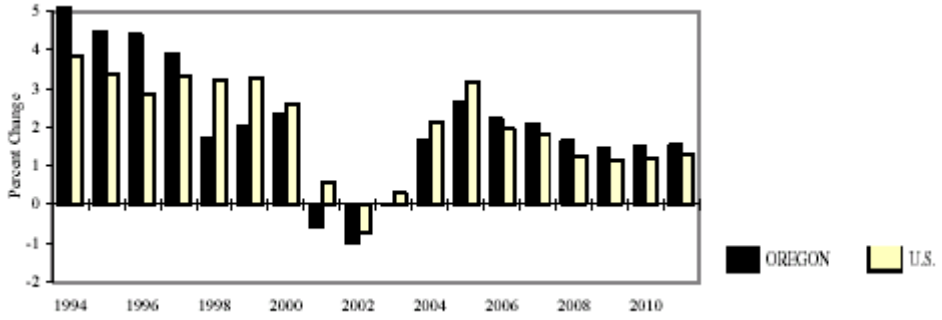
- **Tourism and Transportation**

  Tourism in Oregon is a 6.1 billion dollar industry that plays a vital role in creating new job opportunities and strengthening local and regional economies. Tourism spending has increased 5.7 percent per year since 1991. With the current global economic climate keeping travelers stateside and closer to home, Oregon is well-positioned: nearly half of Oregon's overnight visitors travel from within a 300 mile range, while another 36 percent travel from between 300 and 1,000 miles away.

- **Employment Forecasts**

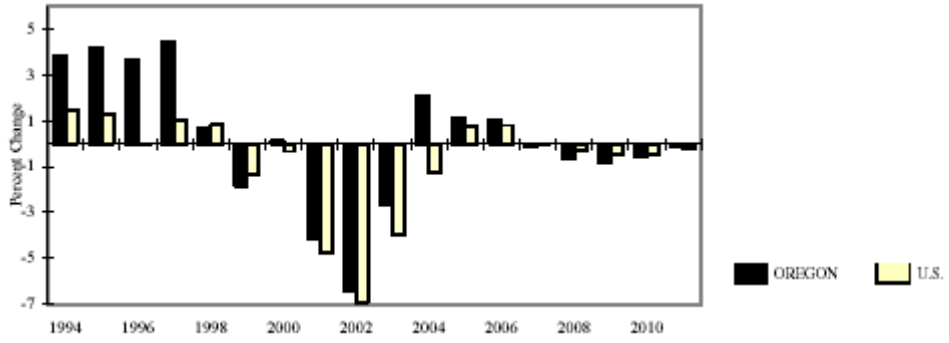
  As noted above, the economic shift toward the service sector of the economy is evident in that the growth of non-manufacturing employment in Oregon is projected to grow at annual rates of greater than the non-manufacturing sector for the U.S. as whole. Similarly, Oregon's manufacturing employment is forecast to grow generally faster than the U.S. job growth, albeit not as rapidly as growth in the non-manufacturing sector. Figures 4 and 5 illustrate this forecasted employment growth in Oregon and the U.S.

**Figure 4 – Private Non-Manufacturing Employment 1994-2010**




Source: Oregon Office of Economic Analysis, Oregon Economic and Revenue Forecast, March 2004

**Figure 5 – Manufacturing Employment 1994-2010**



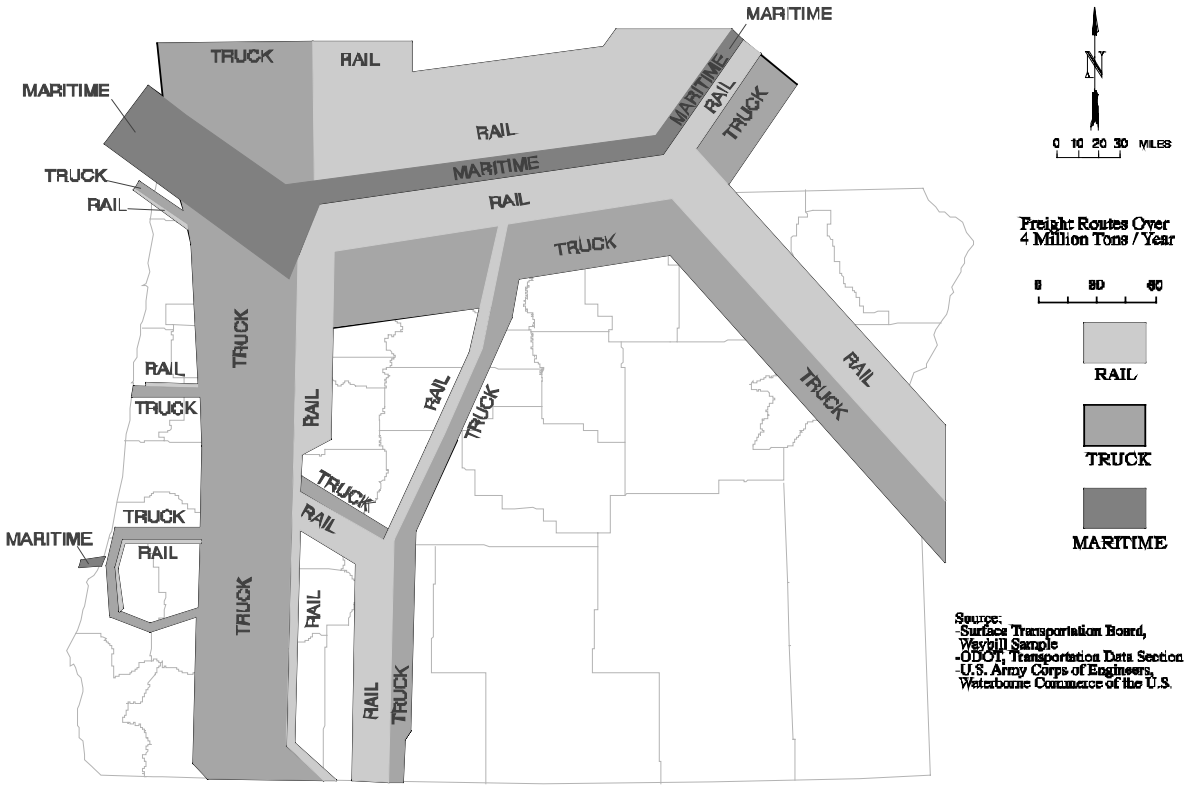

Source: Oregon Office of Economic Analysis, Oregon Economic and Revenue Forecast, March 2004

All areas of Oregon are expected to experience growth in the next twenty years. However, while Oregon's economy is becoming more diverse with the emergence of high tech industries and the growth of manufacturing in several industries, economic growth is increasingly concentrated in the North Willamette Valley with smaller growth centers in the Medford and Bend areas. Other areas of the state will continue to rely on forest products, agriculture and tourism.

## Transportation Trends Related to Oregon's Economic Growth

- **Freight Transportation**
  Figure 6 illustrates major Oregon surface freight corridors and the magnitude of shipments by mode. A number of things are evident from this schematic. First, truck, rail and water freight transportation all form significant north-south and east-west corridors that cross in Portland, which is also the location of the state's largest airport as well. Second, all areas of the state, except the southeast, have direct access to these high volume truck and rail corridors. Third, the relative size of rail and truck volumes indicates that in the Interstate-5 corridor, the most significant north south corridor, trucking carries more cargo than rail.

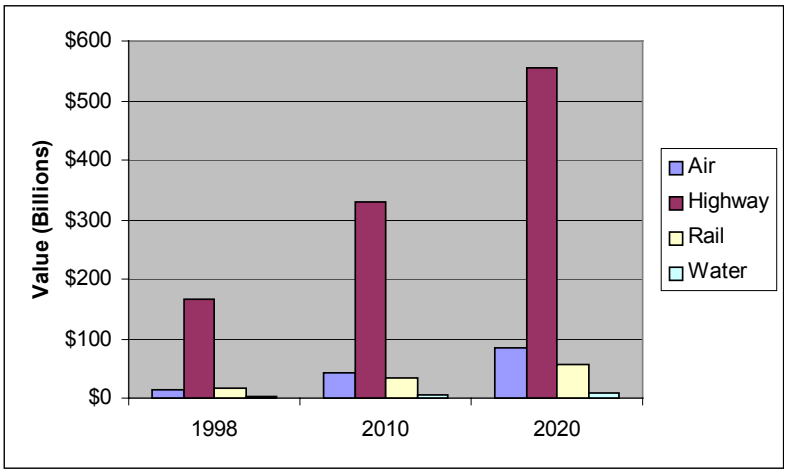
**Figure 6 – Oregon Freight Shipments by Mode**



Modal trends in Oregon freight shipments are reflective of the overall shifts in Oregon's economy. Truck shipments make up for 76 percent of freight volumes and account for 83 percent of the freight value. Shipments by truck have been growing and are expected to continue to grow, both in absolute terms and as a proportion of all freight shipments (Figure 7). Multiple reasons for this shift include increased importance of package express, higher value of goods, more time sensitive goods shipments and the increasing use of "just in time delivery" to support manufacturing.

While truck and air are the fastest growing freight sectors, rail and water continue to grow and to be significant to Oregon. Two of the state's four top traded sector industries, forest products and agriculture, continue to rely on rail and water to reach distant domestic and foreign markets.

**Figure 7 – Oregon Freight Trends**
**Shipments by Mode by Value**




(Source: FHWA Freight Analysis Framework, Freight Transportation Profile (US and Oregon)

Intermodal freight transportation uses containers or truck trailers that can be transferred between modes without reloading. These shipments have become significant to Oregon agriculture and manufacturing in the past 20 years. Intermodal shipping can combine cost, speed and reliability advantages of trucking, rail and water transportation. It can aid industries in outlying areas by bringing advantages of rail or water shipping without actually being on a rail line or at a port. Significant industry effort is going into enhancing the reliability of container shipping by finding methods of tracking containers in real time and making information available to shippers.

- **Passenger Transportation**

  While the primary emphasis of this paper is on freight transportation, several aspects of passenger transportation are particularly important to Oregon's economic future and should not be overlooked:

  1. Oregon's tourist economy depends on efficient, reliable national passenger linkages and reliable transportation networks within the state.
  2. Oregon is host to a variety of corporate headquarters, marketing firms and other firms engaged in selling professional services throughout the nation and the world. Efficient, reliable air linkages are critical to the success of these enterprises.
  3. In the new economy, dominated by high tech and services, getting workers to jobs is just as important as getting supplies to the assembly line. The National Highway Cooperative Research Program Report 463, "Economic Impacts of Congestion," found that congestion and resulting delays actually increases the cost of labor.

**Implications for Freight in the New Economy**

Drawing together transportation and economic development trends leads to several key conclusions that have implications for transportation policy:

- All freight modes, including trucking, rail, water, air and intermodal will continue to be important to Oregon's economic future.

- The significance of linkages to national and international markets will continue to grow.

- Speed, cost and reliability will continue to characterize transportation needs factors, with increasing emphasis on reliability and management of supply chains.

- The increased emphasis on reliability and supply chain management is increasing the importance of efficient local and regional movement of goods even if ultimate shipping destinations are across the nation or overseas.

- Given the increased importance of reliability to Oregon's growth industries, traffic congestion, both for highways and rail, may be the single most significant transportation problem for economic growth and development.

- It will continue to be important to provide transportation linkages to all areas of the state in order to allow those areas to take advantage of economic opportunities, even as growth industries appear to be concentrating in metropolitan areas.

- Targeting of specific industry location decisions such as the citing of manufacturing plants is likely to remain a local and regional responsibility. At the state level, the development and maintenance of an efficient network of connections will facilitate local targeting of industries.

## Transportation and Economic Development Policy

### Policies of the 1992 Oregon Transportation Plan

Policies of the 1992 OTP address economic development and freight issues at a broad level. These policies were visionary at the time of adoption and still address some of the issues and needs discussed above. Key policies include:

**Policy 3A: Balance and Efficient Freight System**: It is the policy of the State of Oregon to promote a balanced freight transportation system which takes advantage of the inherent efficiencies of each mode.

Implementation actions include: (1) developing a freight data base, (2) building ODOT expertise in freight, (3) taking action to ensure equal treatment of intrastate carriers vis-à-vis interstate carriers, (4) working with local governments to improve efficiency and (5) improving rail-highway grade crossings.

**Policy 3B: Linkages to Markets:** It is the policy of the State o f Oregon to assure effective transportation linkages for goods and passengers to attract a larger share of international and interstate trade to the state.

Implementation actions include: (1) attention to connections of freight system to industrial areas, (2) intercity passenger services, (3) highway system improvements to allow efficient truck transportation, (4) promotion and retention of rail services and rights-of-way, (5) promoting air freight, (6) encouraging port investment, (7) maintaining container services at ports, (8) improving river systems and ocean port channels.

**Policy 3C: Expanding System Capacity:** It is the policy of the State of Oregon to expand the capacity of Oregon's freight industry by facilitating increased cooperation among the providers of transportation facilities and services.

Implementation actions include: (1) promoting shipper associations, (2) strengthening interstate relationships regarding the Columbia-Snake River System, (3) port coordination, (4) increasing public awareness of freight needs, (5) removing institutional barriers to efficient rail freight practices.

**Policy 3D: Intermodal Hubs:** It is the policy of the State o f Oregon to promote intermodal freight and passenger transportation hubs to enhance competitiveness, improve rural access and promote efficient transportation.

Implementation actions include: (1) facilitating development of hubs identified in state transportation system plans, (2) recognizing deep draft ports as intermodal hubs, and (3) support of Portland's role as a major freight hub for all modes.

Policies on balance and efficiency, linkages to markets and expansion of capacity were implemented in part through subsequent actions at the state level and in regional planning. Implementation actions in other cases were less effective. In revising these policies for the OTP update, particular attention should be given to addressing the new realities of economic development and freight as described above and in effective opportunities for implementation.

**Examples of Effective and Responsive Policies**

There are several examples of effective and responsive transportation policy development and implementation since the 1992 Oregon Transportation Plan. These examples recognize key factors in economic development, related transportation needs and the existing, overarching OTP policies,.

- **System Preservation Policies**
  System preservation is critical to preserving and enhancing Oregon's economy. Oregon's highway and rail system reaches to all areas of the state, providing the opportunity for development of new industries. In addition, whether in urban or rural areas, increased reliance on just in time delivery and complete logistics systems puts a premium on reliability. Oregon's highway system preservation policy targets road surfaces and bridges to assure a well maintained system, providing access to all areas of the state.

  Largely in response to bridge replacement and repair needs, and the significant negative impact that is beginning to be felt from weight restrictions, the 2003 legislature passed the ten-year, $2.5 billion Oregon Transportation Investment Act III, providing $1.65 billion for repair and replacement of more than 500 state and local bridges. More is said about this program below.

  System preservation is also addressed in ODOT's response to short line railroads. The proportion of Oregon's rail miles owned by short line railroads has grown markedly over the past decade, resulting in short lines comprising almost half of the state's rail mileage and serving almost 60 percent of Oregon's shippers. These lines have been

successful in marketing rail services and providing service to shippers who might otherwise need to relocate or shift to truck.

The 2001 session of the Oregon Legislature provided $2 million in lottery-backed bonds to be used for the rehabilitation of Oregon's short line railroads. The funds were distributed to nine short line railroads in the state and leveraged an additional contribution by the railroads of $1.6 million of their own funds resulting in expenditures totaling $3.6 million. Using these funds, the short line railroad implemented rail infrastructure improvements by June 2003.

- **Corridors Approach to Cracked Bridge Problem**

  Oregon's cracked bridge problem required ODOT to limit the weights of vehicles (trucks) allowed to cross many bridges to address public safety. These weight limits adversely affect Oregon businesses and communities, as well as the state's overall economy. ODOT's Economic and Bridge Option Report noted:

  > Weight limits lead to truck detours, which put trucks on city streets and other roadways that often have inadequate maintenance funding and were not built for these loads. In addition to safety concerns resulting from increased traffic detours through local communities, the current deterioration of local bridges impedes the response time of emergency personnel to reach citizens. For businesses that rely on trucks to bring raw materials and to deliver products, detours mean increased transportation costs, eroded profit margins and other negative impacts.

  The corridor approach and phasing of the program to fix the cracked bridges on interstate and other key freight routes is directly reflective of economic development policy to address negative economic impacts on shippers and minimize the effects of detours on communities.

- **Recognition of the Transit – Land Use Connection**

  Oregon has historically been and continues to be on the forefront of consideration between transportation and land use. Oregon's transportation planning rule (OAR 660, Division 12) requires local jurisdictions to consider land use approaches that help meet transportation needs. These policies are, in part, to encourage transportation efficient land uses and address the problems engendered by lower-density and automobile-dependent land use patterns. ODOT and Oregon Department of Land Conservation and Development's joint Transportation and Growth Management (TGM) Program is designed to integrate transportation and land use planning and has funded development of transportation systems plans and integrated land use and transportation plans for Oregon communities. Transportation systems plans address communities' transportation needs through consideration of land use strategies that can encourage use of alternate modes.

- **Immediate Opportunity Fund (IOF)**

The IOF is a partnership between ODOT and the Department of Community and Economic Development (CED). The fund makes available State Highway Funds (usually up to $500,000) for road and street improvements needed to secure investment in local industry that will create new family wage jobs. CED determines that the investment is necessary and justified.

Normally, the targeting of specific industries is a local and regional responsibility. This approach allows the state to make key non-speculative investments in these targeting industries when lack of adequate road access is the limiting factor. One shortcoming of the program is that it is strictly limited to roads. A similar program that permitted rail, airport or port investment would also be valuable.

## Policy Gaps

In addition to examples of effective and responsive transportation policies with regard to economic development, there also appear to be policy gaps.

- **Congestion**

  As discussed above, traffic congestion reduces economic productivity and may be the single most significant transportation threat to economic efficiency of growth industries. State transportation policies and programs generally address the effects of congestion in terms of air quality impacts or system level of service, but not with respect to economic development. In recent updates of the Statewide Transportation Improvement Program (STIP), project selection has included consideration of freight needs. This is a start, but more consideration needs to be given to strategies to reduce the impact of traffic congestion of freight movement on a system wide basis as well as project-by-project.

- **Lack of State Investment Strategies for Air, Freight Rail and Ports**

  While highway use has been growing–and is project to continue growing – in terms of use and importance with respect to economic development, air, ports and waterways, and freight rail will remain important components of the state's transportation system. Investment policy with regard to these other modes is not as well developed or as closely aligned with economic development policies.

  **Aviation:** The 2000 Aviation System Plan acknowledges the importance of airports to the economy, and the maintenance of a network providing effective air access is one of the aims of the program. However, the only specific economic policy is to educate and inform the public of the importance of airports to the economy. In addition, the very limited funding now available at the state level generally limits state investments in air facilities.

  **Maritime and waterways:** Most ports see their roles as primarily related to economic development. At the state level there appears to be a lack of clear policy on ports and waterways. In some instances, such as dredging the lower Columbia River

to a new depth, the state has participated in funding the project through lottery backed bonds. On the other hand, state policy on maintenance of the Mid-Columbia and Snake River waterways has been less clear. There does not appear to be a clear transportation policy related to assisting development of port facilities.

**Freight Rail:** As noted above, ODOT has been effective in the promotion of shortline railroads and the preservation of branch lines. However, when a 2002 evaluation of Union Pacific and Burlington Northern-Santa Fe operations in the I-5 corridor found significant congestion that was hurting potential port development and potentially limited local industry connections, public options for investing in improvements turned out to be very limited.

## A Proposed Policy Framework for Transportation and Economic Growth for the OTP Update

The following policies are proposed to address the needs, issues and opportunities created by economic growth and transportation trends in Oregon and around the world.

1. It is the policy of the State of Oregon to preserve and extend Oregon's freight network to meet transportation needs of business and industry, with particular attention to:
    a. The role of transportation in promoting traded sector industries throughout the state;
    b. Addressing freight capacity and reliability needs;
    c. Assuring the availability of information technologies to take advantage of new paradigm in freight logistics;
    d. Preservation of transportation infrastructure;
    e. Ensuring that all areas of the state are efficiency connected to the national and international transportation network, through the statewide network of roads, railroads, ports and airports.
    f. Promoting intermodal facilities as an efficient means of enhancing efficiency of services available throughout the state.

2. It is the policy of the State of Oregon that economic development objectives and strategies be included in all local, regional and corridor transportation plans.

3. The State of Oregon explicitly recognizes the role of the passenger transportation network in:
    a. Preserving Oregon's livability as an economic asset;
    b. Providing efficient access to jobs; and
    c. Providing access to the nation and the world to serve industry travel needs and tourism.

4. It is the objective of the State of Oregon to promote economic development through a balanced multi-modal freight network. Therefore, a priority of this plan is to create a flexible source of freight facilities investment, that:

a. Permits investment in airports, ports, freight rail and intermodal facilities when required by compelling statewide economic interests; and
b. Expands the Immediate Opportunity Fund to include all modes of transportation.

# Appendix A: Framework for Evaluation of Transportation and Economic Development Strategies

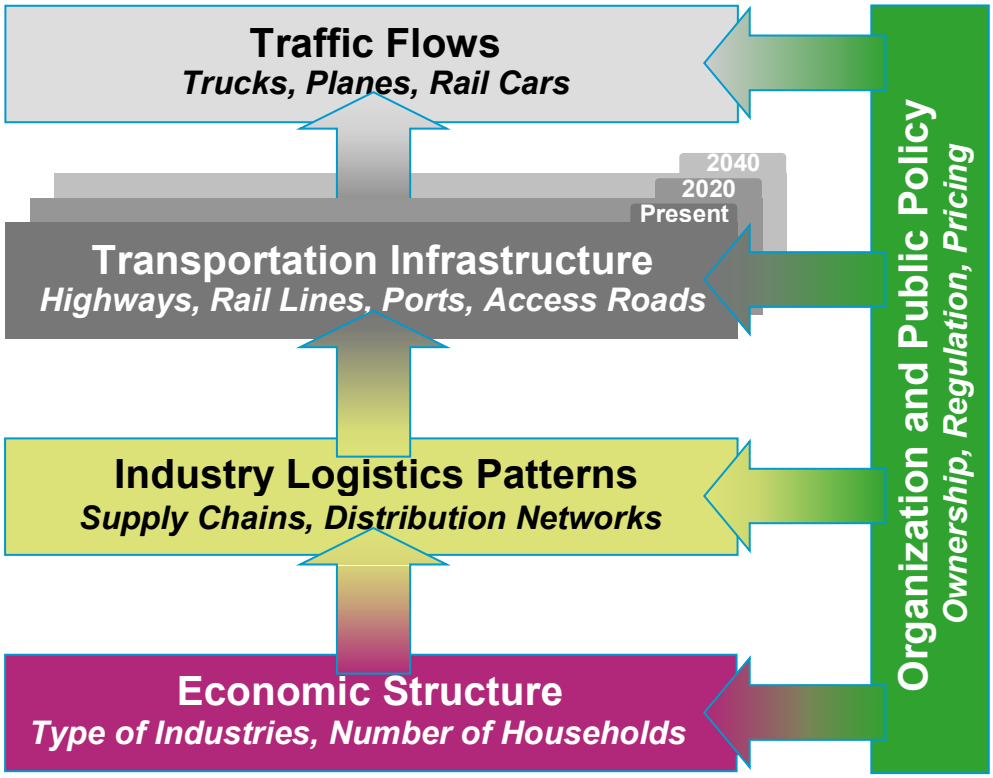
This appendix provides a detailed discussion of how a state or regional agency such as ODOT, or a regional transportation or economic development agency can evaluate alternative transportation strategies for attracting and developing specific industries.

## Integrating Economic Policy with Transportation

Fostering economic development with targeted transportation investments is not as simple as some might believe. As the maturity of our transportation system grows, there are fewer opportunities to unleash significant economic development by widening roadways, dredging channels, expanding airports, or building new transit corridors. Furthermore, transportation projects in and of themselves are almost never the sole impetus for economic development. Industrial location experts almost always cite quantity and quality of the labor force, quality of life, proximity to markets, and access to raw materials as more critical determinants of a region's attractiveness. These complicating factors, fewer opportunities and critical bundling of non-transportation improvements, creates a complex process for transportation planners trying to respond to project stakeholders and advocates who may see transportation funding as one of the few remaining resources to address economic development.

Given this complexity, we propose a comprehensive framework for thinking about the role of transportation in economic development. This framework (pictured in Figure A-1) recommends transportation policy makers and planners think first about the structure of the economy for their region, then how their economy uses logistics to function. These logistics patterns exploit the transportation infrastructure, which results in the traffic flows we observe. The transportation policies and the organizations, regulators, funders, and owners influence all four levels of this process. The opportunities to use transportations polices in each level to improve economic growth is described below.

**Figure A-1 Integrating Economic Policy to Transportation**




Source: Cambridge Systematics, Inc.

- **Economic Structure** – Its important to understand the key trade relationships between the region and its trading partners. This requires quantifying the roles of each major industry and assessing the local, national, and international economic factors that will drive each industry's demand for goods movement. In addition, this step involves profiling each major industry's performance. At the very least, transportation planners and policy makers should be aware if the industry or an industry cluster is growing or shrinking faster or slower than the national average. This trend analysis will be vital in determining how effective transportation investments will be in contributing to the overall health of the industry being targeted.

- **Industry Logistics Patterns** – Given the region's economic structure and industry mix, how do these activities exploit the transportation system to move their goods? Specifically, this investigation identifies the supply chains and distribution patterns for the key industries – factors such as locations of distribution centers, order rates and time sensitivity, transport/inventory cost tradeoffs, and key technology trends.

- **Goods Movement Infrastructure** -- Transportation planners may now turn to the current infrastructure used to support the logistics patterns. This step involves gathering data and mapping all the key regional elements and the

characteristics that affect service. For example, rail shipping through the Cascades is limited because the snow sheds are not high enough for double-stacked domestic containers.

This step will likely involve looking at goods movement infrastructure outside the region that will influence the success of a regional transportation investment. The proposed widening of the Panama Canal, for example, could cause a significant shift for grain moving out the Mississippi to the Gulf ports.

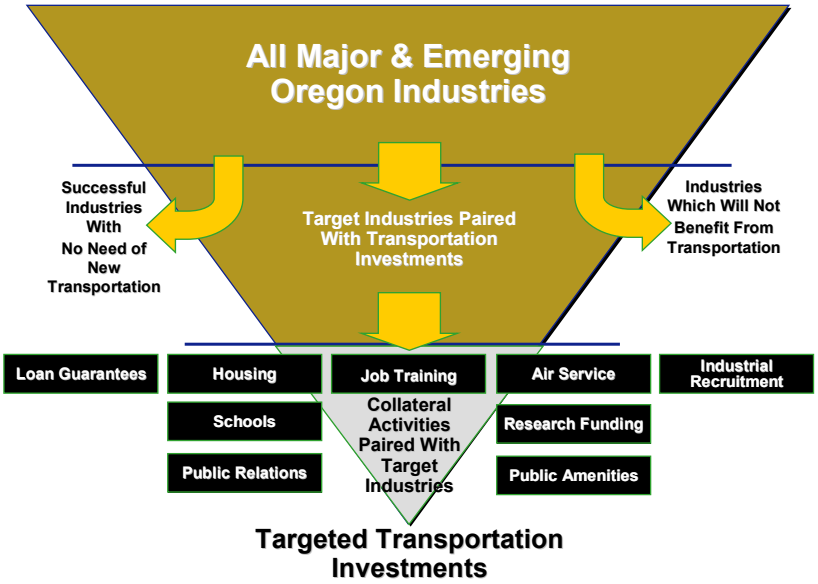
- **Traffic Flows** – Finally, once the previous three layers have been understood, transportation planner may comprehend the observed and forecast commodity flows, traffic volumes, trip origins and destinations, congestion, accidents, etc. in a much more informed and comprehensive light. This approach provides an economic context for how traffic problems may or may not affect economic development.

The vertical bar that straddles all four layers in Figure A-1 represents the public's opportunity to solve problems that show up in each of these layers. Bottlenecks, for example, may indicate insufficient capacity in the goods movement infrastructure (e.g., rail capacity in the Portland Triangle) or insufficient staffing for public agencies (e.g., enough customs officers to process "hot loads" on weekends). Descriptions of possible policies and investment strategies will be described in the sections below.

**Targeting Industries**

The framework laid out in Figure A-1 reinforces the principle that any economic development strategies must be focused on specific industries and integrated into the regional economic structure. Figure A-2 expands the first layer (Economic Structure) in Figure 8 and suggests a strategy for targeting the industries most likely to benefit from transportation investments

**Figure A-2 Targeting Industries for Transportation Investment**




Source: Cambridge Systematics, Inc.

The top-most layer in Figure A-2 requires an understanding of the economic structure of the region to rank all the major industries or industry clusters into three industry groups:

- **Successful expanding industries** who will continue to grow with or without aggressive solutions to their transportation needs or who's growth does not depend on transportation (e.g., electronic microchip manufacturing).

- **Failing industries** that are losing money, market share and employment where the primary causes are not related to logistics, transportation infrastructure, or traffic flows. These industries for which targeted transportation investments would not improve economic prospects. Declines in Oregon's lumber and wood products industry, for instance, is the result of factors that would not be substantially affected by any amount of investment in transportation.

- **Industries with clear transportation dependencies** that are growing more slowly than their national average. This group will range from industries where transportation investments would contribute the most benefit of all possible public sector interventions to those where transportation would contribute the least.

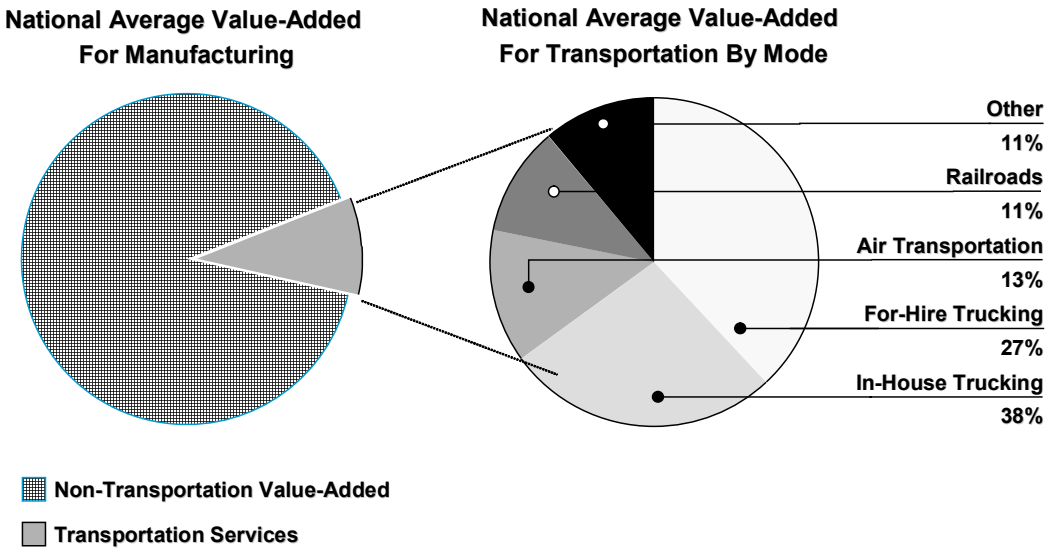
This approach may be thought of as industrial triage, where the identification of industries in the third group provides a more focused target for transportation investment. As a general rule, transportation planners are *not* economic developers (and vice versa). Furthermore, transportation investments – with their added appeal of federal matching

funds – are often perceived as a panacea for policy-makers faced with significant economic problems and insufficient resources to solve them. In Oregon, transportation funding is not large enough to promote economic development without a close integration with economic development fundamentals.

### Analysis of Goods Movement-Intensive Industries

The process of identifying which industries are most likely to benefit from transportation investments may begin with relatively straight-forward analysis of the value added transportation accounts for in each industry's production. While this should be done at the state level, Figure A-3 provides an illustrative snap shot of all industries at the national level.

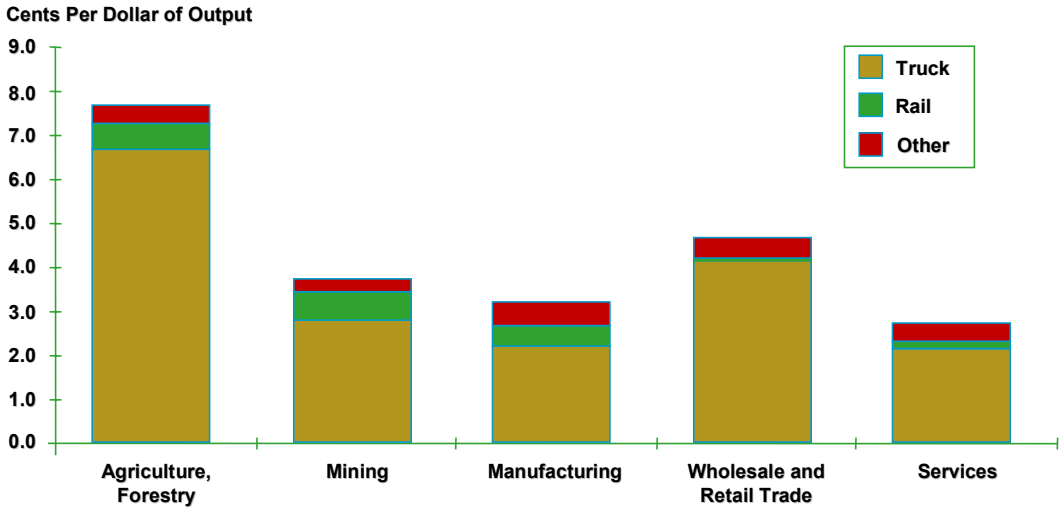
**Figure A-3: Role of Transportation Investment as a Share of Value-Added in U.S. Economy**




Source: National Transportation Satellite Accounts, 1996

The next step is to divide the value added by transportation into the respective modes. Goods movement-intensive industries have less flexibility in the modes they use than is often understood by economic development officials and transportation planners. Careful analysis of each industry's logistics indicates which mode dominates the industries shipping patterns. The analysis may reveal opportunities for mode shifts that in turn provide significant cost savings and/or improved productivity, but these opportunities are few and far between. The Alameda Corridor project in Los Angeles, for example, will probably increase the amount of containers moving out of the Port of LA and Long Beach by rail significantly, but only as on-dock rail capacity in increased by terminal operators and only over time. Figure A-4 illustrates the breakout of the value-added from transportation by mode at the national level.

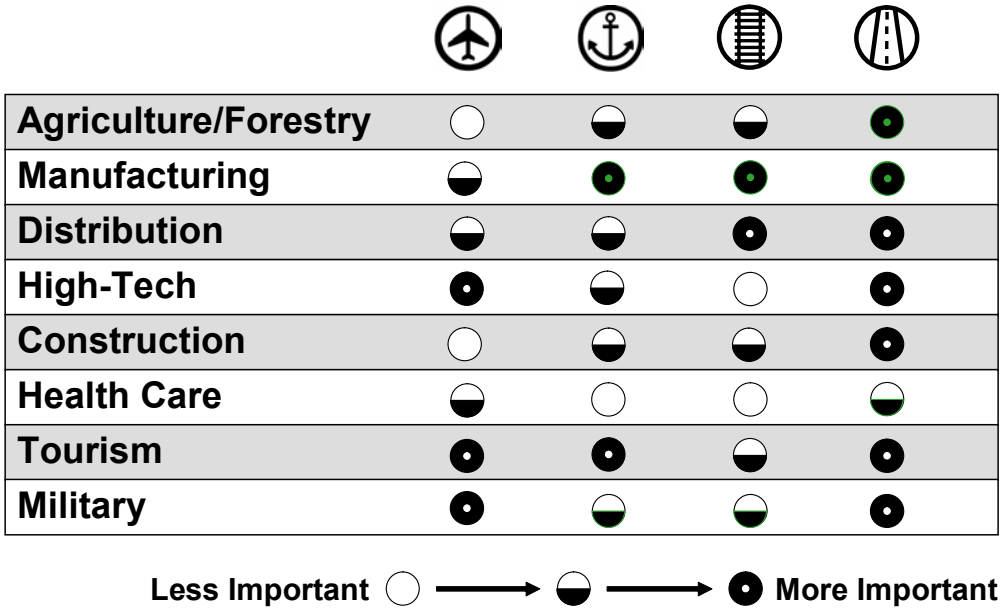
**Figure A-4: Role of Transportation Investment as a Share of Value-Added in U.S. Economy**




Source: National Transportation Satellite Accounts, 1996

Within those industries that need help and would likely benefit, an understanding of how much each industry uses various modes (both those currently located in Oregon and those targeted by economic development officials) provides the first step in targeting transportation investments. Figure A-5 presents a qualitative rating of the modal intensity for major industry groups based on national averages.

**Figure A-5: Average National Modal Intensity Ratings for Major Industry Groups**




Source: Cambridge Systematics, Inc.

Unfortunately, it will not be sufficient to have this understanding at the national level and it may not suffice at the state level. The successes of most transportation investments

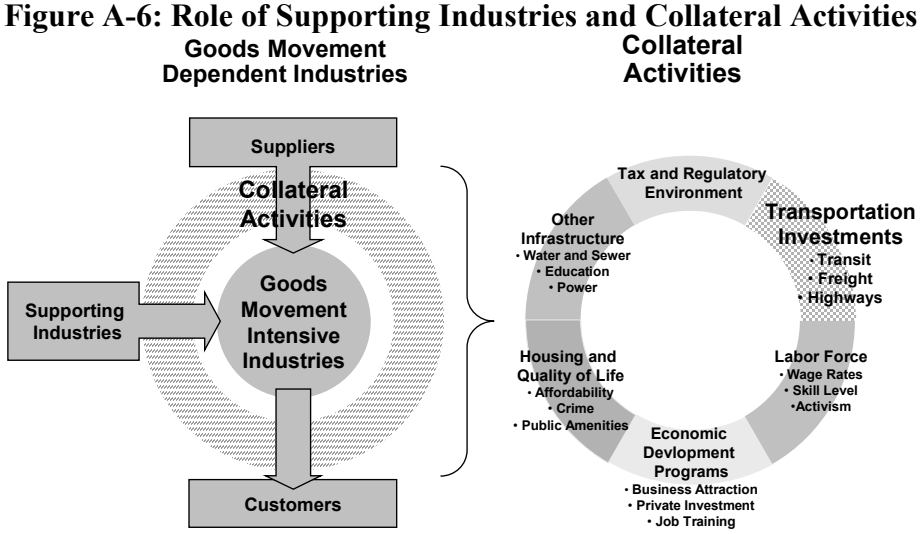
vary by region and by rural versus urban corridors. Research on the role of highways and lane expansions in economic development, for example, shows that improvements to rural highway connections between communities can have significant benefits even if there is no congestion. On the other hand, the same literature shows that expanded highways can sometimes have no appreciable effect on economic development. Therefore, analysis must be both industry and geographically specific.

In summary, this complex and detailed approach is intended to pull apart the often-heard mantra: *build it and they will come*. This approach determines: *who and where they are*. It then evaluates the performance of each industry likely to benefit from the investments, filtering out those that have little or no dependence on highway access to suppliers and customers or that are in steep decline for reasons beyond any need for improved transportation. The next step involves assessing the benefits of transportation in the larger economic context.

## Collateral Activities

Once a transportation or economic development agency has selected group of industries that would benefit from transportation improvements, strategic public investments in highway expansions must be bundled with other non-transportation interventions and investments – what may be termed collateral activities. These activities form a vital interface between the transportation or goods movement-intensive industries and their suppliers, supporting industries and customers. This interface, however, is composed of very divergent elements (Figure A-6).

**Figure A-6: Role of Supporting Industries and Collateral Activities**




As shown in Figure A-6, transportation is only one of many critical elements in a comprehensive economic development program. The other elements include:

- Labor force characteristics such as the wage rates, supply and mix of skilled labor and level of labor organization and activism.

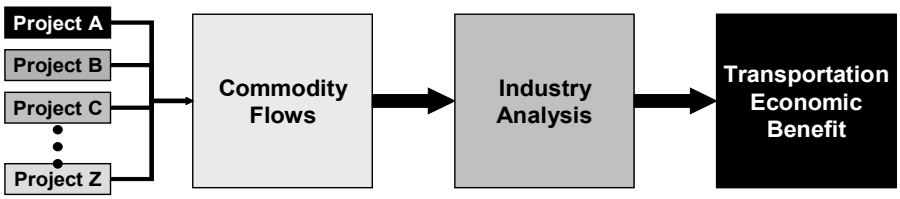
- Economic Development Programs: State and regional economic development corporations (EDCs) or chambers of commerce undertaking business attraction efforts such as industrial and labor force recruitment, job training programs, access to venture capital.
- Quality of life and cost of living, including schools, housing, recreation.
- Other infrastructure improvements, including water, sewer, telecommunications (band width), power;
- Tax and regulatory environment including the ease of building permits and the level of community involvement.

In the past 20 years, it may be impossible to cite a single success that came about from a stand-alone transportation investment. Composing an appropriate and realistic package of collateral activities, however, goes beyond the knowledge, resources and responsibilities of transportation agencies. Transportation must work in concert with economic development authorities to identify the specific collateral activities. Thus to be effective state and regional transportation planners and the State Transportation Commission need to work with economic development organizations to attract and develop target industries.

**Measuring Economic Benefits of Transportation**

If all of the steps describe above were followed planners and policy makers would be left with a list of investments that have the potential to generate economic benefits. The three part analysis is shown in Figure A-7 provides a reasonable comprehensive analysis of each project's likely contribution to economic development.

**Figure A-7 Evaluation of Transportation Projects for Economic Development**




Source: Cambridge Systematics, Inc.

When a highway improvement is proposed, the economic evaluation must first identify which industries will be impacted. This involves the following sequence of three analytical steps within the Commodity Flow analysis):

1. Locate the improvement on the highway or rail network.
2. Identify what commodities are being shipped and person trips on the roadway that will have the proposed improvements and forecast the growth of these commodities.
3. Locate the origins and destinations of these commodities and identify the industries that are involved in shipping and receiving.

The second component (Industry Analysis) takes a closer look at these industries: This second component involves the following three steps:

4. Identify industry sectors that export their products and rely on surface transportation for significant amounts of their inputs and/or outputs. This may involve preparing industry profiles that summarizes the industry's recent performance and dependence or various modes of freight transportation.
5. Identify new industry sectors and new businesses that are not now present in the state or region but could be recruited if the conditions became attractive. This step relies on the knowledge of economic development officials to inform a business attraction model.
6. Estimate each industry's direct benefits, including travel time reductions, operating cost reductions, and safety benefits from the proposed transportation improvement (Step 3) based on its industry profile (Step 4) and the change in its shipping and receiving operations (Step 2).

The third component (Transportation Economic Benefit) involves estimating the job creation, growth in personal income, and changes in regional output generated from completing the project. This component involves the following three steps:

7. Determine the health of the industry (Step 4) and its needs for other economic development assistance (i.e., collateral interventions). This assessment will determine if the businesses being helped are in industries that are declining or expanding. This would give the agency an indication of how effective the transportation investment may be given the broader business climate.
8. Input each industry's direct benefits (Step 6) plus the additional business location estimated with the business attraction model (Step 5) into a multi-regional economic model (e.g., REMI, IMPLAN). This will determine how direct improvements to an industry's access to inputs or customers will ripple through the regional economy to create jobs, increase personal income, and expand the region's gross product. This provides an estimate of the full economic benefits associated with a highway improvement.
9. Estimate the costs of each proposed project using a cost model based on unit costs taken from similar projects recently completed in other states or regions.
10. Compare benefits and costs for each project.

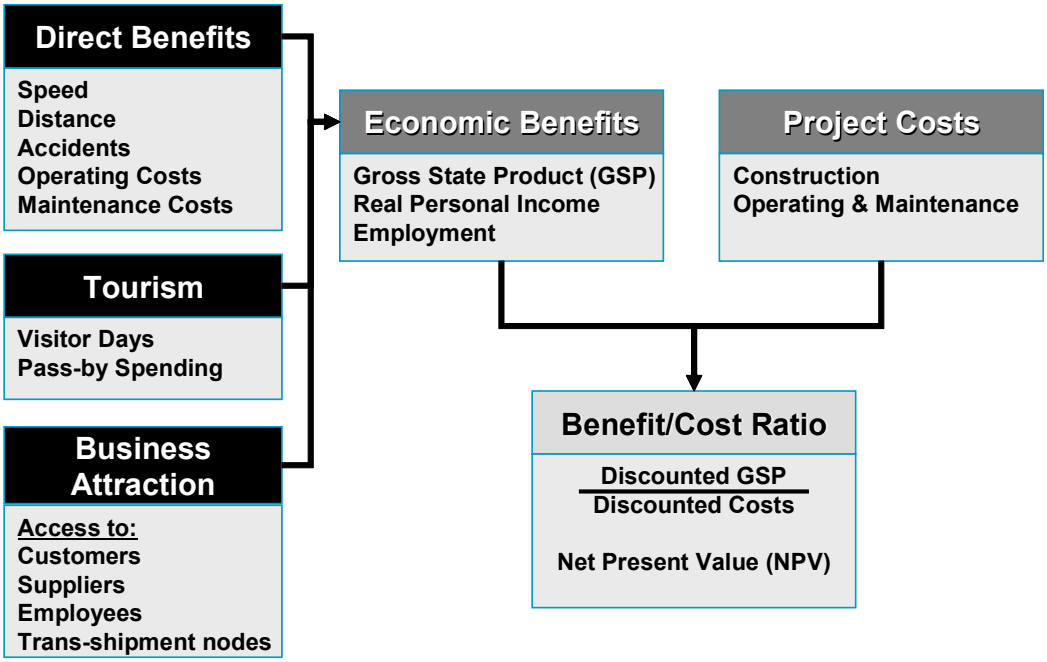
This final step involves determining which projects on this list merit implementation. The answer may be reached through a number of methods. For the sake of brevity and simplicity, we describe two methods that define two ends of a continuum:

- At the most conceptual or visionary end of this continuum is a method that uses a longer term vision of what the region or state wants to look like. The Portland Metro 2040 Plan is an excellent example of such a vision. The projects on the list are then assessed qualitatively or quantitatively in regard to their role in helping the region or state reach this vision.

- At the more quantitative and project specific end of the continuum, each project undergoes benefit-cost (B-C) analysis. Projects are ranked according to their B-C ratio or net present value (NPV). Projects with negative B-C ratios or NPV's are dropped altogether.

Comprehensive benefit-cost analysis has been improving over the past ten years but has by no means developed reliable methods of quantifying all significant benefits or costs. Thus the results must be placed in the context of such non-quantified impacts as community cohesion, environmental impacts, and a host of other quality of life impacts that defy quantitative estimation. Nevertheless, a reliable (if limited) benefit-cost analysis can estimate the major economic benefits to the state's industries. Figure A-8 shows the flow of comprehensive benefit cost analysis.

**Figure A-8 Comprehensive Benefit Cost Analysis of Transportation Projects**




Source: Cambridge Systematics, Inc.