12 Urban Ecology

12A Urban Ecology and Climate Action

Best Practices
Urban Ecology and Climate Action

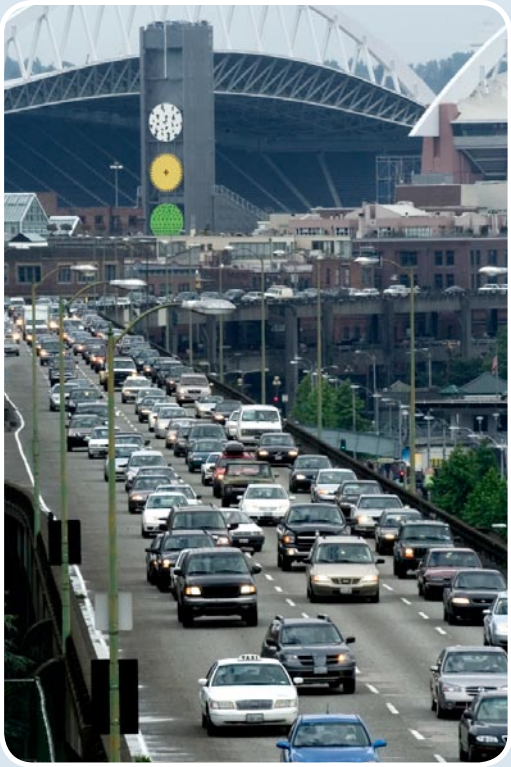
Using transportation policy to help reach Seattle's ecological and climate action goals.

Seattle's choices for its street network effect more than just transportation. By shaping how people move in the city, transportation investments shape the city's impact on the larger global climate, the health of the city's air and water, and the quality of its public realm. Transportation policies that shift travel away from private autos and towards other modes can help Seattle achieve its goals in all of these areas.

While cities have always recognized transportation investments as important to environmental health, perhaps the most urgent ecological problem for policymakers in Seattle today is global climate change. Scientists recognize greenhouse gas (GHG) emissions as the largest contributing factor to a transformation of the global climate. Policymakers increasingly recognize that these emissions must be cut sharply over the coming decades in order to avoid potentially catastrophic consequences.

American cities and counties, including those in the Seattle area, have started to take the lead on this issue. King County recently began to require GHG calculations for approval of new projects as part of the SEPA process, and Seattle is developing similar requirements. A consortium of western states, including Washington, is developing a cap and trade system to manage their emissions. The states of Massachusetts and California have adopted GHG legislation and many more states are considering it as a way to prepare their states to be ahead of federal legislation anticipated in 2009. Seattle has established goals for the reduction of greenhouse gases which require new ways of thinking about everything for industry to transportation. Overall, it has become clear that policy change in the near future will create new costs for economic activities that contribute to global climate change, and new opportunities for activities that reduce emissions.

Seattle's Ecological Footprint

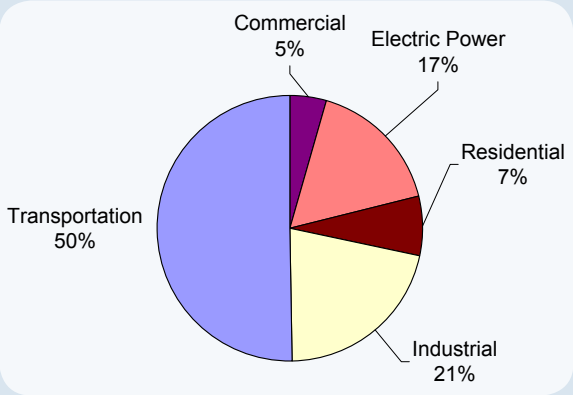


Source: WSDOT

Source: WSDOT

Transportation, especially travel in single occupant cars, is the largest contributor of greenhouse gases that impact our climate.

Washington State Energy-Related Carbon Dioxide Emissions by Energy Sectors, 2001



	CO_2 (million metric tons)
Commercial	3.8
Electric Power	14
Residential	6
Industrial	18
Transportation	42.4

Source: EIA, report # DOE/EIA-0573(2004. http://tonto.eia.doe.gov/state/SEP_MoreEnviron.cfm

Issue #1. How can Transportation Investments Reduce Greenhouse Gas Emissions and Support Seattle's Climate Action Plan?

Seattle adopted a Climate Action Plan in September 2006. The plan sets for the city the goal of meeting the emissions reductions targets embodied in the Kyoto protocol, which requires reducing its GHG emissions to 7% below 1990 levels by 2012. The city has a long-term goal of reducing emissions 80% below 1990 levels by 2050.

After completing an inventory of its greenhouse gas emissions, the city found that by 2005 it had already reduced its GHG emissions enough to meet the Kyoto targets: emissions were 8% below 1990 levels. Seattle emitted about 6.6 million metric tons of CO_2 in 2005, compared to 7.1 million metric tons in 1990.[1] While this is a positive step, as Mayor Greg Nickels notes, achieving the Kyoto targets is "only a beginning. The science is increasingly clear that we must go well beyond the Kyoto target to stabilize our climate."

Further reductions, and even maintaining the current level emissions, will require significant efficiency improvements. This is particularly true given that Seattle expects to have a growing population and a growing economy, and given that emissions from the transportation sector are rising. Transportation sector emissions are up 3% percent since 1990, and emissions from private vehicles such as cars and trucks are up 5%. Currently, about 60% of Seattle's GHG emissions are produced by the transportation sector, including about 40% that comes from cars, trucks, and vans.

Part of the necessary reduction in transportation emissions will come from improved vehicle fuel efficiency and the transition to less carbon intensive fuels in the coming years. In its Climate Action Plan, Seattle estimated that, in meeting the

1 It is important to note that the bulk of this reduction has been achieved by purchasing offsets to account for the small share of the city's electricity supply not derived from renewable or hydroelectric power, rather than actually reducing the city's own emissions. Seattle City Light achieves zero net GHG emissions by purchasing offsets for approximately 200,000 metric tons of greenhouse gas emissions each year. It spends about $2 per customer per year on this program. The purchase of offsets will likely count for a much smaller share of future reductions. Future reduction in emissions may therefore be more difficult to achieve.

Kyoto targets, improved fuel efficiency and use of biofuels could account for roughly 200,000 metric tons of CO_2 emissions reductions per year. However, the plan noted the need for a further 170,000 metric tons of emissions reduced through changes in transportation and land use policy. To meet its more ambitious long-term goal, changes in travel behavior will have to account for an even greater share of overall transportation sector savings.

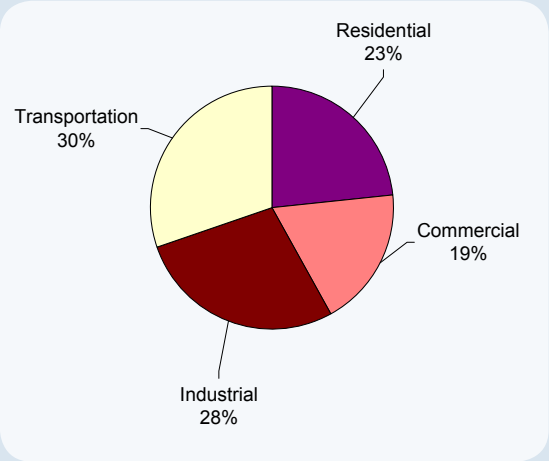
The Climate Action Plan's recommendations for reducing GHG emissions from the transportation sector align very closely with the investments and policies for mitigating the elimination of the Alaskan Way Viaduct that are described elsewhere in this briefing book. In other words, the plans and policies that Seattle must implement to improve the efficiency of its transportation system are many of the same policies it must implement to reduce its impact on the global climate.

Transportation recommendations described in the Climate Action plan focus on three areas that are detailed elsewhere in this briefing book. Core policies in common include those that invest in new transit (Chapter 9); improve facilities for bicyclists and pedestrians (Chapter 8); and manage the price of parking (Chapter 7). In addition, the following policies are particularly important for achieving the goals of Seattle's Climate Action Plan in Seattle:

Encouraging Transportation-Efficient Land Use (Chapter 7)

A major push for more compact development in Seattle would have an uncertain impact on the city's progress toward meeting its established emissions targets, because such policies would undoubtedly increase the city's population and the size of its economy. A larger Seattle might have higher emissions. However, adding population and businesses in this way would have a clear beneficial impact on emissions in the region as a whole and on the overall global climate. The Puget Sound Regional Council finds that households in the most compact neighborhoods in the region drive roughly 28% less than those in suburban areas. Providing more opportunities for households to live in Seattle's compact, transit-oriented neighborhoods, as opposed to locating in more auto-oriented places, would be among

Washington Energy Consumption by End-Use Sector, 2004



Residential	469,225
Commercial	371,303
Industrial	559,196
Transportation	605,061

Source: EIA. Http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=WA#Datum

Congestion pricing in London.
Source: Nelson\Nygaard

Parking station in London.
Source: Nelson\Nygaard

the most cost-effective ways for the city to eliminate GHG emissions.

Implementing Congestion Pricing (Chapter 7)

The plan also recommends that Seattle lead a regional partnership to develop and implement a road pricing system. Congestion pricing is particularly suitable for reducing greenhouse gas emissions for two reasons. First, unlike many other emissions reductions programs that are very costly, congestion pricing both reduces emissions and generates revenue. This revenue can be reinvested in transit and other transportation programs that further reduce emissions. Second, in addition to reducing overall VMT, congestion pricing also reduces emissions from the idling and stop and start driving that come with congestion. The city's climate action plan specifies that a key early measurement of success will be whether road pricing systems are included in the planning for the Alaskan Way Viaduct.

Other cities have already begun to reap these benefits. Since 2003, London has charged a congestion fee to most motorists entering or leaving its 16 square mile central area during peak hours (see section 7F). From 2002 to 2005, annualized weekday VMT in the charging area of London fell by 150,000, or 15%. Because the travel eliminated would have been undertaken under congested conditions, these vehicle miles would have produced far more CO_2 than equivalent miles on a free flowing roadway. The program generated net revenues of £122 million ($252 million) in 2005, most of which was reinvested to transit.

The Climate Action Plan also prioritizes parking reform. It specifically advocates for a New Commercial Parking Tax (which went into effect on July 1, 2007 at 5%, and it will increase to 10% on July 1, 2009, with proceeds to be reinvested in transit), as well as reform of parking requirements.

Reducing Emissions per Mile of Auto Travel

In addition to reducing overall auto VMT, emissions reductions can be achieved by reducing emissions per mile of auto travel. The Climate Action Plan therefore also prioritizes improving fuel efficiency of Seattle's cars and trucks. Numerous improvements may reduce emissions per mile of VMT. It estimates that policies implemented to en-

courage "smart driving," such as less idling, more moderate speeds, proper tire pressure, and taxi regulations could reduce emissions 35,600 metric tons by 2012.

Issue #2. How Can Transportation Investments Benefit Seattle's Local Environment?

In addition to their impact on the global climate, choices the city makes when redesigning its street network will impact the health of the natural environment closer to home. Effective street design, careful attention to waterfront redevelopment, and policies that shift travel away from private vehicles can reduce air and water pollution, support local wildlife habitats, and reduce the urban heat island effect.

Improving Air Quality

In addition to emitting greenhouse gases such as CO_2, private vehicle travel is responsible for a large share of Seattle's emissions of criteria pollutants such as nitrogen dioxide, sulfur dioxide, and particulate matter. These pollutants can contribute to health problems such as asthma and other respiratory-related illnesses. Policies that reduce overall vehicle miles traveled will reduce emissions of these pollutants, and improve overall air quality.

Improving Water Quality

The primary source of pollution in the Puget Sound is rainwater sweeping the heavy metals and oils that leak from cars off roadways and into drainageways. A number of low impact development strategies adapted for urban conditions can be incorporated into new infrastructure systems to address this issue. These include permeable pavements, bioretention areas, and soil amendments. These strategies were encouraged in the 2000 Puget Sound Water Quality Management Plan and are being implemented in various ways throughout the region.

Filtering stormwater through urban raingarden systems is a primary strategy. This not only serves to capture those toxics in the soil and plants but also slows and eliminates the scouring pour of storms that create erosion and allows more water to evaporate naturally, which is part of the natural cycle. Urban raingarden systems can take many

An urban raingarden capture toxics and treat them naturally.
Source: MillerHull

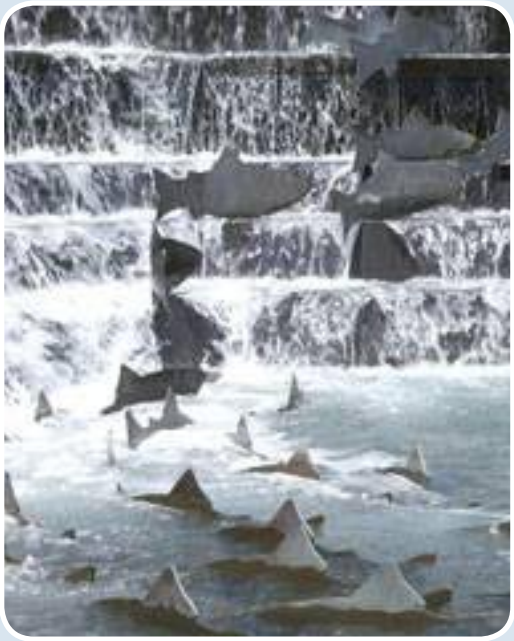
Disconnected downspouts splash into an urban raingarden at the Discovery Center in Seattle.
Source: MillerHull

physical forms – but all have the capability to allow fluctuating water levels to occur. They can be designed to allow infiltration of water back into the ground or when soil conditions are not appropriate for infiltration they can be designed to provide valuable storage and filtering capability.

Protecting Wildlife Habitat

A rebuilt seawall and improved waterfront, implemented as part of waterfront redevelopment following the removal of the Viaduct, could support the waterfront's role as a salmon run.

Juvenile salmon coming from the Duwamish River each year make their way along the bulkheads of the downtown waterfront. Currently, this edge does not provide the characteristics of natural protection from predators. There are no shallow places, eelgrass beds or gravel deposits that the salmon can use to hide in or disguise themselves. As the waterfront is redesigned, there are opportunities to introduce characteristics that support a healthier environment for the salmon. These include introducing plantings that hang over edges, cooling the water temperatures and bringing a greater diversity of insects closer to the water surface. Increasing tree canopy and understory to attract a greater range of bird types will also contribute to diversity of insects. Salmon shelves are a concept being explored along Coal Harbor in Vancouver, BC that will provide "rest stops" for salmon by creating places on the vertical bulkhead that can hold seagrasses.



An urban water feature in Toronto celebrates the historic runs of Atlantic Salmon. Seattle has an opportunity to support a real healthy salmon run on its waterfront.
Source:: City of Toronto

Reducing the Urban Heat Island Effect

Many cities experience the "urban heat island effect" or increased heat resulting from hard surfaces. Cities are typically eight degrees warmer than the surrounding countryside. Urban heat islands increase the energy use for air conditioning and create potentially uncomfortable pedestrian environments. Introducing more porous surfaces, reflective surfaces and vegetation are three strategies for reducing the urban heat island effect. Porous and reflective surfaces absorb less heat. Plants not only absorb less heat but also release moisture through the leaves and cool the air. For example, temperatures in Central Park are substantially lower than surrounding Manhattan.

Increasing vegetation in the urban environment can take many forms. Vegetated roofs, living walls, vegetated screens, understory layers of planting all contribute to cooling temperatures in the city and provide multiple benefits to a high quality urban place for people. One of the most effective ways to reduce the urban heat island effect is increasing the city's tree canopy. More tree canopy has multiple benefits such as increased stormwater retention, biodiversity and the quality of places for people. Seattle has a goal to increase its tree canopy to 30% by the year 2020, from its current tree cover of 18%.

Issue #3. How Can Transportation Projects Contribute to a More Enjoyable and Meaningful Public Realm?

Building Natural Systems into Landscaping and Public Spaces

If designed correctly, open space and landscaping incorporated into streets and other public spaces can serve many purposes besides creating pleasant places. The use of landscaping to reduce the Urban Heat Island Effect is just one of many benefits that healthy trees, soils and hydrological systems can provide to the urban environment. There are other natural processes that healthy trees, soils and water systems provide that can not be replaced with artificial systems. These processes include retaining storm water in root systems; filtering air and water; replenishing healthy soils with nutrients; and supporting a diversity of species and the related healthy food chain web. Vegetation also provides a natural system for filtering and retaining particulates – cleaning up the air and contributing to a healthier environment for people. Many of these services are not replaceable or can be very expensive to replace with traditional infrastructure systems. When urban places are designed with these natural systems in mind the unique characteristics of the location can be reflected in the physical place - limiting the homogenization of our public realm and celebrating our city. Urban places designed with these natural systems in mind can also be beautiful and inviting places that encourage people to walk, enjoy and participate in the neighborhood around them.

Examples of Quality Public Spaces Influenced by Transportation Infratructure

Vancouver-Granville Island.
Source: www.pps.org.jpg

Pioneer Square.
Source: www.pps.org.jpg

Sources:

Seattle's Community Carbon Footprint: an Update. City of Seattle. October 29, 2007.

"Seattle, a Climate of Change: Meeting the Kyoto Challenge. Climate Action Plan." City of Seattle. September 2006.

Status Report on the 2006 Seattle Climate Action Plan Updated: October 2007. City of Seattle.

2007-2008 Seattle Climate Action Plan Progress Report. City of Seattle.

Photo Sources:

Flickr user iotae. This author has given permission for use if credit is given under the following license: http://creativecommons.org/licenses/by-nd/2.0/deed.en. Accessed 12/27/2007

Connecting the City and its Waterfront

Removing the Alaskan Way Viaduct would improve access to Seattle's waterfront. As the new beach at Olympic Sculpture Park illustrates, direct pedestrian access to the waterfront can be a tremendous asset to the city. These types of connections provide people with enhanced recreational options, and increased environmental learning. In addition, a unique waterfront experience reinforces the fact that Seattle is an enriching and engaging place to live and work.