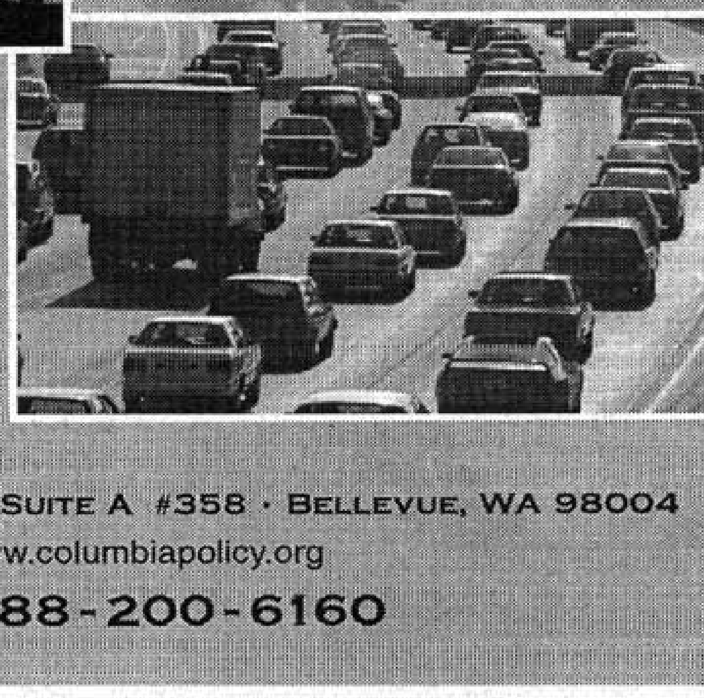
The Columbia Public Interest Policy Institute

The Cost of Growth in Washington State

By Eben Fodor
Research Assistance
by Erik Knoder



10020 Main Street - Suite A #358 · Bellevue, WA 98004
www.columbiapolicy.org
1-888-200-6160

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Prepared For
Columbia Public Interest Policy Institute
Bellevue, Washington

By Eben Fodor
Research assistance by Erik Knoder
FODOR & ASSOCIATES
Community Planning Consulting
Eugene, Oregon

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INTRODUCTION

The purpose of this study is to foster a greater understanding and awareness of complex growth and fiscal issues by citizens and public officials. A great deal of debate has taken place regarding which costs can be attributed to growth, and what impacts these costs have on local governments and the taxpayers who fund them. This report is intended to inform the debate, and to encourage further study by local governments and other public interest organizations.

While most local governments can quickly and accurately assess the additional tax revenues resulting from a new development, very few can perform the same assessment of costs. This lack of complete information has often resulted in a distorted analysis of development impacts on a local community. A greater understanding of the capital costs associated with providing basic public facilities to serve new development is clearly needed.

This study estimates the cost of public facilities to serve new residential development in Washington State, based on the incremental demand generated by a typical new single-family house. Data has been collected and reported in a manner so as to be reasonably representative of the state as a whole. It is important to recognize that each city and county has its own set of regulations, service level standards, land costs, and materials and labor costs that will affect infrastructure costs. Because of this, each location is unique and different. The report does not attempt to provide accurate costs for any specific location.

This study uses actual cost data from capital projects that have been completed in Washington within that past two years as the primary data source. Some capital cost data, service standards and other necessary information are obtained from local and regional government plans and reports, as cited in the report. The data represents a composite of representative costs from around the state. In this sense, the report can be used as a reasonable initial estimate of costs for a given location when there is no local analysis available.

A literature review provided at the beginning of this report shows that there is a fairly consistent body of literature on the fiscal impacts of growth going back more than 25 years. More than 100 studies were reviewed, and citations to many of these are provided in the endnotes to the report. This literature provides a useful context from which to consider the costs analyzed in this study.

This report helps explain why urban growth so often has a negative fiscal impact, as the new public facilities required – schools, roads, libraries, sewer mains, etc. – create heavy, multi-million-dollar cost burdens for the local governments. Most of these costs are borne by all residents of the community through broad-based taxes and are not paid by the developer or new home buyer.

"Every new classroom costs $90,000. Every mile of new sewer line costs roughly $200,000. And every single lane-mile of new road costs at least $4 million."
Maryland Governor Parris Glendening's remarks at the Brookings Institution (1997)[1]

In the 10 fastest-growing towns in southern Maine, property tax rates increased 43 percent between 1990 and 1995.
Source: *Development and Dollars*, NRDC[2]

LITERATURE REVIEW: What Do Other Studies Show about the Fiscal Impacts of Growth?

The fiscal impacts of growth can be considered in various contexts. While this report addresses the capital costs directly associated with typical residential development, most of the literature is devoted to comparing one growth scenario with another. The most common study compares sprawling, unplanned development with compact, well-planned development. Not surprisingly, these studies tend to find that significant, long-term savings result from the well-planned, compact development alternative. This group of studies successfully argues that financial benefits result from the efficient use of land and public facilities achieved through an orderly, planned development process. This review also summarizes studies which look at other fiscal issues: the effect of growth on local tax rates, the cost of public infrastructure to serve growth, and the fiscal impact of different land uses, including the alternative of conserving land rather than developing it.

Sprawl v. Density

Most of the literature on the fiscal impacts of urban development seeks to address the relatively benign question of whether or not controlling sprawl has beneficial impacts on local finances. The argument is that well-planned, compact land development is easier to serve and requires less infrastructure than poorly-planned sprawling development. Therefore, compact development should result in fewer costs to local government over the sprawling alternative. This conclusion is generally borne out by the "cost of sprawl" literature.[3,4,5,6,7,8,9,10] In some cases the cost savings are dramatic. In others it's almost too close to call.

One of the few fiscal impact studies of this type funded and conducted by a national government, was done in Canada in 1997.[11] It compared life-cycle costs and revenues for two alternative land development patterns over a 75-year period. The conventional suburban development pattern in Ottawa, Canada, was compared with a development plan based on principles of New Urbanism, which involved mixed uses, varied housing types and more-compact development.

The study evaluated both public and private sector financial impacts (all in Canadian dollars). Over the 75-year period, the compact alternative had a net savings to the local public sector of $5,906 per residential unit and $240 per square meter for non-residential (i.e. commercial). The private sector savings was $3,041 per residential unit and $137 per square meter for non-residential. The primary savings between the two alternatives resulted from a reduction in the initial infrastructure costs for the compact development of $5,151 ($2,110 were public sector savings and $3,041 were private sector savings).

A 1999 study for the American Farmland Trust examined public policies fostering sprawl in California.[12] They found that "*Virtually every significant [public] policy examined favors low-density sprawl over more compact, efficient development of land, primarily through hidden subsidies to sprawl*." One interesting example identified in the report is a subsidy of electric service costs: "*Ratepayers living in low-density areas receive an estimated $150 a year subsidy to their electric bills, which is paid by Californians residing in areas where land use is more efficient*."

Growth and Taxes

There is growing recognition that sprawling development patterns rarely generate sufficient revenues from the new taxes they produce to pay their ongoing costs of public services.[13,14] However, even standard urban development patterns that include a mix of commercial development have been found to be a net fiscal drain on local governments. A handful of studies have examined the overall effect of growth in population, jobs and urban development on taxes. These studies show that growth tends to result in higher tax rates, contrary to the conventional wisdom of the past that growth increases the tax base and thereby reduces the overall tax burden.[15,16,17]

A landmark study in 1991 correlated various possible factors with the rising property taxes observed in DuPage County, Illinois (west of Chicago).[18] The statistical analysis of empirical data by the county planning department examined many possible causes. They found the strongest correlation between new development (residential and commercial) and rising property tax rates. Areas in the county with faster growth had the greatest tax increases. The implication is that new growth creates additional net costs that necessitate tax increases. Like DuPage County, local governments around the country often rely heavily on property tax revenues to pay the costs of growth.

An earlier, but little known, academic study by Buchanan and Weber (1982) examined the impacts of population on residential property tax bills.[19] The authors used cross-sectional data from the 36 counties in Oregon for the year 1977. Five equations were estimated relating tax levies, property values and per capita income to a variety of explanatory variables, including population. The use of multiple equations allowed the authors to identify not only the direct effect of population on taxes, but indirect effects as well. For example, population growth directly affected the per capita tax levy of counties but it also had an indirect effect on property values, personal income, and density. The authors found that the total direct and indirect effect of a larger population was an increase in the average residential tax bill. Overall, a 1.0 percent increase in population was found to increase the average residential property tax bill by 0.41 percent. Counties in Oregon are also highly dependent on property taxes for most of their revenues.

A similar, but more comprehensive, statistical analysis was performed in 1995 to examine the relationship between growth and taxes in the 6-county region surrounding Chicago.[20] The findings were consistent with those of DuPage County. In addition, the researchers found that population growth correlates with an increased residential tax burden (measured as a percent of personal income). Fast-growing areas that did not raise taxes tended to have a reduction in levels of public services.

A major research effort published in 1994 studied the fiscal impacts of population growth in 248 of the larger counties in the U.S.[21] The 248-county study area included 59 percent of the nation's population. Per-capita spending by counties was used to indicate likely impact on local taxes, since money for government spending must ultimately come from taxes and fees. The study found that current spending (operation and maintenance of government) increased slightly with increasing growth rates at or above the 1 percent annual rate. However, capital expenditures increased markedly for all increases in growth rate. The report states: "*Clearly, population growth puts significant pressure on capital budgets as communities struggle to increase their investment in roads, water and sewer systems, and public buildings*." The report concludes that not only does population growth increase per-capita tax burdens, it also tends to have a short-run effect of reducing local service quality.

In 1999 the City of Portland, Oregon evaluated the fiscal impacts of alternative growth scenarios on city services.[22] The study found that the current Metro regional growth forecast, based on current growth policies, resulted in a fiscal deficit throughout a 20-year study period (2000 to 2020). An alternative scenario with half the growth rate resulted in a smaller deficit. Again, the implication is that growth results in net costs and therefore more growth results in greater costs and a worse fiscal condition for the city. The analysis looked only at services provided by the city and consequently did not included schools.

Growth and Infrastructure

Numerous municipal studies have been performed to evaluate the cost of providing one or more types of infrastructure to serve new development. These studies may be commissioned for the purposes of establishing development impact fees or for evaluating the demand for costly new public facilities that may be imposed by various alternative growth scenarios or by a major development proposal.[23] While these studies provide an excellent source of information on the cost infrastructure required by new development, they address only some of the infrastructure required (i.e. roads or water systems) and are for a particular city at a particular time. Thus, they form a fragmented, incomplete and often dated picture of the total cost impact. A few studies have tried to integrate this data to form a useful set of cost figures that can be applied to new development.[24,25]

Oregon's Governor commissioned a task force in 1998 to review the impacts of growth in that state. The task force's report, ***Growth and Its Impact in Oregon*** (January 1999), included a review of fiscal impact literature related to growth. They concluded that the capital costs for off-site public facilities, such as sewer, water, transportation, drainage and schools, total $30,000 to $35,000 for a single family house.[26] A portion of these costs are paid directly by the development through development impact fees ranging from totals of $2,000 to $10,000 depending on the jurisdiction. The balance of the costs are paid through broad revenues, such as income taxes, gas taxes, and property taxes, which are paid by everyone.

Fiscal impact analysis can be very complex and has a number of pitfalls, which can result in misleading conclusions or incorrect interpretations.[27] A draft fiscal analysis for the City of Spokane is being used to evaluate the costs of alternative growth patterns for the Draft Comprehensive Plan.[28] The analysis compares the city's costs and revenues for each of three growth scenarios. The results show a net fiscal surplus for all of the alternatives. To the layperson, this would seem to indicate that all three growth patterns will have a positive fiscal impact on the city. However, the study excluded all capital costs associated with growth in order to simplify the analysis. This methodology renders any conclusions about net fiscal impacts to be moot.

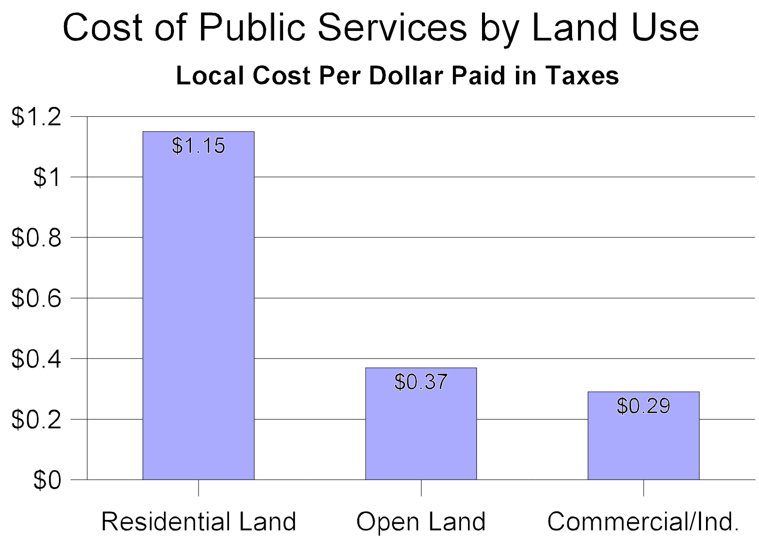
It is becoming increasingly evident that the high capital cost associated with providing the public infrastructure required by new development is likely to be the most significant financial factor to a local government considering urban growth issues and alternatives. While Spokane's draft fiscal impact study may provide some limited information about *relative* impacts of the alternatives, no conclusion can be drawn about likely benefits or costs of growth in Spokane. Furthermore, the study only looked at impacts on city services, and ignored impacts on jurisdictions such as school districts or county and state governments which are also funded by local taxpayers.

The Washington State Legislature commissioned a study in 1998 of local government infrastructure needs by the State's Public Works Board.[29] The study identified $8.16 billion in needed infrastructure from 1998 to 2003 with a funding shortfall of $3.05 billion. Only four categories of infrastructure were included in the study: roadways, sanitary sewer, domestic water and stormwater. Unfortunately the study does not determine the cause of these costs. While it is likely that most of the needs identified in this study are associated with urban growth, the report does not attempt to distinguish growth-related infrastructure costs from other cost.

Cost of Public Services by Type of Land Use

The American Farmland Trust has conducted "Cost of Services Studies" in more than 70 communities across the country. The COS studies looked at the total local revenue and cost stream for each main category of land use: residential, commercial and farmland/open space. While every community is different, they have found that for each dollar generated in taxes, the median cost for residential development is $1.15 to provide public services.[30] Farmland and open space, however cost only $.37 for every dollar in revenue they generate and commercial/industrial cost only $.29 per dollar in revenue. The fiscal deficit caused by residential land use is made up, in part, by surpluses from farmland and other land uses. Numerous other studies have also shown that residential development tends to represent a net fiscal drain to the local government.[31,32,33,34,35,36,37]

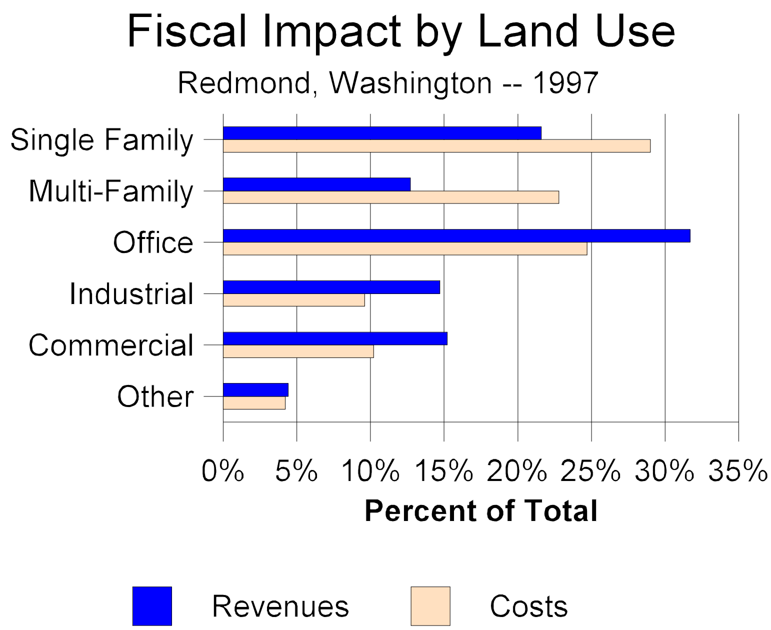
Figure 1



Source: American Farmland Trust.[38] Median cost values for 70 different *Cost of Community Services* studies conducted around the country.

In Redmond, Washington, an analysis by the city of costs and revenues for major land uses found that residential uses cost more to serve than they generated in revenues, while commercial and industrial uses generated a net surplus for the city.[39] These results are dependent on the existing tax and fee structure in a particular locality and may also depend on how the boundaries of the study area are defined. For example, commercial development in one community may produce fiscal benefits while the associated residential development to house the workers may occur in another community that picks up the costs. Some communities seek to encourage only commercial development in the hope that it will generate a fiscal surplus. However, commercial development is likely to generate a demand for nearby residential development as well.[40]

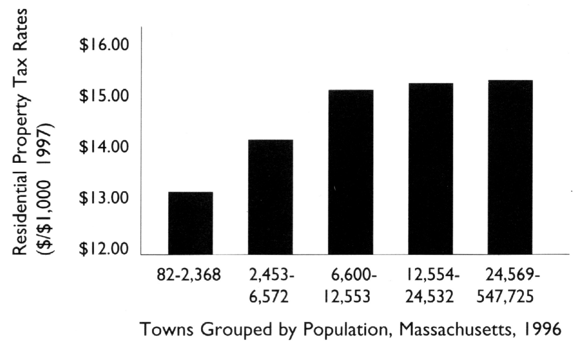
Figure 2



Land Conservation vs. Development

A recent study by the Trust for Public Lands, called ***Community Choices: Thinking Through Land Conservation, Development, and Property Taxes in Massachusetts***,[41] examined the fiscal impacts of land conservation as compared with urban development. It compared property tax rates among Massachusetts towns in terms of various key factors that reflect the amount of growth and development, such as total population, total employment and total business property. A similar comparison was also made based on the total amount of land in conservation. The study did not look at rates of change in the above variables, only at existing levels. While correlations were not evaluated for statistical significance, the relationships are shown in a series of graphs (see example in Figure 3) and indicate that, on average, towns with more land development have higher tax rates.

Figure 3
Town Population and Property Tax Rates in Massachusetts
(Trust for Public Lands, 1999)



The report found that land conservation, which may take some (or all) of the property value of the conserved parcel out of the tax roles, often has the short term effect of reducing the tax base and increasing tax rates. These increases were generally found to be very modest and short lived, due to longer term positive (tax lowering) fiscal impacts. In the longer term, overall positive fiscal impacts are associated with land conservation. The conclusion is that land conservation can help keep property taxes low by limiting increases in the demand for municipal services. The report states:

> *"From a taxpayer's perspective, conservation of a key property may be less expensive than allowing it to be developed in a way that would not provide enough in taxes to cover related services."*

A number of studies have been performed that show a net savings to local taxpayers resulting from land conservation through easements or public land acquisition as compared with the development alternative.[42,43,44] Cities where such studies have been performed include Pittsford, New York; Woodbridge, Connecticut; Bowdoinham, Maine; Yarmouth, Maine; Huntsville, Alabama; Londonderry, New Hampshire; Washington Township, New Jersey; Closter, New Jersey; and Palo

Alto, California.

Recent studies show that park land and open space can contribute to the tax base in another way by adding value to surrounding properties.[45,46] Higher property values generate greater property tax revenues. Natural-area parks have the largest positive effect on nearby home sales prices. Depending on proximity (up to 1500 feet), values increased from $4,337 to $8,971.

The fiscal impacts of land development vary from state to state due to differences in both the revenues and the costs generated. Even within a state, such as Washington, the fiscal impacts will vary from city to city as local tax rates, development impact fees and the costs to serve new development, vary. Rather than generalizing and applying the findings of the literature, it is preferable to have a fiscal impact analysis prepared for specific local conditions and for the particular circumstances under consideration.

WHAT ARE GROWTH-RELATED COSTS?

The realm of impacts of urban growth include social, environmental and economic impacts. These impacts include both costs and benefits. Economic impacts can be readily quantified in a monetary terms and include both private sector (market economies) and public sector (government) costs and benefits.

This study focuses on some of the most readily available of all the impact data: capital costs associated with providing basic public services to new urban development. There are 15 main categories of public facilities required to serve urban growth, as shown in Figure 4. The first 11 categories are typically local government (city or county) or local service district (such as a school or water district). All of these facilities are funded primarily by residents of the local jurisdiction. The final four categories (electric, natural gas, waste disposal and cable/telecom) are typically provided by private utility franchises. These franchises tend to distribute new facility costs across their customer base in a similar manner as local governments use the tax base. This study was limited to an evaluation of the nine categories of infrastructure indicated with a star (*) in Figure 4. This limitation merely reflects the project's priorities and funding constraints.

Figure 4
Growth-Related Capital Costs for
Public Facilities/Infrastructure

- School Facilities (K-12)*
- Sanitary Sewer System*
- Storm Drainage System*
- Transportation System*
- Water Service Facilities*
- Fire Protection Facilities*
- Parkland, Open Space & Recreation Facilities*
- Library Facilities*
- Police Facilities
- Corrections and Jail Facilities
- General Government Facilities
- Electric Power Generation and Distribution*
- Natural Gas Distribution System
- Solid Waste Disposal Facilities
- Cable and Telecommunications Systems

The environmental and social costs of growth (see Figure 5) are likely to be significant, but are difficult to quantify in absolute monetary terms. The values associated with environmental quality, natural amenities, livability and quality of life can, in many cases, be measured in economic terms. New methods are being used to assign economic values to social and environmental impacts. These less-tangible costs may actually have a greater impact on the community than the physical infrastructure costs reported here. While additional research in this area would undoubtedly be productive, the fact is that even the most readily-quantifiable economic impacts of growth have yet to be adequately studied.

Figure 5
Environmental Costs and Other Growth-Related Impacts

- Decreased Air Quality
- Decreased Water Quality
- Increased Rates of Natural Resource Consumption
- Lost Open Space and Resource Lands (farms, forests)
- Lost Visual and Other Amenity Values
- Lost Wildlife Habitat
- Increased Noise
- Lost Mobility Due to Traffic Congestion (delays and increased commute time)
- Higher Cost of Housing
- Higher Cost of Living
- Increased Crime
- Lost Sense of Community
- Increased Regulation (loss of freedoms)
- Costs to Future Generations

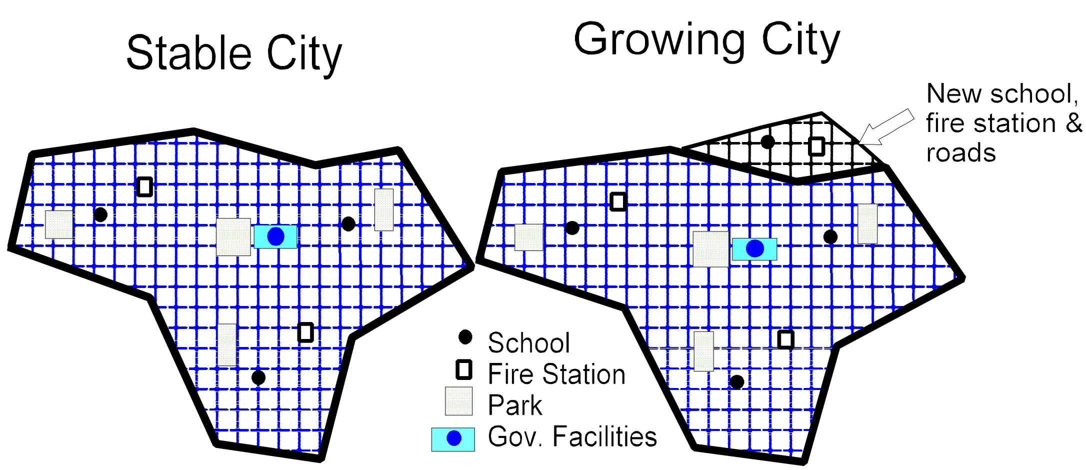
It can be difficult to distinguish growth-related costs from other public-sector costs. Therefore, it is helpful to examine the differences in public expenditures between two hypothetical scenarios: 1) a non-growing or stable community, and 2) a growing community. These two scenarios are illustrated in Figure 6.

In the first scenario, the stable city has had a fairly constant population for some time.[i] All the necessary public facilities — roads, schools, fire stations, parks and government facilities — have already been built and paid for. Taxes are still being collected, and public revenues go to pay for ongoing services and operation and maintenance (O&M) costs. There is no need to expand or build additional facilities

[i] Note that the population of the hypothetical *stable city* scenario is not necessarily static. People could come and go, be born and die, without a net increase in the total number of people. This condition exists when births occur at a replacement level and when as many people move into the area each year as move out of it.

as long as existing facilities are properly maintained. Parts of some facilities will wear out and need to be repaired or replaced. These repairs or replacements, such as a new roof for a school, or re-paving a road, are part of the O&M budget. The stable city scenario serves as a baseline in this analysis by which growth costs are evaluated.

Figure 6
Two Scenarios for Evaluating Growth-Related Costs



If the stable city suddenly becomes a growing city, there will be additional costs to build new or expanded facilities to supply the increased demand resulting from new growth. These are clearly growth-related costs because they do not exist in the stable city scenario. Each increment of growth creates an incremental increase in demand for physical infrastructure.

When the costs for new facilities are paid through property taxes (as with a bond issue or levy), they are spread across the entire community. If the area of new growth in the growing city of Figure 6 represents about 5 percent of the total population, then these new residents will pay roughly 5 percent of the cost of the new facilities required to serve them. The other 95 percent will be paid by the existing residents. In this manner, existing residents continue to pay most of the costs of new infrastructure required to serve new development. A similar inequity results when other broad-based tax revenues, such as a sales tax, income tax or gas tax, are used to fund growth-related infrastructure needs.

Note that the new school, fire station and roads shown in Figure 6 may be shared by the entire community. Nonetheless, the need for these facilities did not exist in the stable city scenario, because the old facilities were already adequate. This illustrates why most, or all, of the costs of these new facilities are correctly attributed to growth. An example of an exception would be the addition of a city cultural center that creates new benefits for all residents.

Also note that both the *stable city* and *growing city* scenarios have government operation and maintenance (O&M) expenses that vary in rough proportion to the size of the population. Local tax revenues will increase, to some extent, to match the increasing O&M costs of a larger community. However, many state laws limit annual increases in property tax revenues that can occur without a public vote. In cases where the combination of growth rates and inflation exceed the state tax limits, growing O&M needs will go unfunded.

The costs of growth to local government can manifest themselves in five different ways:

1. increased taxes;
2. increased financial debt (usually as municipal bonds);
3. infrastructure deficit;
4. deferred facility maintenance;
5. reductions in public services.

The first two types of cost impacts, increased taxes and debt, are those most people are familiar with and are the traditional means of funding public facilities and services. The remaining three cost impacts are essentially methods of deferring payment of costs. Instead of paying for growth in the present, the costs are pushed into the future. These costs do not become immediate burdens on the local residents and may not appear in the balance sheets of local governments, but will accrue nonetheless.

The third type of cost impact, infrastructure deficit, results when a community falls behind on providing the new and expanded facilities needed to accommodate growth. This cost takes the form of overcrowded schools, congested roads and overflowing sewage plants. The fourth type of cost impact is the deferral of facility maintenance, which results when the funds needed to maintain public facilities are diverted to meet the immediate needs of new development. This shows up as an inability to pay for the basic maintenance of local public buildings, roads, parks and recreation facilities. The fifth growth cost impact shows up as a reduction in the quality or extent of public services. As with deferred maintenance, the needs of new development can divert public funds away from providing basic services. Library hours may be cut back, community centers closed and school programs eliminated.

METHODOLOGY

A fiscal impact analysis (FIA) is a comparison of the financial impacts of various alternatives on a particular governmental body (such as a city, county or school district). A FIA looks at both the total costs and the total revenues generated by each alternative over a given period of time. For example a FIA might compare the costs and revenues of one type of development with another (or with a non-development alternative) over a 20-year period.

This study examines the cost of providing the public facilities associated with residential development in Washington. It is not strictly a fiscal impact analysis, since it does not look at either the total costs or the total revenues. The method used here is similar to that used to calculate development impact fees. The full capital costs of public facilities are apportioned to various land uses (residential, commercial and industrial) based on the amount of demand created by each. Unlike impact fee calculations, the costs developed in this study may include more than one jurisdiction. While impact fees are typically charged just for the city's or county's costs, these costs include all public sector cost regardless of whether they are paid through the city, county, state or federal government.

The demand for public facilities is calculated based on the land use itself and is not allocated to people, per se. This can be illustrated by considering the case of traffic impacts. All traffic demand is generated by people, however not all the traffic demand comes from houses. To allocate traffic demand by land use, each type of development is evaluated for the number of new vehicle trips it will generate. For example, a new house generates an average of 10 new trips per day while a new store may generate several thousand trips. The cost of new roads can be allocated according to how much travel demand each type of land use generates.

The best available data on new homes constructed in Washington comes from the ***American Housing Survey*** for the Seattle-Everett Metropolitan Area. The characteristics of a typical new single-family house built in the Seattle-Everett

Metro Area from 1993 to 1996 are shown in Table 1. New homes have different characteristics than average homes, therefore it is not always appropriate to use an average of all existing homes to represent new development.[ii] Lot sizes for new homes are surprisingly large (13,939 sq.ft.) and are equivalent to a net density of about three units per acre.

The capital costs of providing infrastructure to serve new growth is based primarily on actual cost data from recent capital projects around the state. In order to assure the quality of this data and to establish a rational and objective protocol for selecting capital projects, the following criteria were used to select capital projects for cost allocation in Washington State:

- Recently completed capital project. To obtain the most current and accurate capital cost data, project should have been completed within the past three years (1997 or later).

- Project occurs in a city that is fairly typical of cities in the state and does not have unusual circumstances that would affect capital facilities costs in a significant way. The smallest and largest cities are excluded by limiting project to cities within a size range of 5,000 to 250,000.

- Project involves new or replacement facilities (not repair, maintenance, or upgrading).

- To help ensure the completeness and accuracy of system cost data, selected projects were generally limited to complete systems rather than partial expansions, add-ons or modifications.

[ii] The typical new single-family house being built in the Seattle Area from 1993 to 1996 is 16% bigger than the median for all existing houses. Lot sizes for new homes are 19% larger than those of existing homes, resulting in lower overall density than older developments. Adjusting for the higher occupancy levels of new houses (2.4 versus 2.2 persons) they have 6% more floor area and 9% more land per occupant than exiting houses.

- The preferred projects are those which were part of a long range capital facilities planning process that included population growth forecasts and associated demand analysis.

- Multiple data sets from different cities were used, when available, to help verify that the data is accurate and representative of the state.

While these selection criteria do not assure that capital costs are representative, an attempt has been made to collect enough data to provide a reasonable basis for estimating local costs.

For certain categories of public infrastructure, such as with sewage treatment facilities, very little good data was available and cost estimates are incomplete, as noted in the text. For others, such as with schools, there was more data than could be collected and analyzed under the scope of this project. Data from one dozen newly completed schools in 10 different school districts was deemed sufficient to represent school facility costs in the state. Obtaining precise cost data and other key facts was often quite difficult. In some cases only one or two cities were identified which had suitable quality data and representative conditions.

Table 1
Typical New Single-Family House
Seattle-Everett Metro Area[47]

Characteristic	New Houses*
House Size	
Floor Area (sq.ft.)	2,095
Bedrooms	2.8
Lot Size (sq.ft.)	13,939
Development Density(units/net acre)**	3.1
Occupancy (total persons)	2.4
Floor Area/Occupant (sqft/person)	873
Land Area/Occupant (sqft/person)	5,808

Source: *American Housing Survey.* *Based on the median for new houses constructed from 1993 to 1996. **Excludes land for streets.

The representative house used in this study is assumed to be located within an Urban Growth Area (UGA) with nearby public services. It is assumed that the density in an urban area will be higher than the value in Table 1, since this data also includes rural development. Where a density value is required, a fairly typical net density of six units per acre is used. Lower-density sprawling development will usually cost more to serve than the house examined here due to the greater distances required for constructing roads, sewers, water lines, etcetera.

To accurately determine the capital costs required to serve the needs of new development, the level of service must be held constant. For example, the service standard for the amount of parkland per capita (such as 10 acres per 1000 residents) should be maintained as the community grows. To maintain the service standard, the city must acquire and develop new parks as the local population grows. If the service standard is lowered intentionally or by allowing growth to occur without providing new parkland, then the service standard is declining and the full cost impacts do not appear in the capital facilities plans. Instead, residents will pay indirectly through a decreased urban quality caused by lack of adequate parks. This is often the case with transportation systems where cities are finding that the cost to maintain the existing levels of service are prohibitive. In these cases the full cost of the transportation system should also include the costs to the public resulting from lower service standards, such as greater traffic congestion and delays. However, cities are generally not calculating these costs.

It is possible to generalize about the costs of capital facilities around the state, since these costs are relatively comparable from one city to the next (with some exceptions). However, each municipality has its own tax rates and fee schedules. Therefore, the net fiscal impacts of development will vary from one city to the next.

All capital costs in this report are for June of 2000 unless stated otherwise. Costs for other years are adjusted using the ***Engineering News-Record*** Construction Cost Index.[48] Due to the difficulty in adjusting land values over time, only the most recent land cost figures available were used in this report and are reported as nominal values (no time-value adjustments were made).

It is important to note that all the costs evaluated here are ***off-site*** costs. A typical new subdivision includes local streets, sidewalks, water and sewer lines to serve each new lot. These are ***on-site*** costs and are the site development costs typically paid directly by the land developer. By contrast, off-site cost are those for the schools, sewage treatment plants, arterial streets, fire stations and other off-site facilities that are needed to serve the subdivision.

Note that financing costs associated with municipal bonds are not considered in this study. Municipal bonds are used to fund many types of infrastructure such as schools and libraries. Financing cost can be substantial and may double the ultimate price of a public facility financed over a 20-year period.

THE COSTS OF GROWTH

This section reports individually on each of the following nine infrastructure categories evaluated in the study:

- School Facilities (K-12)
- Sanitary Sewer System
- Storm Drainage System
- Transportation System
- Water Service Facilities
- Fire Protection Facilities
- Parkland, Open Space & Recreation Facilities
- Library Facilities
- Electric Power Generation and Distribution

The information sources and data are identified and the calculation procedure is described for each type of infrastructure.

School Facilities (K-12)

School facility costs can vary widely from one area to the next depending on factors such as local land costs, and design and construction standards of the local school district. The cost of constructing new schools is based on a telephone survey of ten Washington school districts. The districts were selected from a list of recent projects that had received state funding through the Office of the Superintendent of Public Instruction. Only recently-completed projects or those with bids accepted in the years 1998-2000 were analyzed. The sample included seven elementary schools, two middle schools, and three high schools. Only new or complete replacement projects were considered. School expansions, renovations and upgrades were excluded from the sample due to the difficulty analyzing and categorizing costs.

The capital costs for facilities include all building construction and land acquisition costs as well as planning and design, site preparation, paving and landscaping, playground equipment, furniture, computers, sports and gymnasium equipment, and library collections. Some schools included in the survey were replacement projects that re-used some student desks and library collections. Districts were not able to estimate the value of the re-used capital equipment and no correction was made to the total capital cost. This results in a slight downward bias in the estimate for facilities cost.

Estimating the land cost for schools is more problematic than for buildings. Although the amount of land used for each school is known, only three districts were able to estimate the market value of the land. Only one of these districts had recently purchased the land, a 32.6 acre parcel for $18,400 per acre. This price is roughly an order of magnitude lower than prices for urban land usually quoted by other school districts and municipal parks and recreation departments. On the other hand, the district in question was certain of the price and larger parcels often have a lower cost per acre than smaller parcels. The actual price of school land will depend on local market conditions and the quantity of land purchased. It is possible that the estimated price is downwardly biased due to this outlying observation in a small sample.

The cost per student is based on the maximum design capacity of the school, which results in a more conservative figure (lower cost) than using actual enrollment, which is typically less than design capacity. School capital costs were allocated to new households using data from the U.S. Census[49] and from the ***American Housing Survey***. School age children (ages 5-17) constituted 19 percent of Washington's population as of July 1999. The fraction of the population in each school level was calculated assuming ages 5-10 attend elementary school, ages 11-13 attend middle school, and ages 14-17 attend high school. The results are shown in the first data column of Table 4 (based on a new household occupancy of 2.4 person per house). On average, each new house will have .46 school-age children, or approximately one school-age child for every two new houses built. This can vary considerably from one area to the next depending on local demographics. High cost areas such as Bellevue are seeing a decline in enrollment as families with children move to surrounding communities seeking lower cost housing. The surrounding communities such as Issaquah, are caught picking up the high tab for new school construction.

Table 2
School Facility Cost (Without Land Cost)

School Level	Average Facility Cost*	Average Design Capacity	Estimated Facility Cost per Student
Elementary	$12,104,415	554	$21,511
Middle	$18,740,304	760	$24,342
High	$29,066,667	1366	$21,428

*Costs and capacities are based on a survey of new and replacement school construction, 1998-2000, for ten Washington school districts. Costs are adjusted to the year 2000 using the Engineering News-Record Construction Cost Index.

Table 3
School Facility Cost (Including Land Cost)*

School Level	Average Land Area (acres)	Average Land Price ($/acre)	Estimated Land Cost	Estimated Land Cost per Student	Estimated Facility Cost per Student	Total Estimated Cost per Student
Elementary	9.16	60,483	$554,024	$1000	$21,511	$22,511
Middle	10.5	60,483	$635,071	$ 835	$24,432	$25,267
High	32.2	60,483	$1,947,552	$1425	$21,428	$22,853

*Land use and costs are based on a survey of new and replacement school construction, 1998-2000, for ten Washington school districts.

Table 4
Total School Facility Cost Per New Single-Family House

School Level	Number of School Age Children per New House*	Total Estimated Cost per Student	Total Estimated Cost per New House
Elementary	.208	$22,511	$4,682
Middle	.104	$25,267	$2,627
High	.144	$22,853	$3,290
Total	.456		$10,599

*The number of school children per new house is based on the ***American Housing Survey***, U.S. Dept. of the Census, for houses constructed from 1993-1996 in the Seattle-Everett Metro Area, Current Housing Reports H170/96-60, November 1997; and the U.S. Dept. of the Census Annual Time Series of State Population Estimates by Age and Sex, July 1999.

School floor area per student is a significant factor in determining the facility cost per student. On average, districts exceeded the state minimum floor area standards (see Table 5). The average high school exceeded the standard by about 12 percent whereas the average elementary school exceeded the standard by about 38 percent. This, in part, explains why elementary schools did not have the expected lower facility cost per student than high schools.

Table 5
School Building Floor Area per Student

School Level	Wash. State Minimum Floor Area Standard* (square feet/student)	Average Floor Area from Sample Schools (square feet/student)
Elementary	80	111
Middle	110	125
High	120	134

*State standards were obtained via personal communication with Brenda Hetland, Office of Superintendent for Public Instruction.

Based on this analysis, the capital cost of providing schools is estimated to be $10,599 per new house. Since some children attend private schools, the public sector cost must be adjusted to reflect this savings. Statewide private school enrollment was 79,543 students in 1999 or 7.4 percent of the total 1.1 million enrolled students.[50] To arrive at a true public sector cost, the total school cost of $10,599 is reduced by 7.4 percent to $9,815 per new house.

While this is a representative cost for providing school facilities, local costs may vary substantially due to land costs, school construction standards and local demographics. Some communities will have a much higher percentage of families with children, which causes the school costs per house to increase. For example, Issaquah was reported to have a cost of $18,600 for each new single-family house in 1999.[51]

Who Pays for Schools?

The decision to construct new school facilities lies entirely with the local district. School districts generally have four main sources of local revenue: the sale of bonds, capital projects fund levies, school impact fees, and interest on investments. The sale of bonds is the primary source of local funds. The State of Washington aids local districts with school construction through revenue from the Common School Construction Fund. The Fund, in turn, receives money from the sale of timber and bonds.[52] The amount of money districts receive is determined by factors, such as the assessed value of taxable property per pupil within the district, local construction costs, and the building space allocated per student. Although the formula is designed to provide the average district with 50 percent of its capital requirements, in 1999 the state contributed only 24% of the $282 million cost of construction of new schools eligible for assistance.[53]

Transportation System

Transportation system costs include all the roads, sidewalks, curbs and gutters, bike lanes, and street lighting and signalization. Only the costs associated with arterial and collector streets (and associated bike and pedestrian facilities) are included, since local neighborhood streets within a residential subdivision are typically built and funded by the land developer.

Costs for building and expanding public transit systems and high speed rail could also be included under transportation system costs. These costs are not included here simply because it is difficult to accurately allocate costs from multi-jurisdictional transit agencies to local development.

Transportation system costs attributed to new development are best determined through a comprehensive, long range planning process that includes the entire road network and considers all the big and small projects necessary to serve projected growth over an extended time period such as 10 or 20 years. Most comprehensive transportation planning in Washington cities was completed in the mid 1990s for the GMA and has not been updated since. The exceptions are new cities and fast-growing cities that outgrew their existing plan.

Sammamish (population 30,793) is a new city created in 1999. The ***City of Sammamish Interim Transportation Plan*** was completed in January of 2000.[54] The Plan looks at two scenarios: one is growth that has already been vested (for concurrency[iii] purposes) and is in the development pipeline; the other is a buildout scenario in which all the land is ultimately developed according to the currently designated zoning. The capital improvements recommended in the Sammamish Plan are sufficient to maintain the current level of service for the vested pipeline development only. The improvements would not be adequate to meet the travel demand at buildout without severely impacting service conditions.

[iii] *Concurrency* means that adequate road capacity has been determined to be available concurrently with the completion of the development.

As shown in Table 6, all the traffic impacts modeled in the “pipeline development” scenario are from single-family and multi-family residential development. It was assumed that multi-family dwelling units will have 60% of the traffic impact of single-family units since they tend to have fewer occupants. The road improvements necessary to maintain the current level of service for “pipeline growth” in Sammamish will cost $197 million. These include adding new arterial and collector roads, widening roads to increase capacity, and upgrading existing roads. Improvements include local portions of roads outside city limits but in the immediate vicinity of Sammamish which will be impacted by the development (the “growth area”). The plan does not include costs to mitigate other regional traffic impacts on nearby towns like Issaquah or on regional freeways. These too are growth-related transportation costs which are rarely accounted for and are not included here for lack of sufficient data.

Table 6
Growth Scenarios Modeled
City of Sammamish (including Growth Area)

Land Use	Current Conditions	Scenario #1 Pipeline Development	Scenario #2 Buildout Development
New Residential Units			
Single-family	NA	2,640	NA
Multi-family	NA	945	NA
Total new units	[14,832 existing]	3,585	13,700
New Commercial Development (sq.ft.)	[796,000 existing]	0	203,000

Table 7
Traffic Conditions for Each Growth Scenario
City of Sammamish (including Growth Area)

Traffic Conditions	Current Conditions	Scenario #1 Pipeline Development	Scenario #2 Buildout Development
Vehicle miles of travel (VMT)	22,398	26,016	49,879
Speed of peak hour traffic (mph)	25	24	16
Average traffic volume per lane on arterials	252	255	490

All of the $197 million in costs can be directly allocated to serving the new development except for the road upgrades. Many existing roads are built to rural standards. They are narrow, have no shoulders, and lack bike lanes, sidewalks, curbs, and gutters. If the city of Sammamish were to stop growing, these roads might continue to be adequate. However, as the city grows, these roads become less safe and bike and pedestrian use becomes difficult. Upgrading roads to urban standards becomes necessary for the safety and harmony of the community. Should these cost be allocated entirely to new growth, or should they be paid by the entire community? Rather than try to resolve this question here, we have made the assumption that half of the $32 million in upgrade costs are attributed to the new development. Therefore, total growth-related costs are reduced by $16 million to $181 million.

Allocating growth-related costs between single-family and multifamily development in the Pipeline scenario, gives a cost per new single-family house of $56,000. While this cost may seem quite high, it does not fully mitigate regional traffic impacts, as noted above. Most of the costs involve city roads, but county and state road improvements are also included in this cost figure.

Are the growth-related transportation costs unusually high in Sammamish? A similar comprehensive transportation plan done as part of an EIS by Snohomish

County for the city of Lake Stevens revealed that the transportation system costs per new household ranged from $56,770 to $66,200, depending on the size of the Urban Growth Area.[55] Such high costs appear to be part of the price tag of sprawling development into formerly rural areas.

One possible reason these two studies show high costs is because they are financially unconstrained. The plans merely reflect the transportation improvements necessary to maintain current service standards. As such, they fully reflect growth-related costs. Final transportation plans are required to be financially constrained by state concurrency regulations. This means that expenditures must be matched with known revenues. If revenues are insufficient, expenditures must be reduced and service standards may be lowered (worsening congestion).

It is important to recognize that the high cost reported here is a reflection of the expense of maintaining an automobile-reliant transportation system to serve a sprawling land use pattern.

The City of Spokane (population 189,200) is in the process of adopting a new comprehensive plan which includes a transportation plan for the period 2000 to 2020.[56] Several alternative proposals are presented which offer different land use development patterns. The lowest cost alternative is to maintain current land use development patterns at $350.8 million over the 20-year planning horizon. Of the total cost, $166.2 million is for upgrading existing roads to higher urban standards. As explained previously, this expense may not be entirely growth-related. As a conservative (low) estimate, 50% of the upgrade costs, or $83.1 million are allocated to growth. This results in a total, growth-related capital cost of $267.7 million for the transportation system.

Because the Spokane Plan is financially constrained to known revenues, it does not attempt to maintain local standards of service at current levels. The city has not evaluated current system-wide service quality and has not determined how the quality of the transportation system will be affected by future growth. The capital investments described above are based on maintaining a set of minimum standards for key transportation corridors. The quality of the system may decline to the point at which a key corridor fails to meet the minimum standard adopted in the Comprehensive Plan. As a result, the capital costs associated with the plan are not intended to maintain the current quality of the transportation system, but rather to prevent projected growth from degrading service levels below the minimum standards. In this case, the full-cost impact of growth on the transportation system would also include the cost to the entire community of the increased travel distances, congestion and delays that will result. However, no estimate of these costs is available.

To allocate road costs to new development it is necessary to know how much future travel demand is projected for each type of land use (residential commercial and industrial). Future travel demand was modeled by the Spokane Regional Transportation Council based on the number daily trips generated. Residential land use accounts for 55.7% of the projected growth in travel demand through 2020. Allocating this share of the capital costs associated with the draft Spokane Transportation Plan “current trends” alternative to residential land results in a total cost of $149 million. 68,800 new residents are expected over the 20-year period. Based on 2.4 occupants per new house, this is equivalent to 28,667 new single-family houses. The cost of roads in Spokane is therefore approximately $5,200 per new house.

There is obviously tremendous variation between the Sammamish cost of $56,000 per new house and the Spokane cost of $5,200. This difference warrants further study which is beyond the scope of this project. The Sammamish cost is used here because it represents the full cost to maintain the quality of the overall transportation system.

The relatively few Washington cities which have transportation impact fees typically charge from $2,000 to $3,000 per single-family home. Based on a comprehensive transportation planning approach that maintains service standards (such as that used in the Sammamish Plan) these cities may not be charging nearly enough to cover actual costs.

Sanitary Sewer System

Facilities for wastewater treatment include a collection system and treatment plant, and in some cases, a distribution system. Information on the cost of new wastewater collection systems was not available since no city in the state has recently built a major new collection system. It is rare for a city or sewage district to build an entirely new system. Even systems that are described as new often use some land or administration buildings that were pre-existing. The amount and value of pre-existing capital is often difficult to determine.

For example, the City of Sumner had a new sewer system project which added one new aerobic tank, but also rebuilt the existing tank.[57] The value of the shell of one used aerobic treatment tank was not known or included in the cost of capital. This results in a conservative (low) estimate of the cost of sewage treatment facilities. The cost for most of the projects surveyed were similarly conservative.

The Water Quality Program of the Washington State Department of Ecology regulates sewage treatment in the state. Department personnel provided a list of recently finished sewage treatment projects that were essentially complete replacements, although as noted, some equipment is invariably reused.(2) Nine cities were surveyed: Sumner, Puyallup, Cheney, Washougal, Mossy Rock, Ilwaco, Woodland, Yelm, and North Bay/Case Inlet.[58]

The costs for plant construction are easily identified from the bid procedure. Relating costs to the number of potential residences that can be served is more difficult due to different measures of system capacity, system characteristics, and the different proportions of residential/non-residential use in each city. Estimates of residential use of plant capacity range from 55% for Sumner to 90 percent for Ilwaco.[59] No estimate of non-residential use was available for Yelm and Mossy Rock so it is assumed that all of the capacity is used for residences. In these two cases the capacity measure used is Equivalent Residential Unit (ERU), which is usually around 230 gallons per household per day, depending on system inflow and infiltration. In the other cases the residential capacity is based on population and current use in the city.

Treatment plants may be categorized by the quality of their output. Most modern plants provide secondary treatment levels. An improvement in water quality is achieved by tertiary treatment. Tertiary treated water may be re-used with some limitations. The costs, in 2000 dollars, for the seven plants that achieve a secondary level of treatment are presented in Table 8.

Table 8
Costs for Secondary-Level Sewage Treatment Plants
(in 2000 dollars)

City	2000 Population	Facility Cost	Residential Capacity	Cost per Residence
Woodland	3795	7300000	3166	2305
Ilwaco	819	4000000	1620	2469
Mossyrock	545	2300000	800	2875
Washougal	8125	5500000	6666	825
Cheney	8545	12540000	4107	3053
Puyallup	30940	21527000	24344	884
Sumner/Bonney Lake	18885	16000000	14526	1101

Cost per house among the cities surveyed ranged from $825 to $3,053. The average cost per residence for the seven plants listed in Table 8 is $1,930. Part of the differences in cost may be explained by economies of scale; some of the lower cost plants serve larger communities. Another likely explanation is that the differences reflect different amounts of re-used capital.

Two communities had plants that achieved tertiary level treatment. These plants represent the future for wastewater treatment. In the City of Yelm, the collection system is pressure tight plastic pipe with virtually no inflow and infiltration. The output is gray water that is used for lawn and garden irrigation, fire fighting, and to establish a wetlands. The cost for tertiary level treatment plants is presented in Table 9.

Table 9
Costs for Tertiary-level Sewage Treatment Plants
(in 2000 dollars)

City	2000 Population	Facility Cost	Residential Capacity	Cost per Residence
North Bay Case Inlet	NA	5250000	1260	4166
Yelm	2940	9600000	4166	2304*

* Other private costs exists for this case. See text.

The average cost per residence for tertiary treatment is $3235. A possible explanation for the low cost of treatment in Yelm is that not all of the sewage is treated at the plant. The system relies on septic tanks at each residence in addition to the treatment plant. The sludge from the septic tanks must be pumped out every few years and spread on fields. The homeowner faces the additional private cost for installing the septic tank.

The figure of $1930 per residence for the cost of sanitary sewer service is used in this study. This does not include the cost of collection systems nor does it include the cost of environmental degradation that results from using secondary, instead of tertiary, sewage treatment.

Stormwater Drainage System

The Washington Department of Ecology regulates stormwater discharge from new construction sites. The department requires two permits for clearing or grading a construction site over five acres, a General Permit to Discharge Stormwater Associated with Construction Activity (Stormwater Discharge Permit) and a National Pollutant Discharge Elimination System (NPDES) permit.[60] The latter is issued under authority delegated by the US Environmental Protection Agency.

The permits require the permittee to develop a Stormwater Prevention Pollution Plan, comply with SEPA regulations, and draft a public notice. The Stormwater Prevention Pollution Plan generally consists of Best Management Practices (BMP's) offered by the Department of Ecology in its Stormwater Management Manual.[61] The BMP's are based on site specific conditions and are implemented and paid for by the permittee.

The Department of Ecology is writing new stormwater discharge standards, commonly called duration control standards, for the entire state. Unincorporated portions of King County, however, have been using duration control standards since 1998. Conversations with personnel from the Department of Ecology and the King County Department of Natural Resources confirmed that essentially all the capital costs incurred mitigating stormwater discharge from new construction are paid privately.[62]

King County conducted a cost estimate of complying with the new standards and concluded that costs for residential development could decrease, remain the same, or increase depending on the nature of the development.[63] In urban areas the study estimated that about 60% of residential development would face a decline in cost primarily due to the use of smaller detention facilities. In rural areas, however, the new standards mean that fewer developments are exempt from stormwater controls and about 41% of developments will face an increase in costs. The estimated costs of complying with new duration control standards in King County are given in Table

10. These costs are paid privately.

Table 10
Estimated Private-Sector Costs of Complying with Stormwater Duration Control Standards
King County, WA

Development type	Percent of development type	Decrease in costs	Percent of development type	Cost (no change)	Percent of development type	Increase in costs
Urban residential	60%	$8,200 to $5,400/lot	19%	$11,500/lot	15% 6%	$6,700 to $7,900/lot $11,600 to $15,900/lot
Rural residential	39%	$6,400 to $4,800/lot	20%	$5,100/lot	36% 5%	$2,500 to $6,400/lot $5,200 to $6,900/lot

King County does charge a stormwater utility fee to cover operation and maintenance, planning, and review of stormwater discharge systems. The base fee is $85.62 per year for residences. The fee for commercial sites is based on the amount of impervious surface area.

Communication with the Spokane Department of Engineering Services, the Tacoma Department of Public Works, and the Bellevue Utility Department confirm that, excepting incidental cases, the capital costs of stormwater control for new development is paid by the private sector.[64]

The occasional exception to the rule of privately paid capital costs occurs when infill construction occurs in a dense urban area and on-site mitigation is not physically possible due to limited space. In this case, mitigation may occur elsewhere at public expense. The money to pay for mitigation comes from the stormwater utility fees that fund the general stormwater program. No estimate is available for the cost of this type of mitigation.

Water Service Facilities

The capital costs of a water system include the water source costs (water rights, wells, watershed protection, etc.), water treatment or filtration plant, storage reservoirs, pumping stations, and transmission and distribution piping. Two cities, Seattle and Kalama, are in the process of building new filtration plants and one city, South Bend, has recently completed a plant. However, no cities have been identified that have new storage or distribution systems. Therefore, this section addresses only treatment plant costs.

<u>Seattle</u>

Seattle (population 540,900) provides 150 million gallons per day (mgd) of potable water.[65] About 50 percent is sold to Seattle customers, 41 per cent is sold to wholesale buyers, and nine per cent is considered non-revenue.[66] Non-revenue use is due to leaks, government use (such as fire fighting), and non-metered use.

The average output of the new plant will be 45 mgd, almost identical to the estimated average usage of Seattle residential customers, 44.3 mgd. The capital cost of the new plant is bid at $65 million. The capital cost per gallon of water output is $1.44. It is assumed that the plant's capacity is devoted to Seattle's residential use and that there are 2.4 people per new house. The cost of water treatment plant alone in Seattle is estimated to be $288 per house.

<u>Kalama</u>

Kalama (population 1,685) provides water to about 3,000 people.[67] The city is currently operating a pilot plant using diatomaceous earth and developed estimates for construction of a complete plant. The new plant is estimated to cost $3 million and would serve 8,000 residential customers plus industry with a capacity of 3.2 mgd. This results in a plant cost of $0.94 per gallon of output capacity. Residential use in King County averages 81 gallons per day per person.[68] Assuming this same usage rate in Kalama implies that about 20 percent of the plant capacity (and cost) should be attributed to residential use. Based on 2.4 people per new house, the cost of water treatment in Kalama will cost $184 per house. City officials in Kalama estimated that a conventional filtration plant would cost 50 percent more than the diatomaceous earth filtration plant.[69] Thus, a conventional plant would be expected to cost $276 per household, very close to the cost of the Seattle filtration plant.

South Bend

South Bend (population 1,645) has a water system that supplies the city and furnishes water to an additional 140 households in the surrounding unincorporated area.[70] The city recently completed a 0.978 mgd plant for a cost of $2.44 million. The capital cost per gallon of water output is $2.48. Assuming 81 gallons per day per person consumption, the cost per new house is $482 for water treatment facility costs only. The City of South Bend has unusually high leakage losses of 40-50 percent in their water delivery system. This would increase the actual cost to at least $804 per residence in this particular city. It is assumed in this report that new development does not contribute to the leakage problem and therefore a new house is allocated only $482 in costs. The city has a small capacity system which uses membrane technology. This may account for the higher cost compared to the larger systems.

The average cost for the three cities' water treatment systems, excluding the cost of South Bend's unusual leakage, is $348 per house. Distribution system costs are not included.

Parkland, Open Space & Recreation Facilities

There are several methods for allocating parkland and recreational facility costs to the various land uses. The predominant method is to assume that the costs of parks and recreation facilities are attributed entirely to residential development. However, it is also reasonable to assume that commercial development benefits to some degree from urban parks and therefore should help bear some of the costs. For simplicity, all costs in this category are allocated to residential land use in this report.

Six larger cities were surveyed to estimate the cost of municipal park acquisition and development. The cities were selected based on having adequate record-keeping and recent parkland purchases. Due to variations in the quality of the data, two of the cities are presented as case studies, while the remaining four are presented as a cross-sectional analysis.

The City of Bellingham

A detailed insight into the cost of acquiring park land is offered by examining the Greenway Program of the City of Bellingham (population 64,720).[71] The program is funded by a special short-term levy. The city has made regular purchases of parks and natural open space areas every year since 1991 and has kept detailed data on purchases.[72] The average cost for the 24 parcels (83.3 acres) of open space and park land purchased for the years 1998-2000 was $51,597 per acre. The average cost for the eight parcels (31.3 acres) which will be used as urban parks was $67,322 per acre, reflecting the higher price of urban land.

During the time period Bellingham has implemented its greenway acquisition program, the city's population has increased an estimated 11,690 people and the city has added 266 acres of parkland. This is approximately 23 acres of parks and open space per 1000 new residents, a considerably higher level of service than the formal standards commonly adopted in other city's management plans. However, Bellingham has an even higher adopted standard of 35.6 acres of parks and open space per 1000 residents. The city has now achieved a level-of-service of approximately 34 acres per 1000 residents. Based on the actual service level (34 acres per 1000 residents), the cost of providing unimproved parkland to the 2.4 residents of the typical new house is $4,210.

Some insight into the cost of developing parks and constructing new recreational facilities may be gained by examining the 1994-99 budget for new construction.[73] The Parks and Recreation Department budgeted $9,657,000 (1999 dollars) for 27 new construction projects for this time period including a pool, a theater, athletic fields, and a golf course. The actual expenditure for new park land and open space during the same period was $7,226,000 (nominal costs).[74] Over a six year period then, new construction was expected to cost about 133% of what was being spent on land acquisition. This implies that the total cost for parks and facilities is about $9,810 per new house.

The City of Kirkland

The Parks and Recreation Department of the City of Kirkland (population 45,090) has standards of 1.3 acres/1000 people for neighborhood parks, 1.6 acres/1000 people for community parks, and 5.7 acres/1000 people for nature parks for a total of 8.6 acres/1000 people. The city currently has 458 acres of urban parks and nature parks, yielding a total of about 10 acres per 1000 residents. The Parks and Recreation Department estimated the average price for their urban park land to be $400,000 per acre, reflecting its development potential in an urban area.[75] The price for nature parks is somewhat lower due to reduced development value of some parcels (for example, a wetland area was purchased for $30,000 per acre). Therefore, a figure of $100,000 per acre is assumed for nature parks. Based on 2.4 people per new house, the land cost for all park land is estimated to be $4,160 per house.

The department estimates that facilities cost $400,000 for neighborhood parks and $2.5 million for community parks. This includes the costs of playing fields, courts, and restrooms, but does not include larger facilities such as swimming pools. If it is further assumed that neighborhood parks are five acres in size and community parks are 40 acres, the cost for all facilities is estimated to be $490 per household. The total cost for park land and facilities in Kirkland is estimated to be $4,650 per new house.

Cross-sectional Analysis

The cost of urban land varies enormously. For example, in Spokane the price of park land varied from $6,250 per acre to over $600,000 per acre, a ratio of almost 100 to one. As another example, the City of Bellevue purchased 5.47 acres of parkland during the period 1998-2000 for a total cost of $12,004,000. This is an average cost of $2,195,000 per acre. A portion of the land fronts Lake Washington and is unusually expensive.

In such situations, relying on an average land price to forecast the cost of a particular park may be misleading. However, knowing an average price is useful for general analysis at the state level. A survey of parks purchased between 1997 and 2000 in Spokane, Kenniwick, Bellevue, and Yakima yielded an average land price for eight city parks of $197,400 per acre.

The cities in the survey also had varying standards for the quantity of park land desired. Standards ranged from a high of 8.6 acres per 1000 people down to 3 acres per 1000 people. Several of the cities have refined the standards slightly to allow for different standards for neighborhood parks, community parks, and natural areas. No standards were found which address the facilities or types of recreational experiences that park users demand. The average land area standard for all types of parks is estimated to be 5.7 acres per 1000 people.

Based on 2.4 occupants per new house, the estimated average cost of the park land alone is $2,700 per household. This does not include capital improvements made to parks, which, may be more than the cost of the raw land.

Parkland Summary

There is significant variation in the cost of providing new parks and open spaces in Washington. Land prices vary over orders of magnitude and facilities range from non-existent to expensive swim parks. The average cost based on the two case studies (Bellingham and Kirkland) is $7,230. Evidence collected indicates that total costs typically lie in the $3,000-9,000 per house range. A midpoint cost for parks and recreation facilities of $6,000 per new house is used in this report.

Fire Protection Facilities

Fire protection facilities include all capital costs associated with building a fire station, acquiring land, and providing the necessary equipment, including fire trucks and other vehicles. It can be difficult to allocate the costs of a fire station to residential development since the service area is often hard to define and includes a mix of land uses. A fire station's service area may also overlap with other nearby stations. The limits of the service area are usually determined by response time and might include all property that can be reached within a four minute drive. This may be further limited by topographic features, accessibility and the distribution of development around the station.

King County Fire District #26 in the City of Des Moines (population 26,700) is completing a new fire station that will serve the entire city. This provides an excellent case for cost allocation, since the service area is well defined. The $5 million bond approved by voters was issued in 1998 and covers all capital cost for the new facility including a new pumper truck ($350,000), refurbishing a second fire truck ($60,000), and an aid car ($100,000) for providing onsite medical assistance.

According to the Fire District, the new station will serve all of Des Moines with the exception of two small areas that are covered by other fire districts. The station will have a service area of 5½ square miles and respond to an average of 2700 calls per year. To arrive at a reasonable distribution of facility cost, the 5½ square mile service area was assumed to be filled with single family houses at a density characteristic of new subdivisions (6 units per net acre). Facility costs were distributed evenly across all of the "potential units" in the service area. The cost per single-family house is $331. The cost for fire protection facilities is the lowest of the eight cost categories calculated in this study. This finding is consistent with a recent analysis in Oregon where similar costs were determined to be $298 per house.[76]

Library Facilities

As a community grows, increased library capacity is needed. Issaquah has outgrown its existing library and is replacing it with one twice as large. Voters approved an $8.1 million bond in November of 1996 to fund a new 15,000-square-foot facility. The bond will cover all capital costs including construction, land acquisition and additional library materials. The new library will serve a portion of the Issaquah School District. The balance of the School District lies in the new town of Sammamish, which also has a new 10,000-square-foot library. The Sammamish library was completed in 1998 at a total cost of $5.9 million (adjusted to 2000 costs).

According to the School District, the population of this service area is 53,000 people. The combined cost of the two libraries serving this area is $14 million. The per-capita cost of the local libraries is $264.

In some instances libraries are oversized to accommodate future growth, however given the ½ square foot per resident size rule used by some library officials, the new libraries are just adequate for the service area. Rather than overbuild the Issaquah library, the building was designed so it could easily accommodate future expansions.

The Issaquah library is part of the King County Library System. The Library System has just completed a new service center which serves all of the county's libraries. The service center cost $22 million and serves the entire King County population of 1,685,600. This adds an additional capital cost of $13 per capita for a total library facility cost of $277 per capita. Based on a new house occupancy of 2.4 people, the cost per new house for library facilities is $665.

Libraries in King County are an independent taxing district. Their operating budget comes from county property taxes. Local library construction is typically funded with a voter approved bond issues that is also paid through property taxes within the voting district.

Electric Power Generation and Distribution

Each new house requires electric service to operate standard household appliances, lighting, electronic equipment, and often for hot water, space heating and air conditioning. The local electric utility must provide additional power generation capacity to meet this new load[77] and distribution facilities must be able to carry the power from the generation source(s) to the house via a high-voltage transmission and distribution system.

Energy facilities are different from other public facilities in that they are typically owned and operated by a private utility company, rather than a local government. The utility has an exclusive franchise for the service area. While the cost of expanding the electrical system does not impact local taxes, the cost is borne in a similar manner by local ratepayers.

Utilities often claim that new customers eventually pay for the cost of expanding the system through their electric bills, however this is rarely the case. The capital costs for expanding the generation and distribution system are typically distributed evenly across the rate base (all power users), regardless of whether they are new customers or existing customers. Since new and old customers pay the same electric rates, new users receive a substantial subsidy to cover most of the costs of system expansion. The resulting funding inequity is similar to that which occurs when municipalities fund local infrastructure expansion through broad-based tax revenues such as property taxes.

There is no available data in Washington which break out capital costs from O&M costs. All available cost data on power generation and transmission and distribution (T&D) include both the cost of adding new capacity and the cost of operating and maintaining the entire system. Total power generation costs amount to 58% of the cost of electricity while T&D amounts to 33% of electricity cost in Washington.[78]

Power Generation Costs

There is no data comparing energy use of new homes with the average home in Washington. New homes typically are better insulated than the average home and have appliances that are 25 to 40 percent more efficient than those sold in 1990.[79] On the other hand, new homes are bigger with more space to heat and cool, are more likely to have air conditioning, and are likely to have more appliances, more electronic equipment and more luxury amenities (like spa baths, saunas and hot tubs) than the average house. The assumption used here is that these factors balance out and the typical new house uses about the same amount of energy as the average house. An average house in Washington requires 5 kW of generation capacity to serve it during a period of peak system-wide demand.[80]

Most new generating capacity is in the form of combined-cycle natural gas turbines. These are among the least expensive power generation systems to build. According to the Northwest Power Planning Council, the cost for a new 230 MW generation unit is $637 per kW.[81] Therefore, the 5kW of generation capacity required by a new house would cost $3,185.

Transmission and Distribution Costs

The T&D system includes the high voltage transmission system, medium voltage distribution system, and low voltage local service. Voltage is reduced in stages with transformers as the distribution system approaches the end user.

The on-site electric service connection from the power distribution system to the house may be funded by the utility or by the developer, depending on the policy of the local utility. Virtually all new local service in Washington is placed underground. The developer may be required to provide the utility trenches and perform the backfilling after the utility has laid the power lines. The developer may also be required to pay for some, or all, of the cost of the local service connection (power line and meter). However, many utilities offer allowances on the order of $1000 for each service connection. In this situation the utility picks up the cost of the service connection up to the amount of the allowance. This amount is funded through the rate base.

Utilities in Washington are not required to report the T&D costs associated with adding new customers or new power load (referred to as "marginal costing"). However, this data is available in Oregon and experts familiar with both states say that these costs would be virtually identical in Washington. Therefore, Oregon T&D cost data is used as the best available proxy for Washington. The most recent marginal cost data are from a 1997 rate case filed by Portland General Electric (PGE). These costs were evaluated by the Citizens Utility Board of Oregon to determine the distribution system costs associated with adding a new residential customer. The costs are based on providing buried (underground) service and assume that there is no developer contribution beyond providing the utility trench and backfill.

As shown in Table 11, T&D costs range from $6,927 for an electrically heated house to $3,857 for non-electrically heated. Since new houses use both forms of heating, a midpoint cost of $4,942 is used here for T&D costs.

Table 11
Power Distribution Costs for New House

Cost Area	Residence with Electric Heat	Residence, Non-Electric Heat
Transmission	$112	$68
Substations	$103	$62
Wires	$4,768	$2,897
Service	$419	$419
Line Transformer	$549	$334
Electric Meter	$49	$49
Customer Service	$27	$27
Total:	$6,027	$3,857

Source: Analysis by Citizens Utility Board of Oregon of the Portland General Electric *Marginal Cost Study*, filed December 1997.

Based on the PGE study, CUB estimates that the cost of adding 12,000 new residential customers a year to PGE's distribution system increases the average electric bill by about $8 per month for the utility's 600,000 existing residential customers. (Generation costs would also add to the electric bill.)

Combining generation costs with T&D costs, as shown in Table 12, gives a total cost of $8,127 to serve each new house.

Table 12
Total Electric Power Generation and Distribution Cost for New House

Cost Area	Cost per New House
Generation	$3,185
Trans & Dist	$4,942
Total Cost	$8,127

Cost Summary

The total cost to the public sector to provide the nine categories of infrastructure evaluated here is approximately $83,000 per single-family house, as shown in Table 13. Most of these costs are due to the transportation system alone, at $56,000. Schools rank a distant second in terms of cost, but still represent a significant expense, at $9,800. Surprisingly large costs are associated with providing both electric power generation and distribution facilities ($8,100) and parks and recreation facilities ($6,000). Note that these costs do not include any financing costs, which would add to the total expense.

The costs reported for sanitary sewerage and water systems cover plant costs only. No data was available for recently completed sewage collection or water distribution systems, so these costs were not included in the total. Stormwater drainage represents a significant public cost in many states. However, in Washington these costs are usually borne by the private sector and no cost is included here for stormwater facilities.

State-wide costs for residential infrastructure can be estimated using home construction data. For 1999, a total of 41,483 permits were issued for residential units.[82] Sixty-six percent of these were for single-family and 34 percent were for multifamily units. Where impact fees are being collected, these fees should be deducted directly from the total costs calculated in this study. If it is assumed that average impact fees around the state are $2,500 per single family house, the net cost is about $80,500 per new house. A multifamily housing unit has approximately 60% of the cost and impact as a single-family home. Assuming impact fees are also about 60% of the single-family rate, the net cost would be approximately $48,300 per new multifamily unit. A rough estimate of the total annual statewide infrastructure cost associated with residential development is about $2.87 billion.

Table 13
Growth Cost Summary*
New Single-Family House – Washington, 2000

Cost Item	Amount
Transportation Facilities	$56,000
School Facilities [A]	$9,815
Electric Power Generation and Distribution Facilities	$8,127
Parks and Recreation Facilities	$6,000
Sanitary Sewerage (plant only)[B]	$1,930
Library Facilities	$665
Water System Facilities (plant only)[C]	$348
Fire Protection Facilities	$331
Stormwater Drainage	NA[D]
Total:	$83,216

* This is a summary of the capital costs reviewed in this study and is not a complete listing of growth-related costs. A) School facility costs can vary widely depending on local standards and demographics. B)Sewage collection system costs were not available. C) Water distribution system costs were not available. D) These costs are borne by the private sector in Washington.

HOW ARE GROWTH-RELATED COSTS PAID?

In general, Washington's mix of local financing and revenue sources for capital projects is complex, different for each community, and changing from year to year. An excellent source of information for those seeking to understand how capital projects and growth-related infrastructure are funded is ***Infrastructure Financing for Small Communities in Washington State*** by The Washington State Department of Community, Trade and Economic Development.[83]

This study focuses on improving understanding of the capital cost generated by new residential development and a review of public finance is well beyond the scope of the project. However, it is possible to simplify the issue somewhat by focusing on the matter of equity.

If it is assumed that the benefits of newly expanded infrastructure go primarily, or entirely, to new development, then shouldn't the costs also be paid primarily or entirely by that development? Currently, the key issue regarding the equity of funding public infrastructure is whether these cost are distributed across the entire community or placed directly on the new development. Most taxes, such as sales and property taxes, are broadly distributed across the local population. Everyone pays. When broadly-based revenues are used to fund infrastructure serving new development, questions of equity arise. Are residents of the community receiving benefits commensurate with their contributions? Are they receiving any benefits? These are important questions which need to be discussed and resolved in a public forum.

Development impacts fees provide one method for assigning the capital costs described here to the new development which generates them. The state's Growth Management Act specifically authorizes cities and counties to collect impact fees for certain categories of infrastructure. The State Environmental Policy Act (SEPA) also enables local governments to mitigate development impacts through fees. Currently only a small portion of Washington's cities and counties collect impact fees, and those that do, often collect much less than the full cost.

Developers often contend that these fees force up the price of housing. While development impact fees may cause new home prices to increase, it is important to recognize that these fees are not ***new*** costs created by government bureaucracies. The costs are created by the new development. The real question is who should pay them. The role of impact fees is to shift costs out of the general tax base and onto specific developments. This provides general tax relief and thereby lowers the cost of housing for the whole community.

Another argument against impact fees is that the new development will eventually pay its share of costs through regular tax payments. While tax payments by new development may contribute a small amount to the infrastructure costs incurred by the community, the amount is probably only on the order of 1 to 5 percent (as explained in the section *What are Growth-Related Costs*?).

On the other hand, many of these public facilities carry additional financing costs that are also paid by the community, usually as bond interest rates. Financing costs can increase the total price of infrastructure by 100 percent over a 20 year period. Neither the tax contribution of new development, nor the financing cost of capital are examined in this study.

CONCLUSIONS

The general findings of a literature review of the fiscal impacts of growth are that, in most instances, urban growth results in real net costs to local governments. Residential development in particular is likely to represent a net fiscal drain. The fiscal burden of residential development may be high enough to make land conservation (through acquisition or easements) a viable, cost-saving alternative where land costs are moderate.

Fiscal impact analysis appears to be gaining recognition as an important tool for evaluating local land use and development policy decisions. A greater use of this analysis tool by local governments in Washington would shed needed light on how urban growth is impacting communities in the state. To achieve a real understanding of growth's fiscal impacts, the substantial capital cost of the infrastructure growth requires, must be included in any analysis.

Based on the evaluation of costs to provide nine categories of public infrastructure in this study, typical residential growth creates a substantial capital cost burden to the local community of approximately $83,000 per new single-family house. The total extent of this cost burden is not widely known or reported. A rough estimate of the total annual statewide infrastructure cost associated with residential development is about $2.87 billion. This is equivalent to an annual cost of about $500 per person in the state.

As noted in the report, many of these costs are not being paid directly, but are manifesting themselves in declining levels of service. For example, the most expensive category is transportation, where the road system expansion costs are about $56,000 per house. These high costs are required to maintain the service levels of the transportation system. However, many communities find the cost of maintaining service standards is too high, and settle for greater congestion instead.

The negative fiscal impacts of growth reported in the literature are a result of the system of taxes and policies which act to subsidize growth at the expense of all taxpayers. Policy-makers, if they wished, could act to remove these subsidies so that growth paid its own way and was not a financial burden on the residents of a community.

Development impact fees are being used by some Washington cities and counties to help fund infrastructure. However, most local governments in the state charge no impact fees at all, and those that do often charge much less than the full cost to serve new development. The use of impact fees represents an opportunity to better fund infrastructure needs and to achieve greater equity in revenue collection.

The findings in this report are consistent with most of the literature on the subject. New urban growth creates demands on local governments for both expanded public services and new capital facilities. The high cost of the capital facilities shown here provides a possible explanation for the increasing tax rates and negative fiscal impacts associated with growth. Since rapid growth will dramatically increase demand for public facilities, this may explain findings in the literature showing that areas with the highest growth rates also have the highest tax increases.

The research for this report would have been greatly facilitated had more local governments collected and reported capital costs associated with serving new growth in a useful way. While most local governments carefully distinguish dozens of line items, very few can distinguish growth-related costs from other costs. As citizens are becoming increasingly aware of the fiscal impacts of growth, local governments are beginning to provide better reporting of growth-related costs.

□

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