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LOCAL GOVERNMENT AND CLIMATE CHANGE: EFFECTIVE LOCAL RESPONSES TO A GLOBAL PROBLEM

BRIEFLY

The 2008 Legislature instructed the State Department of Community, Trade and Economic Development to provide guidance to local governments as they consider policies that respond to climate change (ESSB 6580). CTED should consider the basic precepts in this report as it develops that guidance.

Concern about climate change and its impacts on the future livability of the planet has been building for many years, and has, in the past few years, reached a critical mass of public interest. More recently, a combination of factors have led to strains in the world's supply chain for petroleum and refined products, leading to sharp increases in prices for gasoline and diesel.

It turns out, of course, that the most obvious remedy for both of these problems is a reduction in the use of energy in general, and fossil fuels in particular. As such, the issues are often conflated. Sometimes this makes little difference, but at other times the solution to one can run counter to the other. For example, substituting domestic coal for increasingly expensive imported oil may save money but does little to reduce carbon emissions.

State and local governments establish many of the public policies that shape individual and organizational decisions with respect to greenhouse gas emissions. But the disconnect between the global scope of the issue and the local venue for action makes it difficult to balance costs and benefits. At the same time, however, a local focus on energy efficiency and waste reduction can have far reaching benefits beyond their possible impact on climate change.

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Climate change and its associated energy issues are enormously complex, and this report does not attempt to answer the scientific and technical questions. The key point is that decision-makers in the public and private sectors are increasingly orienting themselves around efforts to reduce energy use and greenhouse gas emissions. Local governments, in turn, will be affected whether they undertake proactive strategies or not. While the scientific work will continue for a long time, the basic public policy framework is taking shape now. The key is to make sure those public policies are flexible enough to adapt to emerging scientific discoveries.

Growth management and comprehensive planning

The state Growth Management Act provides a vehicle to undertake planning aimed at reducing energy use. The arrangement of housing, employment and services, and the transportation links between them will influence travel behavior and building types and, hence, energy use. Comprehensive plan updates will increasingly contain components related to climate change and energy.

WASHINGTON RESEARCH COUNCIL
16300 Christensen Road, Suite 207
Tukwila Washington 98188
206-467-7088
fax: 206-467-6957
www.researchcouncil.org

In drafting these plans, local governments should respect consumer preferences and markets. Land use planning that attempts to buck basic values and social trends will fail, even when undertaken with the best of intentions. Planning for energy uncertainty should aim to find ways to meet market needs in new and unexpected ways that are more energy efficient.

Focus on jobs-housing balance

For the past 15 years growth management planning in most of the state has emphasized an urban center model that attempts to drive more growth into concentrated centers that can be served more easily with public transit. The idea is that within the centers, close proximity of housing and retail will encourage walking and biking, rather than automobile use. For the Central Puget Sound region, the Puget Sound Regional Council's new Vision 2040 plan anticipates that 30 percent of growth over the next 30 years will be concentrated in the "metro cities" of the region (Seattle, Bellevue, Tacoma, Bremerton, Everett) and another 20 percent in the "core" cities, such as Kent, Puyallup and Lynwood. (Puget Sound Regional Council 2008)

The record of attracting growth to centers has, however, been mixed thus far. From 1992, when Growth Management was launched, to 2007, the Puget Sound metro cities have attracted less than 20 percent of the region's growth. The core cities have attracted over 20 percent of growth in this period, but much of that has been in low-density settings within those cities. Most of the designated urban centers themselves – downtown Seattle and downtown Bellevue being the notable exceptions – have seen little growth.

The role of multi-family housing is a good-news-bad-news story. The good news is that multi-family builders are shifting from energy-inefficient "woody walk-ups" on the periphery to stacked flats in centers. The bad news is that there has not been a region-wide shift toward multi-family housing: the ratio of single-family to multi-family housing has remained constant since 1990. Questions about the mix of housing types will be discussed more below.

The urban centers strategy will likely continue to dominate the planning process for the foreseeable future, despite its mixed record of success. But the more promising planning avenue for reduction of commutes and consequent savings of energy is to rebalance jobs and housing. Recent research on traffic congestion concluded that the only land use measure that promises to reduce traffic congestion (and, thereby, energy use) is to optimize the balance between jobs and housing (Sarzynski et al. 2006).

Unfortunately, the jobs-housing balance has been moving in the wrong direction in the Puget Sound area (see Figure 5, page 5). An analysis of housing development and migration trends shows that while King County has been the main job creation center of the Puget Sound region, it has not kept up with housing demand (Washington Research Council 2008). The effect has been to export housing demand generated by job growth in King County to Pierce and Snohomish Counties. This results in long, energy consuming commutes.

A very useful contribution to reduced energy use, therefore, would be policies that offer housing choices closer to jobs. Plans should both encourage greater housing choices in areas with large concentrations of jobs (see housing section below) and encourage job growth in areas with a high concentration of moderately priced housing (see economic development sec-

tion below). This is mostly a Central Puget Sound problem at present but with rapid increases in housing prices in smaller communities of the state, long commutes could easily spread.

Plan for mid-level densities

Urban centers strategies call primarily for stacked-flat housing. There is a limited market for this housing form, and, at the same time, a large and mostly un-met market for housing at moderate levels of density (between 10 and 20 units/acre net). Housing at these densities can offer lower cost and greater convenience while still providing many of the advantages of single family housing.

The inverse relationship between housing density and carbon footprint is established but the metropolitan areas with the highest overall density (and lowest carbon footprint) are not ones necessarily associated with high-rise living. Los Angeles and Orange County, often used as metaphors for sprawl, are actually among the most dense metropolitan areas of the country, according to the U.S. Census Bureau, and have remarkably low carbon footprints. Los Angeles has spread its density out across the region, offering numerous housing choices throughout the area (Brown, Southworth and Sarzynski 2008; Glaeser and Kahn 2008).

Specific design features that enhance energy efficiency will be discussed below in the section on housing. For planning purposes, the important consideration is the placement of these kinds of development within the urban fabric. Most plans place high density housing in urban centers or along arterials. Mid-level density housing should, however, retain a neighborhood feel as much as possible. Plans should allow for placement of these energy-efficient designs in infill settings in existing neighborhoods.

Plan for redevelopment

It will not be enough to apply energy and climate policies only to new development and centers: changes to the existing built environment will be needed. But without specific policies aimed at redevelopment, existing residential land uses tend to get locked in. Older houses are replaced one at a time with new homes that themselves have a 50-to-100-year useful life. Low density, energy intensive land uses get perpetuated without concerted action to change them.

The Cascade Agenda has adopted a 100-year planning horizon, and it would be useful if local governments did the same. Most housing and commercial structures have a useful life of less than 100 years, so planning should anticipate the optimal time to consider rezoning an area to a higher density, more energy-efficient pattern.

One technique for retrofitting and redeveloping existing low-density neighborhoods is known as “smart sprawl” (Siembab 2005). This planning concept calls for placement of most services within one or two miles of all households so they can access them easily with light-duty, non-emitting vehicles. Smart Sprawl includes transit, but does not require the high densities and high cost of rail, and recognizes that personal vehicles make the most sense over short distances. In a well-designed smart sprawl setting, light duty vehicles can be practical and safe.

Transportation

Transportation generates about one third of carbon emissions in the U.S. so this is obviously a key place to look for energy use reductions. It is also,

however, the place with the biggest conflicts between energy reduction strategies and individual values and habits.

As a starting point, no one should underestimate the value that individuals place on mobility. Throughout human history, new transportation technologies have been readily embraced, and people have been willing to spend a great deal of money to gain access to them. The automobile is the culmination of this development and its rapid and near universal global adoption testifies to its value. Simply put, people everywhere in the world will cling tenaciously to personal vehicles, enduring whatever costs or inconveniences arise.

Attempts to force reductions in the use of personal vehicles have always had limited success. There is a limit to the degree of taxation or other penalties that a democratic society can impose on such a popular activity, and with the recent run-up in gasoline prices it is questionable whether the federal government will impose significant additional taxes anytime soon.

With that in mind, here is a look at the major alternatives to the automobile and an assessment of their potential for reducing energy use.

Public Transportation

The core of most local government energy use reduction strategies is an increase in the use of public transportation. Conventional wisdom suggests that public transportation is the answer to climate change and energy efficiency, but there are several challenges:

Cost. Public transportation is expensive and fares recover only a fraction of the cost.

A well run bus system may recover 25 percent of its total operating costs at the farebox, but less at the margin where capturing new riders requires opening new routes to low density areas. So, promoting transit ridership implies an increase in the taxes needed to support the system. But since most residents of metropolitan areas do not ride transit regularly, there will be resistance to new taxes.

Energy use and carbon emissions. Bus transit systems may not be any more energy efficient than the average car. It all depends on the load that the bus carries. Full buses at rush hour that do not deadhead back to their bases are very energy efficient. But a bus running through a suburb in midday with two or three riders is far less energy efficient than if those riders drove mid-sized cars. The problem is that most transit systems have already captured the ridership that is most efficient. Any growth in their systems will tend to be energy inefficient as they attempt to capture riders in low density areas and in off-peak times. Shifting to smaller, more energy-efficient vehicles on low density routes would save energy, but those routes would still have to contend with high labor cost per rider.

For rail transit systems the dilemma concerns construction. From the production of concrete and steel to the operation of vehicles and machinery, the process of building rail transit systems emits a great deal of carbon into the atmosphere. By the time a system opens, it already has a large carbon deficit to make up. And if the electricity used to run trains comes from coal or gas-fired plants the system generates more carbon emissions than meets the eye.

Convenience. Public transit is very good at two things. First, it provides transportation to those who cannot get around any other way. Second, it

provides reliable, cost-effective rush hour transportation into and between dense urban centers. Outside of those two functions, transit struggles to provide a service that can compete with the convenience of the automobile.

Travel patterns often involve a "chain" of trips (Puget Sound Regional Council, 2007), with the individual or group traveling in succession to a number of places. Transit cannot serve this need very well from a timing perspective, and it is quite possible that one of the destinations in the chain involves an activity with large, awkward items.

The ideal role for transit service would be as a link between very dense urban centers, where chained trips can be mostly accomplished on foot and high densities allow for frequent service. The analysis of chained trips will help planners better understand the potential and limitations of mixed use zoning and transit orientation as tools that will allow people to cut back on chained trips and therefore make transit more practical. But cities still must contend with the fact that most of the built environment we will have in the next 30 years is already on the ground, and is mostly not very pedestrian or transit friendly.

Figure 1: Mode splits in 1990 and 2006

	Central Puget Sound		Metro Portland	
	1990	2006	1990	2006
Drive alone	73.5%	70.6%	72.7%	69.6%
Carpool	11.9%	11.7%	12.4%	10.8%
Transit	6.3%	7.5%	6.2%	7.9%
Walk	3.5%	3.1%	3.4%	3.4%
Bicycle	0.5%	0.8%	0.9%	1.6%
Other	1.0%	0.6%	1.6%	0.9%
Work at home	3.4%	5.3%	3.8%	5.7%

Source: U.S. Census Bureau

Efforts to create more transit friendly environments in the Seattle and Portland areas have yielded minimal results. Figure 1 shows mode splits for the three-county Portland metro area and the three-county Central Puget Sound area in 1990 and 2006. In both areas, driving alone has fallen somewhat, but the corresponding increase in transit use is actually less. Carpooling had a reduced share in both areas, and the largest increase in share was in working at home.

But it is critical to note that even with the drop in driving alone in both metro areas, the number of daily drive-alone commutes increased by 200,000 in the Puget Sound area and by 120,000 in the Portland area. Both metro areas saw expanded transit service during this time, and aggressive land use policies designed to promote transit ridership, but nonetheless, new drive-alone commuters outnumbered new transit riders by nearly five-to-one.

Given the high cost of expanding public transit, the difficulty of attracting new riders in energy-efficient ways and the likelihood that most of the built environment will remain difficult for transit to serve, we must be realistic about the role that transit can play in reducing overall energy use.

Walking/biking

Walking and biking are certainly energy-friendly transportation modes that have the added benefit of promoting exercise. But each has some significant limitations in terms of growth in mode share.

According to the Census Bureau's 2006 American Community Survey (ACS), over 50,000 people in the Central Puget Sound region walk to work on most days. Although the share of walking dropped from 1990 to 2006 in the three-county area, walking did gain share in King County. And, with the construction of thousands of multi-family units in Seattle, Bellevue, Tacoma and other centers, we can expect some growth in walk-

ing to work.

In recent years the multifamily housing industry has seen a shift away from auto-dependent complexes on the periphery to more pedestrian-friendly projects in urban centers. Thus, many more apartments and condominiums are within walking distance of major employment centers.

It is not clear, however, that the ability to walk to work is the primary motivation for moving to housing in urban centers. The 2000 Census (the latest year for which census tract commuting data is available) showed that in the census tracts surrounding Downtown Seattle, 39 percent of commuters reported walking to work and 33 percent drove to work in cars. Nearly half of commuters in these census tracts reported a commute of longer than 20 minutes. Clearly, a lot of people are living next to Downtown Seattle for its amenity value and then commuting elsewhere.

Less is known about walking for other purposes. The planning ideal of self-contained urban centers where residents can meet their daily needs has been reached in just a few areas. The challenge will be dealing with consumer choice. There may be stores, restaurants and churches in the urban center, but are they the ones that the residents really want to go to? American society is built around the concept of choice, and few urban centers can offer many choices. In a previous age the faithful would walk to their neighborhood church on Sunday, whereas now thousands drive past dozens of neighborhood churches, heading toward the gigantic parking lots of the mega-churches.

With the continued housing development in urban centers in the state we can expect to see an increase in walking to work and walking to neighborhood shopping and services. It is not clear, however, how many daily automobile trips will be displaced by walking.

The 2006 ACS also shows that about 10,000 commuters bike to work in the Puget Sound region. Biking has grown slightly as a share of commuting in the Puget Sound region from 1990, but remains at less than one percent of commuters. This falls to one quarter of one percent in Pierce and Snohomish Counties.

Expansion of bicycle commuting is associated with growing networks of dedicated bicycle paths and lanes. Dill and Carr (2003) found a significant positive relationship between cities with a large number of dedicated bicycle lanes and paths and the level of bicycle commuting in those cities. The causal relationship, however, is not clear. Do paths increase bicycle commuting, or does the popularity of bicycle commuting lead to more paths?

From an energy and greenhouse gas perspective, it must be asked if the impacts of construction of bike paths will be offset by the reduction in energy use and carbon emissions from bicycle commuting. Some very expensive (and therefore energy-intensive) bicycle lane construction projects have yielded lanes that get very little use.

Furthermore, for many commuters, bicycling is weather-dependent. In poor weather many bicyclists will shift to other modes, likely transit, so there needs to be adequate capacity to accommodate those who leave their bikes at home in grim weather.

Bicycle commuting as part of the overall transportation system suffers from scale: it is just too small to be part of a macro solution. Even if dou-

bled, bicycle commuting would still be less than 1.5 percent of commuting in the Puget Sound region and statewide. Bicycling has undoubted health and recreational benefits, but it would be a stretch to claim that it can be a major part of energy-reduction strategies in Washington.

Telecommuting/work at home

As seen in Figure 1, working at home experienced a larger share increase than any other mode. In both the Seattle and Portland metro areas over five percent of workers over age 16 now identify themselves as working from home. The total number of work-at-home individuals more than doubled in both metro areas over this time period, and now exceeds the number of bicyclists, walkers and motorcyclists combined.

The increase in work-at-home has little to do with any public policy, and more to do with technology combined with shifts in attitudes among employers. Telecommuting has evolved as organizations have learned how to integrate work-at-home employees into their management practices. The use of independent contractors who work from home has also increased.

The use of telecommuting centers – satellite offices or neighborhood office suites – has not proved successful. It seems that once an employee decides to leave home in the morning, they may as well continue on to their primary office.

There are a couple of energy use downsides to telecommuting. In some cases the heating, lighting and electricity use in a home office may exceed that in a business setting. Second, there appears to be a minor trend of individuals telecommuting from distant communities. So, although they may stay at home in Wenatchee three or four days a week, they will also take a long drive to headquarters in Redmond on occasion, offsetting some of the savings from not commuting locally.

The technological and organizational trends that have given rise to telecommuting will likely allow this practice to continue to expand in the future, promising some level of energy savings. The role of local government in this trend is not clear, except insofar as local agencies allow their own employees to telecommute.

Housing

The section above on planning discusses the energy implications of the arrangement of various types of development within the urban areas. Here the discussion is the energy use of specific types of housing. Home use of energy for heating, cooling, lighting and appliances accounts for about 20 percent of U.S. carbon emissions (Brown, Southworth and Sarzynski 2008), and the overall energy picture of homes can vary widely.

An energy strategy for housing should allow residents to meet their space and lifestyle needs with minimal energy use. Few people will give up the basic creature comforts of their home in the name of energy efficiency, but most will happily adopt technologies and designs that preserve those comforts in a more cost-effective way.

Most of the action in home energy efficiency will happen outside the purview of local governments, as the makers of building materials, appliances, heating systems and lighting improve the efficiency of their products. The market has proven very receptive to “green built” homes and most builders need few incentives to improve the energy efficiency of the

homes they build.

Local governments have two primary roles with respect to the energy efficiency of homes: encouraging a range of home sizes and managing retrofit of existing homes.

Encouraging a range of home sizes

Providing zoning and regulatory incentives for a range of home sizes is closely related to the discussion above about encouraging mid-level densities. A variety of densities should be accompanied by a variety of housing types and sizes to accommodate the needs of a range of household sizes.

Figure 2: Household size, type, and presence of children - 2006

	One person	Two person	Three person	Four or more person	Children under 18	Single family housing
State	28%	35%	15%	22%	31%	63%
Benton	28%	32%	16%	24%	32%	61%
Clark	24%	34%	15%	27%	37%	71%
King	33%	33%	15%	19%	28%	56%
Kitsap	26%	38%	16%	20%	30%	67%
Pierce	26%	35%	17%	22%	33%	62%
Snohomish	27%	33%	16%	25%	34%	63%
Spokane	30%	35%	15%	19%	30%	67%
Thurston	25%	37%	16%	21%	32%	65%
Whatcom	29%	37%	13%	21%	27%	59%
Yakima	24%	32%	13%	31%	36%	64%

Source: U.S. Census Bureau

Figure 2 shows household sizes for the state and its 10 largest counties, as well as the percentage of households that have children under 18 at home. Statewide, 63 percent of households have one or two members, and no county has more than 50 percent of households above two members. Statewide, 31 percent of households have children at home, and Clark County, with 37 percent, has the highest number of households with children.

Looking, at the final column in Figure 2, we see that nearly two thirds of the housing stock in the state is single family detached. There is clearly a mismatch between the housing stock and the space needs of households in the state. Many of those one and two person households would probably like to have something other than a single family house, but their choice of alternatives is often limited to large apartment and condominium complexes.

Homes that are too large for the household occupying them represent a waste of energy as they need to be heated, cooled and lit. Providing a choice of housing types and sizes to the market allows smaller households to occupy – and heat and light – just the amount of space they need.

Experiments with home sizes have shown that many one and two person households who do not want to live in attached housing are quite comfortable with a detached home of 1,200 to 1,400 square feet. This is roughly half the size of typical suburban homes. But existing homes of this size are mostly over 50 years old, and many homeowners want to have newer homes with fewer headaches.

Local governments should create zoning and development codes that make it profitable for builders to develop smaller homes on smaller lots to meet the needs of the many one-or two-person households who want the privacy of detached housing, but not all the space of typical new homes.

By providing these alternatives, a city can encourage empty nesters and retirees to downsize, thereby freeing up the larger housing stock for families with children. This, in turn, will allow closer-in neighborhoods to pro-

vide housing opportunities for younger workers close to job centers, thereby shortening commutes.

Retrofitting older homes

A community cannot see real reductions in energy use without retrofitting existing neighborhoods and homes. Figure 3 shows the ages of all housing units in the ten largest counties in the state. Statewide, over half of housing units were built prior to the 1980s when strict energy codes became the norm. Twelve percent of housing units in the state, and 16 percent in Spokane County, were built before 1940, when it was common to have no insulation at all in walls and attics. Many of these older houses and apartments will have been upgraded by now, but many will still lack insulation in walls and double-pane windows.

Figure 3: Age of housing stock, 2006

	Before 1940	1940s	1950s	1960s	1970s	1980s	1990s	After 2000	Before 1980
State	12%	6%	9%	10%	19%	15%	18%	11%	56%
Benton	2%	11%	10%	9%	27%	12%	15%	13%	60%
Clark	5%	4%	6%	8%	20%	13%	29%	17%	42%
King	14%	6%	10%	13%	16%	16%	14%	10%	60%
Kitsap	9%	7%	5%	6%	22%	17%	24%	10%	49%
Pierce	11%	5%	8%	10%	19%	15%	20%	13%	52%
Snohomish	6%	3%	7%	11%	17%	18%	21%	15%	45%
Spokane	16%	9%	14%	8%	20%	11%	14%	9%	67%
Thurston	7%	3%	5%	9%	21%	17%	24%	15%	44%
Whatcom	15%	3%	5%	7%	21%	15%	22%	13%	50%
Yakima	14%	12%	12%	11%	20%	13%	13%	6%	68%

Source: U.S. Census Bureau

In most areas of the state, the older housing stock is also more likely to be renter-occupied than the newer stock. In nearly all rentals, tenants are responsible for heating and lighting bills, so landlords have little incentive to upgrade insulation, appliances, heating systems and lighting fixtures.

Statewide, over half of all housing units are heated with electricity, climbing to three quarters for rental units. Prior to the 1980s, this made sense, since electricity was abundant and inexpensive, and electric heating systems are inexpensive and easy to install. Now, however, electric heat is among the most expensive ways to heat a home and, in terms of energy efficiency, makes little sense: natural gas is converted to heat energy to make electricity, which is then converted back to heat energy.

All of this points to the opportunity to retrofit the existing housing stock to make it more energy efficient. The cost and logistics are daunting, but there is no way to make a serious dent in household energy consumption without dealing with outdated insulation, appliances and heating and lighting systems. The marginal energy saving benefit of retrofitting an old house will be far more than anything that can be squeezed out of new construction, which is already very energy efficient. Local governments may have some role in energy retrofits of older homes, which raises two critical issues

Who pays? The energy retrofit of a home has a clear private benefit in that it will save the resident money, generally more over time than the retrofit costs. There is also a public benefit in reduced energy use. So, when pursuing energy retrofits of older homes, who should pay, and how?

Many household retrofit programs rely on a reimbursement, which has a serious problem. The homes most in need of retrofit are often owned by low income and/or elderly residents who do not have the money or capability of getting the work done in the first place. Similarly, non-subsidized retrofits that pay for themselves over time through lower energy bills must be funded up-front, which low income homeowners cannot do. The funding situation becomes even more complicated with rental housing. Should subsidization of energy retrofits depend on the resources of the landlord or the tenant?

How is the program managed? Cities and counties need to give careful consideration to the mechanisms through which retrofit services are provided. Existing weatherization programs are small in scale compared to what will be necessary to make a major difference in energy use, but moving to much larger scale customer-intensive services will be outside the normal capabilities of most local governments. Cities and counties should partner with not-for-profit agencies and for-profit contractors to create the most efficient and cost-effective delivery methods.

It should be emphasized that local governments should avoid one additional role: rewriting energy codes. The existence of state, national and international building codes allows contractors to move easily from one jurisdiction to another without having to learn and apply myriad local code variations. While it may be tempting to one-up state and national energy codes to show just how committed a city or county is to reducing energy use, such changes increase costs with little benefit.

Economic Development

Business location has a large impact on energy use, through both energy consumption at facilities and employee commuting patterns. Many, if not most, local governments have active economic development programs that aim to attract businesses to their jurisdiction, presenting opportunities for energy savings.

Figure 4: Commute times, 1990 to 2006

	Less than 20 min.		20 to 40 min		More than 40 min	
	1990	2006	1990	2006	1990	2006
Benton	59%	54%	29%	31%	12%	14%
Clark	49%	40%	40%	42%	12%	18%
King	40%	35%	43%	44%	17%	21%
Kitsap	48%	43%	34%	35%	18%	22%
Pierce	45%	39%	37%	37%	18%	25%
Snohomish	39%	32%	40%	37%	21%	31%
Spokane	56%	49%	37%	42%	7%	9%
Thurston	54%	48%	34%	37%	11%	15%
Whatcom	65%	63%	28%	28%	7%	9%
Yakima	69%	64%	25%	29%	6%	8%

Source: U.S. Census Bureau

Sarzynski (2006) found that the only way to consistently reduce traffic congestion is by locating jobs nearer to housing. This makes intuitive sense: shorter commutes mean fewer vehicle-miles per person, which takes the load off the road and highway systems and also saves fuel. Figure 4 shows the shift in commute times from 1990 to 2006 for residents of the ten largest counties in the state. Increases in commute times reflect both the length of the commute and the traffic congestion encountered on that commute (whether in a car or on transit).

All counties have seen a significant reduction in proportion of short commutes and a corresponding increase in longer commutes. This pattern is especially notable in Snohomish, Pierce and Clark counties, which are commuter suburbs for the job centers in Seattle and Portland. Figure 5 shows the ratio of jobs to housing in the Central Puget Sound region and Clark County. Current employment patterns and household sizes suggest that the overall ratio within a

commute shed should be about 1.2 jobs per housing unit. Pierce, Snohomish and Clark counties all fall well below that ratio.

Figure 5. Ratio of jobs to housing

	King	Pierce	Snohomish	3-county total	Clark
2000	1.57	0.85	0.89	1.28	0.85
2001	1.52	0.84	0.86	1.25	0.84
2002	1.44	0.83	0.83	1.19	0.80
2003	1.40	0.83	0.82	1.16	0.79
2004	1.39	0.83	0.82	1.16	0.79
2005	1.40	0.84	0.84	1.17	0.81
2006	1.43	0.85	0.87	1.19	0.81

Sources: Puget Sound Regional Council, Office of Financial Management, Department of Employment Security

The data in Figure 4 and Figure 5 indicate that the major metropolitan areas of the state are not doing a good job of balancing employment and housing. There are two ways to remedy this, and local governments control both:

Bring housing to jobs: This is discussed in more length in the planning and housing sections above. Migration data for these counties suggests that households are moving from King and Multnomah counties to Pierce, Snohomish and Clark counties in search of affordable family-friendly housing (Washington Research Council 2008). Policies that increase housing opportunities for families in King and Multnomah counties will shorten commutes and reduce energy use.

The most promising strategy to do this is to employ the techniques described above to expand housing alternatives for seniors and empty nesters who will then put their larger homes on the market for younger families.

Bring jobs to housing. This process has been underway for several decades, as employers have moved from central cities to suburbs. When the Boeing Company opened facilities first in Renton, then in Everett, then in Fredrickson, it provided employment opportunities close to large areas of new, affordable housing. Microsoft continues to grow almost entirely in East King County, and major warehousing and distribution operations have migrated into Pierce and Thurston counties.

The fact that so many people in the urban counties still have commutes of 20 minutes or less demonstrates the success of the dispersal of jobs to outlying areas. This process needs to continue, and the main obstacle is the availability of land sufficient to accommodate those jobs. This is a function of local planning.

The urban centers strategy is having some success bringing office jobs to suburban areas, but much of the employment base of the region now, and in the future, will not fit into high-rise office buildings. Plans for industrial centers must be realistic about the needs for land, access, utilities and other requirements of industry.

Utilities

Nearly all utility service is provided either directly by local governments (cities, counties, utility districts) or through local franchising arrangements with investor-owned utilities. Utility service presents local governments with the greatest risk in the face of uncertainty over climate change.

Water supply. The urban water supply in Washington is controlled almost entirely by local governments or private purveyors. Since all domestic water comes from the sky at one time or another (fossil water from non-recharging aquifers is not a significant source of water in Washington) changes in rain and snowfall will have an impact on municipal water supply.

Precipitation in Washington varies widely from year to year, so a change in average precipitation is unlikely to be noticed (King County 2007). The question is whether that precipitation falls as rain or snow: A gradually increasing average temperature would tend to reduce the amount of precipitation falling as snow and speed up the annual melting of the snowpack.

Water storage in Western and Central Washington consists of rechargeable aquifers and reservoirs, both of which are fed by snowmelt from mountains. Even if future climate change does not affect the overall amount of precipitation, if less of that precipitation falls as snow, current storage reservoirs will not have enough capacity to meet current needs. Reservoirs will need to spill excess water during the wet months and will not refill with snowmelt through the dry summer months. If streams slow down too early in the summer due to lower snowpack, aquifers will not continue recharging.

Like energy savings, water conservation is generally a good thing, irrespective of its relationship to climate change. The state continues to grow, but its water storage capacity does not. The solution for local governments is to increase storage capacity and cut summer water use. Storage capacity can be increased through larger reservoirs, but permitting reservoir expansion is problematic due to increased attention to stream flows. Artificial aquifer recharge can increase underground storage when excess surface water is available.

The most significant water savings at the municipal level will come from reductions in landscape irrigation. Many utilities have rate structures that charge a premium for the above-average water use associated with lawn and garden watering. More compact development of detached housing, as suggested above, has the benefit of providing much smaller yards, and therefore less landscaping per household. Many of these innovative developments are designed with drought-tolerant landscaping that does not need summer irrigation.

Low-flow toilets and showers have been incorporated into plumbing codes for a number of years, but as seen in Figure 3, much of the state's housing stock pre-dates these codes and will have older fixtures. With occasional replacement of a few parts toilets can last indefinitely, so it is quite likely that the great majority of pre-1980s housing has the old 3.5 gallon-per-flush toilets. Large scale fixture replacement programs face the same challenges as energy retrofits described above.

Wastewater. The primary vulnerability of wastewater systems lies in the potential for increased rain and consequent flooding of sewer systems with rainwater. This is an ongoing problem for cities with combined sewers, but also a problem for separated sewers that have leaking pipes. Rainwater infiltrates into leaking wastewater pipes, overloading treatment plant capacity. To the extent that climate change results in increased winter rains, some sewer systems could be at risk of overload.

Electricity. The challenges faced by electric utilities, whether public or private, is well beyond the scope of this paper. Local governments that do not operate electric utilities do play a role through their franchise agreements with utility companies or public utility districts (PUDs). But when it comes to providing power to communities, the most appropriate role for local governments is to stay out of the way.

Local governments do need to work with electric utilities on reliability, safety and emergency response. To the extent that climate change results in more frequent and more severe storms, the power grid needs to be hardened against damage. Cities will determine the extent of vegetation management that utilities can undertake in public rights of way and the degree to which power can be undergrounded. An ounce of prevention is worth a pound of cure, when it comes to the reliability of the electric grid.

Open space and tree preservation

The role of vegetation in absorbing carbon from the atmosphere has led to increased concern about preservation of open space and trees. Open space and tree preservation have undoubted benefits for community quality, but such efforts can have the unintended consequence of increasing development and deforestation elsewhere.

Infill and redevelopment in urbanized areas tend to use far less land per job or per unit of housing than greenfield development on the periphery because construction densities are higher and rights of way are already in place. So, from an open space and tree preservation perspective, more intense urban development makes the most sense. Aggressive tree preservation as well as efforts to preserve open space in urbanized areas will simply push development to peripheral areas where impacts will be higher.

This is an excellent illustration of the global nature of climate change. Tree preservation does not have a localized carbon reduction impact, whereas increasing the total number of trees on the planet does. Justifying reduction of development capacity for open space or tree preservation by invoking climate change makes no sense. Sacrificing urban trees to preserve rural trees nearly always provides a net benefit.

Summary Recommendations

- ❑ Focus policy direction on cost-effective ways to reduce energy consumption within the jurisdiction's boundaries.
- ❑ Work with, and not in opposition to, market forces and consumer preferences, looking for ways to meet market expectations in more energy-efficient ways.
- ❑ Concentrate on the energy retrofit of older buildings and neighborhoods, recognizing that market forces by themselves will generate energy savings in newer construction but not always in older buildings.
- ❑ Shift the focus of regional planning to a jobs-housing model, expanding housing choices in job-rich areas and expanding employment in residential areas.
- ❑ Expand the choice of housing types in all neighborhoods to make the size and configuration of the housing stock better meet the needs of varied household types and to minimize unused spaces that require heating and lighting.
- ❑ Create long-term plans for redevelopment of existing neighborhoods to increase housing choices and create transportation efficiencies.
- ❑ Before committing to plans that call for expanded use of public transit, be realistic about the cost, net energy benefit and marketability of transit.
- ❑ Assume that people will continue to use personal vehicles – of increasing energy efficiency – for most of their trips.

- ❑ Be realistic about the contribution that walking and bicycling can make to energy use reductions. Consider the cost-benefit ratio of expensive bicycle facilities.
- ❑ When state and national standards are in place – equipment, building codes, appliances -- do not trump those standards with more stringent local ones.
- ❑ Work closely with existing energy utilities to improve safety, reliability and energy efficiency.

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