Oregon Highway Cost Allocation Study Summary

The following summary, provided by John Merriss of the Oregon Department of Transportation (ODOT), describes the purpose, history, assumptions, approaches, and methods of the Oregon Highway Cost Allocation Studies (HCASs).

Purpose

The Oregon HCASs serves two main purposes:

- To determine the fair share that light vehicles (vehicles up to 10,000 pounds gross weight) and each class of heavy vehicles (vehicles having registered or declared gross weights over 10,000 pounds) should pay for the maintenance, operation, and improvement of the state's highways, roads, and streets.
- To recommend adjustments to existing tax rates and fees to bring about a closer match between the payments and cost responsibility of each vehicle class.

History

Oregon has now completed 15 HCASs. The first occurred in 1937, and the most recent HCAS is currently underway. This is by far the largest number for any state. All studies prior to 1999 were conducted internally by ODOT staff. In February 1998, the then Directors of ODOT and the Department of Administrative Services (DAS) agreed to transfer responsibility for the studies from ODOT to DAS. The Office of Economic Analysis (OEA), a division of DAS, now oversees the studies. Consultants hired by OEA performed the 1999, 2001, 2005, and 2007 Studies. ODOT staff performed the 2003 Study under the direction of OEA with limited consultant assistance.

The Oregon studies provide highway users and other interested parties an opportunity to offer their input in an open and objective process. The 1999 through 2009 Studies have included a Study Review Team formed by DAS to provide policy guidance and overall direction for the studies.

Study Approach

The Oregon studies, like virtually all HCASs conducted by the federal government and other states, use a *cost-occasioned* approach. The cost-occasioned approach is based on the premise that the best way to assess the responsibility of each class of road users is to quantify the costs associated with their use of the road system. This is done in the *expenditure allocation* or *cost responsibility* side of the study.

The second side of the study is the *revenue attribution* side. This involves estimating the payments that will be made by each user class (light vehicles or heavy vehicles) during the next biennium under existing tax rates and fees.

The final step of the study brings together the revenue attribution and cost responsibility sides of the equation to calculate equity ratios: payments divided by cost responsibilities.

In short, the revenue attribution side determines what each class *will* pay absent any change in the existing tax rates and fees. The cost responsibility side of the equation determines what each class of highway users *should* pay, based on each class's use of the road system. Each equity ratio therefore compares what *will* be (the numerator of the ratio) with what *should* be (the denominator of the ratio).This measures the equity of the existing tax rates and fees.

Analysis Periods

The Oregon studies use a *prospective* approach in which the cost responsibility and attributed revenues are determined for a future time period, specifically the next biennium. This is called the *study period*. The *base year* is the most recent year for which complete historical data is available at the time the study is conducted. The *forecast* or *study year* refers to the mid-year of the study period. The traffic data for the HCAS is first developed for the base year and then projected forward to the study year using weight class-specific growth rates.

Study General Methodology

Like most HCASs conducted by the federal government and other states, the Oregon studies use an *incremental methodology* to allocate several of the expenditure items included in the studies. This methodology is based on the fact that vehicles of different sizes, weights, and other operating characteristics contribute to the cost of many aspects of highway construction, maintenance, and operations. State and national-level research has resulted in the development of accepted engineering procedures which relate these costs to the responsible classes of vehicles.

The basic approach of the *incremental method* is to compare the costs of constructing, maintaining, and operating highway facilities for light vehicles only with the costs of building and maintaining these facilities for different traffic mixes containing successively larger and heavier vehicles. The increased costs caused by larger and heavier vehicles are referred to as *incremental costs*. Examples include the need for wider and stronger pavements and bridges.

The first increment is referred to as the *basic increment*. It is based not only on the type of traffic using the facility, but other factors as well, such as environmental influences. The cost of these non-traffic-related factors is included in the basic increment and can often account for a sizeable portion of the total cost. Under the traditional incremental method, all vehicle classes share in the cost of a facility designed for light vehicles on the basis of some relative use measure such as vehicle miles of travel (VMT). Each group of successively larger and heavier vehicles also shares in the incremental costs it causes.

The Oregon studies apply the incremental method from the bottom up. This is the more common approach, although it is also possible to apply this method from the top down by beginning with the full facility design and then hypothetically removing vehicle classes and calculating how much this would reduce the cost of the full design.

Vehicle Classes

Because the Oregon registration fee and weight-mile schedules are graduated in 2,000-pound increments, the Oregon studies allocate expenditures and attribute revenues by these same 2,000-pound registered or declared gross weight classes. Light vehicles up to 10,000 pounds gross weight are considered one class. (Note: The more common practice in other states is to sub-divide light vehicles into a limited number of separate classes based on vehicle weight or type, e.g., motorcycles and scooters, automobiles, light trucks such as pickups and SUVs, and vans and panels.)

For reporting purposes, the Oregon studies often categorize the 2,000-pound classes into the following nine summary-level gross weight groups:

1 to 10,000 pounds (light vehicles)
10,001 to 26,000 pounds (medium-heavy vehicles)
26,001 to 46,000 pounds
46,001 to 54,000 pounds
54,001 to 78,000 pounds
78,001 to 80,000 pounds
80,001 to 104,000 pounds
104,001 to 105,500 pounds
Over 105,500 pounds

These summary-level weight groups are based on the characteristics of the vehicles in each group, logical divisions in the tax structure, and the number of vehicles and miles of travel in each group. For example, vehicles in the 10,001-26,000 pound group pay the state fuel tax and higher registration fees rather than the weight-mile tax, and most are two-axle, single-unit trucks and buses used in local commercial delivery operations or passenger transport. Similarly, because of the large number of vehicles and miles in both the 78,001-80,000 and 104,001-105,500 pound classes, it is logical to keep these classes as separate summary-level groups.

At the highest level and because of the language in the Oregon HCAS's constitutional mandate, the study reports present results for light vehicles versus all heavy vehicle classes combined. Since the constitutional and statutory language gives DAS some flexibility in how to define light and heavy vehicles, the study reports present summarized results for heavy vehicles both above 10,000 pounds and above 26,000 pounds gross weight. However, the more usual and accepted dividing line between light and heavy vehicles is 10,000 pounds gross weight.

Road Systems

The Oregon studies use six different administrative highway or road systems: Interstate Rural, Interstate Urban, Other State Rural, Other State Urban, County Roads, and City Streets.

The Oregon studies develop separate expenditure or program data for each system. The rationale is that the level and shares of projected expenditures by expenditure category

and work type can vary by road system and ownership. Local governments, for example, have historically spent a greater share of their available road budgets on preservation and maintenance than has the state. The Oregon studies also develop separate miles of travel estimates and other traffic-related data for each system because the level and mix of traffic varies widely between systems. Trucks and other heavy vehicles, for instance, account for almost 20% of the total travel on rural interstate highways, but only about 3% of the travel on the typical city street.

Attributed Revenues

The revenues attributed to the vehicle classes in the Oregon studies have traditionally included only those flowing into the State Highway Fund, including the approximately 40% of those revenues which are then apportioned out to Oregon counties and cities. Some other states have also included federal and/or local revenues in addition to state revenues.

There are three main reasons why the Oregon HCASs attribute only state revenues:

- Oregon has better access to data for state revenues and which vehicle classes contribute these revenues than for federal and local revenues.
- A portion of the funds counties and cities use to maintain and improve their roads come from "non-user" revenue sources such as property taxes and timber receipts, and determining how these revenues might be attributed to road users (vehicle classes) is problematic.
- Most importantly, the purpose of the Oregon HCASs is to provide information for the State Legislature, and the only revenue sources and rates our legislators have direct control over are state revenues and rates.

Allocated Expenditures

The Oregon studies have traditionally taken a *prospective view* and allocated those expenditures planned for a future time period. This is done to allow for changes in both the level and mix of traffic and expenditures. It also means that any legislation enacted in response to the study recommendations will go into effect while the study projections still apply. Studies by the federal government and some other states, however, have allocated expenditures for a past period or, in some cases, both historical and future expenditures.

The Oregon studies allocate only direct governmental expenditures and exclude indirect or external costs such as those associated with congestion, pollution, noise, and the societal costs of traffic accidents. The primary reason for excluding these so-called *social costs* is that they are more difficult to quantify and incorporate in the analysis than are direct highway expenditures.

The Oregon studies through 1999 allocated only expenditures funded with State Highway Fund revenues. The 2001 HCAS, for the first time ever, also included expenditures funded with federal-aid dollars. The rationale was that these dollars are largely interchangeable with state dollars and excluding them would present an incomplete

picture of ODOT's full expenditure program and could potentially distort the study results.

The 2003 HCAS, again for the first time ever, also included all local government road and street expenditures, in addition to state and federally-funded expenditures. This included local government road and street expenditures funded with the approximately 40% of State Highway Fund revenues received by counties and cities, local governments' own revenue sources (e.g., local fuel taxes, property taxes, etc.), and the federal-aid highway funds received directly by local governments. The rationale was that local governments can often finance their road and street projects with either their state apportionments or their own, locally-generated funds.

The approach of the 2003 HCAS was further refined in the 2005 and 2007 HCASs by including only those local expenditures funded with local, own-source revenues considered to be truly interchangeable with state or federal dollars. Specifically, the 2005 and 2007 HCASs excluded expenditures financed with locally-issued bonds, property taxes, systems development charges, and traffic impact fees because revenues from these sources generally must be spent on certain projects or types of projects and are therefore not fully interchangeable with state dollars.

Expenditure Categories and Work Types

The many different expenditure and work types allocated in the Oregon studies fall into the following major categories:

- Modernization – New construction or reconstruction of pavements, bridges, interchanges, safety improvements such as guardrails and retaining walls, and traffic signs and signals. Most modernization projects today involve providing expanded highway capacity to address congestion or making improvements designed to address safety concerns.
- Preservation – Major rehabilitation of pavements, bridges, truck weigh stations and other facilities. The majority of preservation expenditures involve pavement overlays and other treatments designed to extend the useful life of pavements and bridges, items for which heavy vehicles traditionally have a majority of the responsibility.
- Maintenance and Operations – Routine maintenance of pavements, bridges, and other facilities such as rest areas and buildings.
- Administration, Collection, Planning and Other Costs – General administrative and tax collection costs for ODOT, counties, and cities; preliminary engineering; right of way acquisition and property management; transportation planning, research, and analysis; and project development and delivery.
- Additional Categories – Because of their present importance in the Oregon Transportation Investment Act (OTIA) expenditure programs, bridges, as well as the allocated amounts of the bond-financed projects carried forward from prior studies, are now broken out as additional major expenditure categories.

Within each of these broad categories, expenditures are further broken down into a number of individual work types or activities. Under Maintenance and Operations, for example, there are sixteen different work types, ranging from surface and shoulder maintenance (e.g., pothole patching) to maintenance of rest areas, mowing and brush cutting on highway right of ways, emergency maintenance (e.g., clean-up and repair of highways after floods, rockslides, etc.), and sanding and snow or ice removal.

Specific Cost Responsibility Methods

Each study includes a separate cost responsibility analysis to determine how each individual cost or work item should be allocated between light vehicles and the various classes of heavy vehicles. The various cost items can be divided into three main groups based on how they are allocated:

1. Costs allocated incrementally by vehicle size, gross weight, or axle weight:

   Vehicle Size – Some incremental costs result from the greater size of trucks and other larger vehicles. For example, overpasses may have to be somewhat higher because of the greater height of trucks, and interchange ramps have to be longer, wider, and less curved to accommodate the greater lengths and reduced turning abilities of the largest trucks. Since trucks can be up to 8 ½ feet wide (as compared to 6 feet or less for the typical passenger vehicle), they may require wider travel lanes, shoulders, and entrance and exit ramps. If so, this in turn increases the area that needs to be graded and fitted with drainage structures (pipes and culverts), thereby also increasing grading and drainage costs. (Note: trucking industry representatives argue that existing lane and shoulder widths are provided to meet national defense and emergency evacuation standards and as a safety and convenience factor for all highway users, and therefore realistically would not be reduced even in the absence of trucks and other wider vehicles.)

   Gross Weight – Bridge costs are the primary item affected by vehicle gross weights. Both load-related and non-load-related factors such as span length, environmental forces (wind loads, stream flow, potential seismic forces), and the weight of the structure itself influence the cost of new, replaced, and reconstructed bridges. Because of the load-related factors which influence bridge design, increased structural strength is required for increases in gross vehicle weight. Additionally, deck lanes, and therefore the entire bridge, may have to be wider to handle heavy, wider vehicle traffic.

   Axle Weight – Pavement costs are primarily a function of axle weights rather than gross weights. New and reconstructed pavements must be built stronger and thicker to support the heavy axle loads of trucks. Pavements are designed to withstand the application of a certain number of equivalent single axle loads (ESALs) or load equivalence factors (LEFs) over their usual design life of 20 years. Both ESALs and LEFs are engineering measures used to compare the pavement stresses imposed by axles of various weights. Both represent exponential relationships, so that the stress applied to pavements rises rapidly with increases in axle weights. Pavement wear and the consequent need to repair and maintain pavements are also primarily the result of

heavy axle loads, so that trucks are responsible for a majority of pavement rehabilitation and maintenance costs.

2. Costs that are a shared responsibility of all road users. These are costs judged to be independent of vehicle size, weight, or other operating characteristics and that therefore cannot be allocated incrementally or assigned to any specific vehicle class. The HCAS considers them a shared responsibility of all highway users and assigns them to all vehicle classes on the basis of a relative use measure such as VMT. They are referred to as *common costs* and actually constitute a majority of the dollars allocated in some studies. Examples include maintenance of rest areas, roadside mowing and cleanup, provision and maintenance of traffic signs and signals, maintenance required as the result of rockslides, floods, and other weather-related events, and general administrative costs.

3. Costs that are a unique responsibility of a particular vehicle class or classes. These are costs which apply only to a particular class of vehicles and so are legitimately assigned only to the vehicles in that class. The cost of registering light vehicles at the Division of Motor Vehicles (DMV), for example, is assigned only to light vehicles, while the cost of maintaining and operating the state's truck weigh stations is assigned only to heavy vehicles. Similarly, expenditures made to repair the pavement damage caused by studded tires are assigned exclusively to cars and other light vehicles, since with very few exceptions trucks do not use studded tires.

Treatment of the Alternative-Fee Difference Amount

Alternative-fee-paying vehicles are those that pay reduced taxes or fees, or pay taxes or fees on a different basis than regular, full-fee-paying vehicles. Operators of farm vehicles, for instance, pay lower registration fees than operators of regular commercial vehicles, and most pay the state fuel tax instead of weight-mile taxes. Publicly owned vehicles are exempt from the weight-mile tax and, in some cases, the state fuel tax, and are subject to only a nominal registration fee. The summed difference between the taxes and fees paid by these vehicles and what they would pay if subject to the full tax and fee rates paid by full-fee-paying vehicles is termed the *alternative-fee difference* or, loosely speaking, the *subsidy* amount.

The Oregon HCASs have generally reassigned the alternative-fee difference amount to all full-fee-paying vehicle classes on the basis of the relative VMT of each of these classes. The rationale for this approach has been that the granting of these subsidies represents a public policy decision by the Legislature and all full-fee-paying vehicle classes should therefore share in this cost based on their relative use of the system.

Others, including the consultants for the 1999 Oregon Study, have argued that an alternative approach would be to follow the more common business practice of treating the subsidy amount as an overhead cost and allocating it in proportion to the allocation of all other study expenditures. This could make a significant difference in the final study results by decreasing the full-fee-paying light vehicle responsibility share and increasing the heavy vehicle responsibility share. The exact amount of the difference would depend

on the amount of the alternative-fee difference and its distribution by vehicle weight class.

Treatment of Debt-Financed Expenditures and Debt Service

The introduction of significant bond-financed expenditures, as with the OTIA I, II, and III programs, has necessitated a departure from the pay-as-you-go approach traditionally used in earlier Oregon studies. Debt financing introduces a disconnect between study-period revenues and expenditures because the time period in which the revenues are collected differs from that in which the expenditures are made. Specifically, debt-financed projects result in current-period expenditures which are then financed by future-period revenues. This makes it important to avoid double counting these expenditures, which would occur if both the debt-financed project expenditures and full debt service expenditures (including interest and repayment of principal) were included in any given study.

Recent Oregon studies have handled debt-financed expenditures and debt service by including state expenditures of bond revenues and treating them in the same manner as non-debt-financed expenditures. The debt-financed expenditures actually allocated in these studies, however, have been reduced to the amount that will be repaid in the current study period (i.e., the study-period debt service expenditures) before being combined with the allocated amounts for all other, non-debt-financed expenditures. This avoids the double-counting issue noted in the previous paragraph. Given a 20-year maturity for the bonds, it also means the allocations of bond-financed expenditures in each study get carried forward to the next nine studies.