

OREGON TRANSPORTATION PLAN UPDATE
Transportation and the Economy

Table of Contents

CONGESTION AND THE ECONOMY D-2

IS TRANSPORTATION A COMMODITY? D-3

TRANSPORTATION & INDUSTRY..... D-6

TRANSPORTATION & ECONOMIC DEVELOPMENT D-8

RECENT HISTORY – FUTURE CHANGE D-10

SUMMARY POINTS D-11

OREGON TRANSPORTATION PLAN UPDATE

Background Paper

Transportation and the Economy

One of the most important pillars of a modern economy is the ability to move goods and people where they need or wish to go. However, all transportation is not the same. The ability to move goods and people affects the economy differently depending upon whether the movements are local or long-distance in nature, and the purpose of each trip.

In general, the purpose of and expectations for long-distance trips are very different than those of local trips. Long-distance passenger trips are dominated by business and vacation travel. Local passenger trips are dominated by commute trips, shopping trips, and other personal business travel. Long-distance shipments of freight tend to be from resource area to factory to warehouse, or factory to factory. Local shipments of freight tend to be from warehouse to retail center, or warehouse to home.

While local and long-distance movements may utilize the same or similar equipment, the way the equipment is used, and the range of acceptable performance (in terms of time of departure, length of travel time, and consistency of travel time length), is very different. In addition, each type of movement has very different impacts on the economy.

All modern economies are dependent upon transportation of some form to move people and goods to and from other economies. Access to other economies enables trade and facilitates the specialization of labor and capital, leading to greater productivity growth and higher wages. Without such access, many productivity-improving developments would not occur, resulting in lower average productivity and lower wages. This is because isolated areas would be focused on local needs, production volumes would be low (usually implying high costs), specialized goods and innovation from outside the area would be unavailable, and there would be no or limited demand for goods (or services) in which the isolated area could specialize.

Beyond the issue of transportation access is the issue of transportation cost in terms of both time and money. Even where some basic level of transportation access exists, the cost of that access may be prohibitive for some people and some industries. This may be because of modal characteristics, lack of competition, lack of volume, etc. In such cases, trade and productivity growth are still constrained. The result is that high transportation costs prevent economies from developing at their potential rates. Therefore, a major consideration in any economic development strategy is to ensure the minimization of transportation costs to target industries. As transportation services are generally open to all users willing to pay the appropriate fees, such efforts also lower transportation costs for the rest of the economy. For example, a program designed to improve railroad connections between grain growing regions and ports would also reduce the cost of other commodity shipments that move on the improved rail lines.

Congestion and the Economy

Many industries have adopted transportation-dependent strategies designed to reduce non-transportation costs, or improve customer service. These include siting facilities in areas where large numbers of potential employees live within commuting distance, implementing “just-in-time” manufacturing and delivery concepts, and siting facilities where package express air services can pick up a parcel in the evening and still deliver it the next day.

For new plants, transportation facilities are generally in-place that enable these strategies to be adopted when the plant is sited and built. However, these transportation facilities can become degraded by congestion. As congestion worsens, it takes longer for employees to reach work-sites. Travel times become less predictable. People become less willing to travel to established work-sites. In order to keep the same general skill level in an employer’s potential labor-pool, wages must rise. As this occurs, a partial self-correcting mechanism of congestion is eliminated, in that workers are then more willing to travel to work-sites under congested conditions.

At the same time, a growing number of production facilities are depending upon “just-in-time” manufacturing techniques to minimize warehouse and working-capital costs (i.e., the interest cost of holding parts or materials in inventory). The aspect of congestion that makes parts’ or materials’ delivery times longer is a relatively small problem for manufacturers. A much larger problem with congestion (for manufacturers) is that it causes travel times to be highly variable. Shipments from a silicon wafer factory to a chip plant may take one-half hour one day and an hour the next. Accidents or other “non-recurring” events may cause a delivery trip to take even longer. For plants not contiguously located, these effects make the most efficient forms of just-in-time manufacturing impossible to implement.

Just as congestion affects the logistics of managing factory inputs, it also affects the logistics of managing factory and service firm output. For example, situations have arisen where air express delivery services could no longer guarantee next-day delivery for parcels picked up in the late afternoon. Due to congestion, guaranteed next-day delivery required an early afternoon pick up. This precludes shipment of a non-divisible final product (e.g., engineering plans) or a full day’s output (e.g., microchips).

Congestion becomes an even greater problem when peak travel hours spread throughout the day beyond a couple of hours in the morning and a couple of hours in the evening. This appears to be happening in the Portland area.

Congestion is usually perceived as a local problem. While it generally occurs in identifiable local areas, it can still have a significant effect on long-distance movements. Urban highways, airports, ports, and railroad facilities can experience congestion. While affecting only a small portion of the length of the movement, conditions in these areas can have a large effect on the time and cost of moving goods and people between two

points that are far apart. For example, airport congestion may mean that an arriving flight cannot predictably unload its passengers in time to make a near-term connecting flight. As a result, passengers must wait for a later flight. The extra time involved may result in some potential passengers not making a trip or making a different trip.

Similarly, it is very difficult to plan a motor vehicle trip between Salem, Oregon and Bellingham, Washington that avoids stop-and-go traffic in the Portland and Olympia-Tacoma-Seattle-Everett areas. Stop-and-go traffic can add one or more hours to such a trip. As a result, all other things equal, there are likely to be fewer tourist trips and shipments of goods (i.e., less trade) between Salem and Bellingham. Less tourism and less trade result in lower income.

In summary, transportation supports regional economies in three distinct ways. One is providing some form of access to/from other economies. Another is through the provision of services and infrastructure that have the ability to reduce transportation costs. Finally, transportation supports economies by ensuring the services and infrastructure provided are managed and operated in a manner that allows industries to minimize production costs as well as transportation costs. In particular, this means it is very important to find ways to reduce congestion or at least keep it from getting worse.

Is Transportation a Commodity?

Transportation is often discussed in terms of moving freight or people from point A to point B, without regard to:

- By what mode the freight or people are moved,
- Whether the mode in which they are moved matters,
- Whether trip characteristics (e.g., speed, reliability, comfort, ability to conduct work) matter, and
- Whether the movements are of a local or long-distance nature.

For freight, clarification of these points depends upon the exact nature of the trip. Local freight shipments are mostly made by truck and, with few exceptions, cannot be made by other modes. However, the manner in which a truck is managed depends upon whether the shipment is for delivery to a just-in-time manufacturer, delivery to a distribution center, delivery to a retailer, express delivery to a wide variety of customers, or delivery to a household. Each of these operations has different cargo values, different values for on-time performance, different labor costs, and different non-labor (insurance, fuel, depreciation, etc.) operating costs. The result is that one kind of trucking operation cannot easily be substituted for another.

Long-distance freight shipments may be transported by truck, railroad, barge, ship, pipeline, airplane, or some combination of modes. Long-distance data is approximated by the intercity data in Table 1. These modes can compete for some types of shipments, but

not for others. For example, it is prohibitively expensive to ship large volumes of heavy goods by air-freight, and marine ships cannot directly access inland areas.

Table 1: Percentage of Domestic Intercity Ton-Miles by Mode

Year	Rail	Truck	Oil Pipeline	Waterborne	Aviation
1950	56.1	16.3	12.1	15.4	0.0
1960	44.1	21.7	17.4	16.7	0.1
1970	39.8	21.3	22.3	16.5	0.2
1980	37.5	22.3	23.6	16.4	0.2
1990	37.7	25.3	20.2	16.4	0.4
2000	41.0	28.7	16.5	13.5	0.4

Source: Eno Transportation Foundation, Inc. compilation and estimates.

On the other hand, both trucks and railroads can move containers, trailers, and bulk cargo long-distances over land. Containerization of cargo that has traditionally been shipped by trucks has enabled railroads to establish services that compete for such cargo. In general, trucks are faster and can take advantage of a ubiquitous road network, but are more expensive for long-distance trips. Railroads tend to be slower (except when using specially dedicated trains) but less expensive for long-distance trips. The cost structure of railroads is such that they are in a better position than trucks to take advantage of economies of scale permitted by high volume shipments.

On a per ton basis, ship and barge operators provide the lowest cost services for long-distance trips. However, marine transportation is relatively slow, provides limited access to land mass and population centers, and is most competitive when shipping very large quantities of bulk cargo. Marine shipping can dominate certain specialty markets. For instance, barge operations on the Columbia/Snake River system ship a vast quantity of grain from the intermountain region and the northern Great Plains to the Port of Portland. As there are no oil pipelines across the Cascades, petroleum products in much of this area are shipped on Columbia River barges.

The result of all this is that trucks, railroads and to a lesser extent, barges, can compete to ship many, but not all, kinds of long-distance cargo. The winners will be determined by cost, shipment size, issues related to speed, timeliness and reliability, and connectivity to the final destination. Activities or government policies that improve these characteristics for one mode will enable that mode to capture a larger share of the market for transporting long-distance cargo.

For movements of people, clarification of the points above depends upon the exact nature of the trip as well as individual preferences. Local passenger trips are usually made by personal motor vehicles (e.g., cars, vans, SUVs, motorcycles, etc.), but light rail transit, bus transit, walking and bicycling also have a role in serving transportation demand.

Many local trips are extremely difficult, if not impossible, to conduct by any other mode of transportation than the automobile. Multiple grocery bags and “big box” items are difficult to manage on a bus or carry while walking. Seriously ill persons with contagious diseases shouldn’t be traveling to doctors on either a bus or a sidewalk. Persons who need to link several stops together in “trip chains” (e.g., work-daycare provider-grocery store-home) generally cannot use any other mode than a personal motor vehicle.

At the same time, there are many kinds of local trips that can be provided by alternatives to automobiles. Non-chained, urban commute trips can be served by van pool, light rail or bus transit services. Transit effectively provides transportation for routine doctor visits as well as special events. Along high-frequency transit corridors, mall shoppers often use transit services to make their trips. In small rural towns, non-chained commute trips are often served by walking.

All of this means that for many kinds of local trips there are no real substitutes for automobile travel. For other kinds of local trips, alternatives to the automobile can compete to provide transportation. However, as per capita income increases, both individuals and society as a whole have greater expectations for convenience and comfort. They also place a greater value on time. This implies it may become more and more difficult for alternatives to the automobile to capture market share. Relatively recent innovations such as Bus Rapid Transit (BRT), transit-oriented development (TOD), pedestrian-oriented development (POD), and more efficient zoning may enable transit services, walking, and bicycling to continue as viable alternatives for many kinds of trips. Nevertheless, automobiles will remain the predominant mode of transportation for local trips for the foreseeable future--even in congested urban areas with high levels of alternative services.

Long-distance passenger data are approximated by the intercity data in Table 2. Even before World War II, the overwhelming majority of long-distance passenger travel was provided by the automobile. That dominance continues today. As per capita income has increased, travelers’ value of time has increased. Simultaneously, as aviation technology and operations management has improved (with corresponding real fare decreases), aviation has increased its market share.

Table 2: Percentage of Intercity Passenger-Miles by Mode

	Automobile	Aviation	Bus	Rail
1940	89.0	0.4	3.1	7.5
1950	87.0	2.0	4.5	6.5
1960	90.4	4.4	2.5	2.8
1970	86.9	10.1	2.1	0.9
1980	82.5	14.9	1.9	0.7
1990	78.6	19.4	1.2	0.7
2000	76.6	21.3	1.5	0.6

Source: Eno Transportation Foundation, Inc. compilation and estimates.

Automobile and air travel together have claimed most of the already modest market share once held by bus and rail travel. However, for certain regional markets (e.g., the Northeast Corridor), rural communities, and travelers with few (if any) other options, these modes have vital importance.

The relatively new concepts of high speed rail and coordination of bus and rail services may eventually enable these modes to capture a larger share of long-distance travel. However, even in 1940, when the automobile was slower and owned by proportionally fewer households, bus and rail travel only captured about 11 percent of the long-distance travel market compared to 89 percent by the automobile. The ability to serve only a limited number of terminals or points per region implies that these services are more likely to compete with air travel than automobile travel.

The tragic events of September 11, 2001 resulted in drastically reduced air travel. While most observers believe air travel will eventually begin to grow at a high rate (relative to other modes), this has not yet occurred. Long-term changes in Americans' long-distance travel choices may occur, but what they will be is not yet clear.

Transportation & Industry

While it is common to think of specific regions as having some sort of specialty or economic base, most American regions have remarkably similar economies. The vast majority of economic activity in every region revolves around household purchases or services to households. For instance, the retail sales industry provides nearly 25 percent of most cities' employment. Add to that other supporting sectors such as schools, law enforcement, construction, public utilities and financial services, and more than 60 percent of almost any American city's jobs are found in supporting industries. Households and these industries will directly or indirectly provide a huge proportion of highway and transit demand, and large portions of the demand for other modes' services.

Other industries and sectors must compete with this demand for transportation capacity and services. Supply constraints may make this difficult for certain sectors that are relatively transportation-intensive or dependent on rapid service. In Oregon, these sectors include international trade, western state distribution of goods, manufacturing, and tourism.

A large volume of freight is shipped through Oregon's ports. Large volumes are also shipped to Canada and Mexico by truck and railcar. By value, a large amount of freight is also shipped to and from international locations through Portland International Airport. During 2001, Oregon exported \$8.9 billion of goods to international markets, increasing to \$10.1 billion during 2002.

The acts of shipping, transferring, and handling goods generates a large number of jobs. However, even greater numbers of jobs are generated by industries producing goods for

export. In value of exports per capita, Oregon ranked ninth nationally during 2001. Many of these exports (and associated jobs) are highly dependent on their efficient movement. High transportation costs or missed connections will result in product orders going to other places.

Goods that have a relatively low value by weight (e.g., lumber) are usually exported to overseas destinations by ship. In contrast, goods that have a high value by weight (e.g., microchips) are often exported by aircraft. As the state's economy develops, a greater proportion of production consists of goods that have a high value by weight. This indicates that access to airports and air freight services will become increasingly important to international trade as well as domestic trade. Areas without timely, efficient, dependable access to air freight services are unlikely to attract or retain "high value-added" manufacturers dependent upon either overseas markets or overseas suppliers.

Oregon has become a center of distribution for the western United States. Distribution activities are largely highway dependent with some support from railroad transportation. During 2000, Standard Industrial Classification (SIC) 42, "trucking and warehousing," employed an average of 26,637 people in Oregon, with a payroll of \$902.3 million. Some of these activities serve Oregon businesses and consumers. The access to other western states provided by I-5, I-82, and I-84, as well as both major western railroads, has contributed to the emergence of a large, interstate distribution-oriented sector in Oregon. Expansion, or even just retention, of this sector requires two things: 1) continued efficiency of trunk systems (e.g., interstate highways and Class I rail lines), and 2) reasonable access (in terms of traffic delay, and community impacts) to/from trunk systems.

During 2000 (a peak year), manufacturing generated about one-third of Oregon's Gross State Product (a broad measure of output and resulting income in a state). Over 15 percent of Oregon jobs were in manufacturing. In general, these jobs are paid about 40 percent more than average. Directly or indirectly, manufacturing supports much of Oregon's economic activity and jobs.

Manufacturing is dependent on transportation to receive raw materials and to deliver its products. Manufacturing is usually a highly competitive activity. Unless an area has other low cost attributes, high transportation costs will cause manufacturers to leave or avoid that area. Similarly, congested transportation systems that cause operating costs (in terms of inventory costs, wages, and customer service) to increase will have the same effect. Transportation considerations become even more important if service levels are declining or expected to decline relative to other possible locations. As a result, efforts to retain or attract manufacturers to an area usually have a significant transportation component.

A large part of Oregon's economy is based on tourism. The Oregon Economic and Community Development Department estimates that during 2001, an average of 95,600 jobs were directly travel (including business travel) and tourism related. This is about six percent of all Oregon jobs. Because of sharp declines in other sectors (e.g., lumber manufacturing), many local economies are dependent upon tourism for their survival.

While a majority of tourist expenditures in Oregon are by Oregonians, all tourism is heavily dependent upon transportation. Tourists have very limited amounts of time available for travel. Few tourists are willing to spend most of a day traveling to a destination when they will need to spend most of the next day traveling back. Oregon families with young children are more likely to visit Disneyland than Disney World, not because of cost, but because of the amount of time involved in travel. For potential tourists making these decisions, the speed and reliability of the transportation system are extremely important factors. Clearly, any tourist-oriented development will be heavily influenced by and dependent upon the available transportation system and tourists' willingness to use it.

Households and supporting industries, firms shipping goods across regional and international borders, manufacturing, warehouse-based distribution of goods, and tourism all require substantial amounts of transportation capacity. Where demand for transportation services exceeds supply (i.e., capacity), those industries and sectors most sensitive to time and other congestion-related problems may relocate to more suitable areas. Even when gradual, such relocations can have a significant negative impact on a region's economy.

Transportation & Economic Development

There is universal agreement among interest groups that transportation facilities and services are necessary to enable economic development to occur. However, there is little agreement among interest groups on a specific definition of "economic development." Economists define economic development as activities that result in increased average per capita incomes. However, most common viewpoints of economic development can be generalized as follows:

1. Capital investment in high wage industries resulting from investment (e.g., transportation improvements) that improves the competitiveness of a region;
2. Development of new territory that is separate from similar, existing developed areas;
3. Development/investment in specific built-up areas (e.g., central business districts, along light rail corridors); or
4. Specific developments (e.g., a new paper mill, a new microchip plant) at specific sites.

Factors limiting private-sector capital investment in a region can often be identified. These factors may be a limited water supply, an inadequate land supply, limited sewerage and wastewater treatment capacity, an insufficiently skilled workforce, congested highway segments, or difficult and time consuming access to distant markets. When these factors are constraining and the limits are removed, private-sector investment will create jobs. For instance, the recently improved aviation connection between Portland and Frankfurt, Germany is expected to generate significantly increased trade and tourism between these parts of the world. Highway improvements in the right places will have the

same effect. The key element is identification of those factors that constrain private-sector capital investment.

Some areas are characterized by large amounts of vacant land, constrained access to that land, and local citizens' desire to see it developed. Development of such land may be "economic development" if it attracts new high wage industries along with supporting commercial and housing development that would not otherwise locate in the region, or if it provides housing for population growth that cannot be accommodated in more developed areas of the region. However, land development that merely diverts capital investment or housing from other nearby areas provides little, if any, actual economic development to a region. In any case, areas having roads designed for low-volumes and low-speeds will require new high-speed, high-volume roads to accommodate large-scale urban or suburban development.

In built-up areas, transportation facilities are sometimes used to focus capital investment in the vicinity of certain places. For example, light rail lines in Portland appear to have influenced the location of many kinds of development (e.g., retail, industrial, and housing). However, such investment is generally diverted from other areas within the region. This may improve urban form and slightly reduce passenger miles traveled, but diversion provides little actual economic development to the region as a whole.

The use of public funds to support the location of industrial plants at specific sites is common practice. Often the public funds are used to improve roadway facilities (e.g., with signal improvements, turn lanes, access roads, etc.) in the area of the plant. Absent public funds, some improvements would be financed by the developer while others would not be made. Expenditure of public funds to ensure investment at specific sites needs to be carefully balanced with the use of funds to improve the overall business climate of a region (e.g., better highway access to distant markets).

With exceptions, retail development is not usually a creator of economic development. Retail development is usually the result of economic development. One way or another, households will purchase the goods and services they need. As household demand for these goods and services increases (either through increased population or increased per capita income), retail capacity follows. Absent an increase in household demand, an increase in retail development would merely divert retail sales from an existing location to a new location. No new jobs would be created. Exceptions include 1) development that increases competition, lowers prices and thus increases economic activity; 2) development that diverts sales from out-of-state locations, and 3) development that results in sales to out-of-state residents. The effects of these exceptions are quite modest on a statewide level but may be important to specific locations.

The implication of all of this is that transportation access and funds used to encourage or subsidize retail development for the purposes of economic development usually will not be effective for the economy as a whole. The use of transportation funds to subsidize retail development may be an effective way to address other issues (e.g., urban form, community development, livability) however. Similar conclusions also should be applied

to transportation expenditures designed to shift the development of other industries from one Oregon locality to another.

Finally, there is one universally agreed upon principle concerning transportation and economic development. *Modern transportation facilities are necessary, but not sufficient, to ensuring an area's development.* Other necessary factors include available and competitively priced land, labor, capital, and natural resources, as well as reasonable tax rates, an acceptable quality of life, and the presence of other types of infrastructure. Biggs, Oregon is an example. It is located along two east-west Class I railroads, a north-south railroad, an east-west interstate highway, a major north-south highway, and one of the country's busiest barge routes. Yet it remains a very small town in a very rural area. Transportation has a major role, but transportation improvements alone cannot cause economic development to occur.

Recent History – Future Change

The relationship between transportation and a region's economy depends upon its industry mix, the location of industry growth, and the location of population growth. Between 1990 and 2000, significant changes took place in the makeup of Oregon's base industries, but very little change occurred in the relative size of industries supporting household activities (see Table 3). For example, employment in the forestry, lumber and paper industries declined while employment in the instruments and electronic equipment industries increased. At the same time, the proportion of the workforce employed in retail trade and in the finance, insurance, and real estate industries remained about the same.

Table 3: Oregon Covered Employment: Selected Groups Percent of Total

Industry Group	1990	2000
Forestry, Lumber & Paper	6.3	3.8
Instruments & Electronic Equipment	2.4	3.1
Retail Trade	19.0	18.7
Finance, Insurance & Real Estate	5.1	5.2

Source: Oregon Employment Department data

Base industries, in Oregon as well as nationally, are shifting to industries that add a large amount of value to their inputs. In the recent past, this shift has been into computer software and the production of microchips. In the future, the shift may be into biotechnology, nanotechnology, fuel cells, or some other currently unknown product class. Because of their high value, production and distribution of these goods will be highly time and schedule sensitive. This requires a transportation system that can meet these manufacturers' (as well as service providers') needs. If a transportation system

cannot meet the needs of these firms, they will locate elsewhere, reducing job and income opportunities that would otherwise be available.

Existing resource-oriented industries are heavily transportation dependent but are slow growing, and their inputs and outputs are not nearly as time- and congestion-sensitive as high value (by weight) goods. Nevertheless, cost increases for these industries would also encourage a gradual shift in location elsewhere, similarly reducing job and income opportunities that would otherwise be available.

The location of industry growth is reflected in job growth figures. Between 2003 and 2040, over 80 percent of population growth is expected to be concentrated in just eight counties (job growth is highly correlated with population growth). They are Clackamas, Deschutes, Jackson, Lane, Marion, Multnomah, Washington, and Yamhill counties.

In general, these counties are already the most congested counties of the state, with over 71 percent of the population. Only two of them are off of the interstate highway system. Public demands for modernized transportation services will be heavily influenced by growth in these counties, and the need to ensure long-distance market access to and from these counties (e.g., California skiers to Deschutes County, agricultural products from Spokane through Portland to overseas markets, microchips from Washington County to Asia, etc.).

Summary Points

- Modern transportation facilities are necessary, but not sufficient, to ensuring an area's development.
- In order to attract (or retain) firms that add a large amount of value to their outputs, an area should focus transportation investment in a way that best enables people and goods to be shipped with speed and a high degree of certainty for meeting schedules required by shippers and their customers.
- As the state's economy develops, a greater proportion of production consists of goods that have a high value by weight. This indicates that access to airports having air freight services will become increasingly important.
- There are very important economic reasons to reduce congestion. These not only involve direct transportation costs, but also involve labor costs, inventory costs, and the cost of meeting customer needs (e.g., delivery schedules).
- In the future, the overwhelming majority of Oregon industry, employment and population growth will occur in just eight counties that are already well developed and have at least some level (generally a high level) of congestion problems.

- Slowly growing counties will require their infrastructure to be kept up-to-date in order for their existing industries to remain competitive and to ensure that transportation is not a constraint on further development.
- Automobiles will remain the predominant mode of transportation for local trips--even in urban areas with high levels of alternative services. Therefore, while transit programs have a role in congestion reduction, they will not be the primary solution to major congestion problems.
- Long-distance passenger travel will continue to be dominated by automobile and air travel.
- Even with increased speeds, improved service and increased frequencies, intercity bus and rail services will continue to be small-scale providers of long-distance passenger travel. These services are more likely to displace air travel than automobile travel.