Peak Oil Task Force Briefing Book

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Office of Sustainable Development
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Peak Oil – An Overview

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Much has been written about the concept of "peak oil" in recent years. This introduction will summarize the key conclusions and uncertainties that will inform the Task Force in its work. For details or a more in-depth discussion of the issues, many books and web resources are available. The bibliography at the end of this document provides such references.

What Is "Peak Oil?"

The term "peak oil" refers to the idea that the rate of global oil production is near or past its peak and will soon begin a long-term decline. When an oil field is developed, there is a maximum rate of production which can be sustained without damaging the field – if it is pumped too fast, groundwater may intrude or the internal structure of the field may otherwise be compromised. That eventually happens anyway when about half the oil in a field has been produced, and it becomes more difficult and expensive to pump what remains. At that point the production rate can no longer be maintained, and it begins to decline.

Regional or national production is maintained or increased by adding production from new fields, not by pumping more out of existing fields. When production from a large number of fields has peaked and begun to decline, and there are not enough large new fields being found and developed to offset the lost production, the system is said to have peaked. As with individual fields, this is expected to happen when about half or slightly more of the ultimately recoverable oil has been produced. Peak oil does not mean that no more oil exists, but that we're at the point where global production can no longer be maintained or increased. Production will no longer be able to meet growing demand as it has been able to do in the past. Instead, production will begin to decline, year after year. If demand does not decline at the same rate as production, prices will rise, and alternatives will need to be found or prices will rise, with attendant economic and social consequences.

Peak oil typically encompasses the idea of peak natural gas as well. Natural gas is often found in association with oil (it is also found "non-associated"). It has many similar uses, and oil and gas can often be substituted for one another. Together oil and natural gas account for 65 percent of the primary energy used in the U.S. and worldwide. Natural gas follows a production curve similar to oil. World natural gas is expected to peak perhaps a decade or two later than oil. However, the U.S. is expected to experience the effects sooner than that. North American gas production appears to have peaked in the past few years and, unlike oil, it is more difficult and expensive to import replacement natural gas from overseas – it has to be liquefied for transport and then re-gasified for distribution.

How Sure Are We About Peak Oil?

Oil is a finite, non-renewable resource. As a limited resource, it is inevitable that the ability to extract it will eventually peak and begin to decline. The only question is when. Is that day a long way off, or is it close? Is there cause to be worried?

Opinions differ as to when production will peak. Some experts believe the peak is imminent or has already happened. Others believe it will occur in the next 10 to 15 years. The most optimistic opinions place the peak around 2030 to 2040. The primary difference revolves around two related questions: estimates of how much oil remains to be discovered, and estimates of earth's ultimately recoverable reserves.

A review of the literature suggests the peak likely will occur sooner rather than later. There is no single conclusive piece of evidence; rather, there is a preponderance of evidence pointing toward this conclusion. The reasons are outlined below.

1) In the long run, production cannot exceed discoveries. Experience indicates that production lags discovery by 25 to 40 years. For example, in the U.S., discoveries peaked in the early 1930s, and production peaked in 1971.
2) World discoveries of oil peaked in the early 1960s, and have declined ever since.
3) Discoveries fell below production for the first time in the mid-1980s and have continued to fall. That means the world is currently drawing down reserves. The world currently finds one barrel for every four-to-six it produces and uses.
4) The modeling technique developed by petroleum geologist M. King Hubbert in 1956, which predicted the peak of U.S. oil production in 1970, has been updated and shows world oil peaking in this decade. Hubbert himself predicted world oil would peak at the beginning of this decade.
5) New discoveries have tended to be fewer, smaller, deeper, more remote, and more costly. Large, easy-to-find deposits are likely to have been discovered first.
6) Knowledge of where oil may or may not be located is more extensive than ever. Geologists have identified what kind of geological formations are likely to produce and hold oil, and the earth's geology has been extensively mapped. In addition, millions of wells have been drilled looking for oil and other resources. The likelihood of finding new fields comparable to those in Saudi Arabia, or even the U.S., Iran, Mexico, Kuwait, or the North Sea, is very low.
7) Additions to reserves have typically come from updating the estimates of old discoveries, not from new finds.
8) Estimates of existing reserves are unreliable. Reserve estimates of OPEC member nations were increased about 60 percent in the late 1980s for political reasons relating to production quotas. In the past two years, Shell Oil and Kuwait downgraded their estimates of proved reserves by 20 percent or more.
9) About two-thirds of oil-producing nations have already peaked and are in decline, including the U.S., Mexico, and the North Sea (U.K. and Norway).
10) At least two of the world's five largest fields ever found – Burgan in Kuwait and Cantarell in Mexico – have peaked and begun to decline.

11) Estimates of ultimately recoverable reserves have held reasonably steady at around 2 trillion barrels for fifty years. The world has used about 1 trillion barrels to date. Optimistic estimates that the earth holds 3 trillion barrels of recoverable oil would require a reversal of discovery trends and a doubling of remaining reserves.

Arguments Against Peak Oil

The main arguments against peak oil are as follows.

1) Reserves have been growing.
2) Current problems, like those of the 1970s, are political in nature. Political problems in Iraq, Iran, Venezuela, and Nigeria may affect prices, but they do not address long-term trends in discoveries.
3) "We've heard this before." There have been repeated claims in the past that oil is running out, most recently in the 1970s, and none have come to pass. Each time, critics claim, price signals elicited new exploration and discoveries.

The primary difference between earlier claims and the current debate is the knowledge base. The current claims are based on considerably more historical data and perspective, and better analytical tools and methods. That said, uncertainties remain around the peak and decline of world oil production. While unlikely, it is possible the optimists are correct and the peak is 15 years away or longer. It is possible that some nations have as many or more reserves than currently estimated, or that significant new discoveries will be made. It is also possible that unconventional resources (oil sands, oil shale, coal-to-liquids, etc.) will be developed soon and can offset the decline in conventional oil.

However, even if the optimists are correct and the world holds 3 trillion barrels of ultimately recoverable oil, at current rates of consumption and growth the peak would be delayed only a decade or slightly more. But the implications of peak oil are so potentially profound, it would be prudent to begin mitigation efforts now. Robert Hirsch, co-author of the highly regarded report completed for the U.S. government, "Peaking of World Oil Production: Impacts, Mitigation, and Risk Management," concludes that peak oil is going to happen, although the timing is uncertain, and that it could cost the U.S. economy dearly. The report further concludes that to have substantial impact, mitigation options "must be initiated more than a decade in advance of peaking…Mitigation efforts initiated earlier than required may turn out to be premature if peaking is long delayed. On the other hand, if peaking is imminent, failure to initiate timely mitigation could be extremely damaging."

Why Does It Matter? What Will Be the Impacts?

Oil and natural gas account for about two-thirds of U.S. energy use, with oil accounting for 40 percent and natural gas another 23 percent. Coal, which emits more heat-trapping carbon dioxide (CO_2) than oil or natural gas per unit of energy, accounts for another 22 percent, bringing total U.S. dependence on these fossil fuels to more than 85 percent.

Oil and natural gas are used in virtually everything we do - they underpin the majority of our economic activity. Personal and freight transportation are almost wholly dependent

on oil. Between 7 and 15 percent of Oregon's electricity is generated by natural gas, depending on hydro conditions and nearly half our building space is heated by natural gas. Oil and natural gas are used for industrial processes, including use as a feedstock for thousands of products such as asphalt, fertilizers, pesticides, plastics, chemicals, paints, medical products, vinyl, and shoes and clothing. As oil and gas become increasingly scarce and expensive, it will have profound implications for our economy and lifestyle.

One of the main charges of this task force is to identify the impacts of peak oil and natural gas in Portland, as a prelude to designing appropriate strategies to prepare for and mitigate the effects.

Will Coal, Nuclear, and Alternative Energy Sources Replace Oil and Natural Gas?

Rising prices will likely stimulate technological improvements to mitigate, though not eliminate, the impact of declining oil and natural gas resources. The most common alternatives mentioned are nuclear, “clean” coal, oil sands, oil shale, hydrogen/fuel cells, and biofuels (biodiesel and ethanol), wind and solar.

Each of these is discussed briefly below. However, the overarching conclusion is that while some or all of these alternatives will be used in some measure, none of them, individually or in combination, are likely to be available in sufficient quantity to replace oil and natural gas in the quantities they are used today. All have a lower energy return on energy invested (EROEI) than oil or natural gas—that is, they take more energy to produce and yield a smaller net energy gain. Oil and natural gas are the most concentrated energy sources known, with EROEIs typically 20-to-1 and greater. Fuels with lower EROEI would be less productive and, as a result, more expensive, which is why they have not been competitive with oil and natural gas to date. Fuels with an EROEI less than 1 take more energy to produce than they yield. More importantly, each of these alternatives will take at least a decade of development to replace significant amounts of oil or natural gas.

Coal is abundant in the U.S., with 240 years worth of reserves at current use rates. It can be used to generate electricity or can be made into gaseous or liquid fuels. However, increased use of coal would seriously aggravate global warming. Much of the CO_2 can be sequestered, but it requires about one-fourth of the energy in the coal to do so. In addition, coal use would have to quadruple or more to displace oil and natural gas. But if U.S. coal use increased just 2 percent per year, the lifetime of our coal reserves would drop to 85 years and lead to a “peak coal” problem in the not-too-distant future.

1) *Nuclear power* produces electricity only, which means it is not well suited to replace oil as a transportation fuel. Even if nuclear power could meet all U.S. energy needs, the 10- to 20-fold increase in nuclear power plant capacity would require massive infrastructure costs. With anything close to that many plants in operation, known reserves of uranium would be depleted within less than 20 years. Breeder reactors could prolong the lifecycle of nuclear power, but safe, affordable breeder reactors are not currently available. Nuclear power also poses the problems of nuclear waste disposal and nuclear weapons proliferation. Oregon has had strong opposition to

nuclear power, and Oregon's only nuclear plant was closed early because of leaking steam tubes.

2) *Oil sands* in Canada and Venezuela are abundant. However, the oil is not in liquid form, but rather more like sand-impregnated asphalt. This makes oil sands extraction land- and water-intensive, polluting, and high in carbon emissions. In addition, it has a low EROEI of about 3-to-1, meaning it takes about one-third of the energy in the oil sands to produce it.

3) *Oil shale* has many of the same problems environmental problems as oil sands. In addition, oil has never been produced commercially from shale. Shale oil has an estimated EROEI of about 1.5-to-1, meaning two-thirds of the energy it yields must be used to produce it.

4) *Enhanced oil recovery* involves advanced methods to extract more oil from a field, such as in-fill drilling, horizontal drilling, hydraulic fracturing, and injection of solvents like CO_2 or nitrogen to make the oil move more easily. Because of costs, enhanced recovery is unlikely to affect an oil field's peak since it is not typically applied until after production has peaked. Recent studies also suggest these methods simply allow the oil to be extracted a little faster, with the total amount of oil produced from a field remaining about the same.

5) *Biofuels (biodiesel and ethanol)* are highly touted to replace oil for transportation. Biofuels are carbon neutral, meaning the CO_2 they emit is balanced by the CO_2 they need to grow. However, biofuels would compete with other uses of the land, such as food, forest, erosion control, and habitat. In addition, most ethanol in the U.S. is now made from corn, which is oil- and natural gas-intensive to grow and, as a result, has a low energy return – best-case analysis estimates the EROEI at about 1.67-to-1. There are hopes that ethanol will be able to be made from cellulosic plants such as switchgrass, which are less energy intensive and can be grown on marginal lands. However, this is still in the research stage. Biodiesel has a better EROEI (3-to-1 or slightly greater) than ethanol, but will probably require dedicated crops and cropland, thereby limiting the amount that can be produced. While biofuels hold some promise, they are unlikely to replace more than a small share of the petroleum-based liquid fuels currently used.

6) *Hydrogen* is often touted by many as the clean, renewable fuel of the future. However, hydrogen is an energy carrier, not an energy source. It is not found in its most useful state–H_2–but must be separated from other atoms to which it is attached, such as carbon or oxygen. Most hydrogen today is produced from natural gas. This is not sustainable when natural gas is in decline. In the long run, if hydrogen is to be used as a transportation fuel, it will have to be electrolyzed from water using renewable power. But because of thermodynamic losses in producing and transporting the hydrogen, it may be more efficient to use the renewable power directly. In addition, because of its volume and porosity, hydrogen is difficult to store and distribute. The current storage and distribution infrastructures for natural gas and gasoline would have to be replaced, at huge costs, to accommodate hydrogen.

7) *Clathrates* are ice crystals containing methane (i.e., natural gas) found at the bottom of oceans. The potential resource is immense. However, methane is a more potent greenhouse gas than CO_2, and release of even part of this methane could trigger

runaway global warming. At this time it is not technically feasible to capture the methane for commercial use without a large portion escaping.

8) *Renewables (wind, solar, biomass, wave power)* will need to be developed to the fullest extent possible, and fortunately Oregon is well-endowed with them. However, aside from biofuels, most renewables produce electricity or thermal power (heat). Their applications rarely include transportation. While abundant, it is not clear how much of our total energy needs renewables will be able to meet. The immediate need for renewables is to meet electric load growth, then to begin displacing coal and natural gas in electrical generation to reduce CO_2 emissions. In addition, fossil fuels are required to produce renewable energy systems. We need to begin building the infrastructure now while cheap oil and natural gas are still available, or they will be more expensive and difficult to make.

9) *Efficiency improvements* are a significant and necessary resource as well. They can reduce demand, which will make it easier for the resources above to meet our needs. Demand must decline, even as population continues to grow. While we cannot conserve our way to zero, we must significantly reduce the energy intensity of our economy.

If Alternative Energy Isn't Sufficient, What Is Required?

It is unlikely that the resources discussed above will displace oil and natural gas in the quantities with which they are currently used, at least within a few decades. In particular, peak oil presents a liquid fuels (i.e., transportation fuels) crisis. Major efficiencies are needed through redefining needs and reorganizing institutions. This may include lifestyle changes and adapting to expected impacts. Determining what those changes might be is one of the major charges of this task force.

Identifying Potential Impacts of Peak Oil and Natural Gas

One of the main charges to the Peak Oil Task Force is to identify the potential impacts of peak oil in Portland. Once the impacts are identified, it will be easier for the task force to target its recommendations for maximum effectiveness. The following section provides an introduction to some of the likely areas of impact, and to serve as a guide in developing a more in-depth analysis.

Some of the major impacts are quickly determined by reviewing where oil and natural gas are used directly. Virtually all transportation — surface, water, and air — are fueled by petroleum-based products. Natural gas heats half of Oregon homes and businesses, including most new homes, and is used to generate more than 7 percent of Oregon's electricity. Oil and natural gas provide process heat for various industrial processes, and about 10 percent of each fuel is used as feedstock to produce products such as chemicals, fertilizer, asphalt and plastics. Price increases or cutbacks in key fuel resources will affect these activities. Impacts on these activities will vary depending on the ability to conserve, find substitutes, consolidate and re-prioritize activities. Impacts may also vary according to the percentage of a business operation's activities dependent on the fuel resource, although in many cases the fuel resource may be critical even at low percentages of the overall operation.

Other impacts may be secondary — that is, they may not depend directly on oil, but may depend instead on products or services that are impacted directly by the price or availability of oil. For example, as oil and natural gas become more expensive or less available, a larger share of personal incomes will go toward transportation and heating, and sales of other products and services may suffer. Alternatively, land use patterns may shift as businesses and residents relocate in response to problems with cost and availability of oil. This, in turn, may affect public services.

Below are some of the major areas which may experience impacts and questions intended to foster discussion. The task force is not anticipated to answer all of these questions but rather to assess which are the most relevant for Portland and illustrate the most significant local vulnerabilities.

Transportation

How will transportation modes and patterns be affected? Air transportation is likely to be one of the first sectors to be impacted by peak oil. How will that affect Portlanders? How will ports and intercontinental shipping be affected, and what will that mean for the economy in the Portland area? How will surface transportation be affected? Commuting? Inter-city and regional travel? Long-haul trucking? Intra-city trucking and distribution of goods? Warehousing and "just-in-time" delivery? Will rail, both long-haul and intra-city light rail, help minimize disruptions?

Land Use

In addition to population shifts, will there be other changes is how land is used? What will happen to regional malls and vehicle-oriented developments? Will there be increased pressure for mixed uses? How will neighborhoods be affected? Will some areas become depopulated? If so, what to do with them? What are the implications on roads, transportation, and traffic patterns? How about urban design?

Economic Impacts

Businesses can be affected in two primary ways: by how the price or availability of oil or natural gas impacts the product or service they provide, and by how it affects demand for their product or service among their customer groups. Economic activities which are non-essential, or those where oil and natural gas are critical resources which cannot easily be substituted or reduced, stand to be negatively impacted. For example, RV and long-vacations may be one of the first activities to be affected, as might the chemical industry which uses oil and natural gas as a feedstock for production. Other activities may maintain, still others may thrive. For planning purposes, which economic activities are at risk? What services or products unique to the region will be in high demand in an era of peak oil? What products or services provide a unique economic development opportunity for the region? How will heavy industry be affected? Light industry? Retail? Finance and insurance? Real estate? Construction? What are the implications for employment? What can the city do to minimize the impacts in these areas?

Housing

How will housing and housing patterns be impacted? Will new construction be impacted as people opt to fix up existing homes? How will availability of construction materials be affected? Will people look for smaller housing in an attempt to reduce costs? Will there be a move toward infill development, or dividing large homes into smaller units? How will jobs in real estate and the construction trades be affected? Will upkeep and maintenance suffer as people spend more on heating and transportation? Will homelessness increase? Are there particularly vulnerable demographic groups?

Food

The ability to transport food over long distances will be impacted. Also, price and availability of products which are highly dependent on fossil inputs (i.e., natural gas for fertilizers, oil for pesticides) will be significantly affected. For example, yields of corn, our largest crop, could drop from 130 bushels per acre today to 30 bushels per acre without fertilizer. These are just a few examples. What are the implications of this for Portland? How will food production change? Food processing? Long-distance transportation? Distribution? Storage and preservation? How will the price and availability of food be affected? Diet and nutrition? What are some potential problems if left unaddressed?

Public Services

Considering some of the possible population, economic, housing and land-use shifts, how will demand for public services such as water, sewer, police, and fire be affected? Will crime increase, decrease, or change in character? Will the need for fire protection increase if housing is poorly maintained? How will provision of these public services be affected? What are the implications on costs? How will these services be maintained? What if people can't afford to pay (i.e., water, sewer)? What are the consequences of reductions in services? (Transportation, planning, housing and social services are discussed in separate sections.)

Population Shifts

Will there be any mass movement of population? Will there be a movement toward denser urban areas to reduce travel, or will there be a movement toward rural areas to be closer to food? On a larger scale for Oregon, will there be widespread in-migration from other states?

Social Services

Based on some of the impacts identified from sectors discussed above, what will be the impact on social services? Will there be an increase in homelessness? Hunger? Shelter (heating)? Unemployment? The uninsured? How will this affect demand for housing assistance? Food assistance? Heating assistance? Health care for the poor and uninsured? Children services?

Health Services

How will the nature of illness and accidents requiring treatment be affected? How will health services be affected? How will it affect the model of care provided by health providers? Where are oil and natural gas, or oil and gas-based products, used in the health care system? How will price and availability of these products be affected? How will pharmaceuticals be affected? Sanitation? Emergency services? How will long-term care of the elderly, infirm, and disabled be affected? How will public health be affected? Would stress and other impacts on home heating and nutrition increase exposure to certain diseases? As impacts elsewhere require changes in housing, employment, recreation, etc., how will mental health be affected—will there be an increase in depression, panic, delusion, or other symptoms requiring treatment?

Education

What are the implications of peak oil for education? How will enrollment at individual schools be affected based on in- or out-migration? Will attendance at private schools increase or decrease? How will it affect the ability of the schools to provide busing? How will government revenues be affected? How will the curriculum be affected—i.e., how will job and career choices be affected (check with economic development/planning)? In terms of higher education, how will it be affected? Will there be as many opportunities for college graduates? Which fields will remain critical (e.g., medicine)? Which may go by the wayside? How will this affect registration? How will affordability be affected? What will that mean for low- and middle-income students? Will there be an increased or decreased need for vocational training? In what fields?

Electricity

On the supply side, slightly more than 7 percent of Oregon's electricity is generated from natural gas. What will be the impact on electricity generation if natural gas is in short supply? On the demand side, what will be the impact? Will there be decreased demand because of stretched incomes, job loss, and impacts on other businesses? Or will electricity be called upon to pick up an added load now shouldered by oil and gas – for example, plug-in vehicles, residential customers switching to electric heat, industrial fuel switching? Will there be a net increase or decrease in demand? If a net increase is expected, how would utilities be able to meet the increased demand?

Manufacturing

Industry uses oil and natural gas both as a feedstock and to power various industrial processes. In some cases these may be critical resources—i.e., it may be difficult to find adequate alternatives. In other cases their supply/supplier may be at risk. In still others demand for their product may be affected. How will some of the key industries and industrial concerns in the area be affected by peak oil? What will that mean for jobs? Tax revenues?

Retail Business

Which kinds of retail businesses will be most affected by peak oil issues. Key candidates include food/groceries, clothing, electronics, appliances, cars, and housing supplies. How will the supply chain be affected? How will price or availability be affected? How will

demand for the various products and services be affected if people have less discretionary income available? Will there be an increased demand for locally produced products? How will large chains stores fare relative to independent businesses? How will local artisans and craftspeople fare?

Communications

What are the implications for communications? What will be the effect on the microelectronics industry? How will chip production be affected? What does that imply for price, availability of computers? What about the cost of launching satellites? What about demand trends? As travel becomes more difficult or expensive, will demand for electronic communications increase (cellular, phone conferencing, video conferencing, etc.)? What are the implications of these supply/demand trends?

Oregon Biennial Energy Plan 2005-2007 (excerpt)

Oregon Department of Energy, January 2005

Oregon's Energy Demand and Supply

Overview

Trends Since 1990

Oregonians spent $7.6 billion on energy in 2000, the last year for which figures are available. This does not include energy used to generate power or to transport natural gas in pipelines. Total energy use was 773 trillion British Thermal Units (Btu–a measure of energy consumption), up 15 percent from 1990. However, the per capita energy use in Oregon fell by 4 percent between 1990 and 2000, primarily because ocean vessels purchased less fuel in Oregon and factories decreased their use of wood waste.

The use of taxed gasoline increased by 13 percent between 1990 and 2003, while per capita use declined by 4 percent. The per capita decline was largely because of the higher efficiency of new vehicles, relative to the fleet of existing vehicles. The number of miles driven per capita was about the same for both years.

Overall Energy Use

Nearly half of the energy Oregon uses is from petroleum products and is used primarily for transportation (Figure 1).

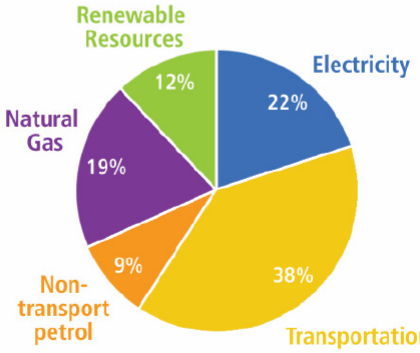


Figure 1: 2000 Oregon energy end uses
Forty-seven percent of the energy Oregon uses is from petroleum products, primarily for transportation. Direct-use renewable resources include geothermal, hogged fuel (bark, sander dust and other wood-related scrap), pulping liquor and wood burned in homes.

The Impact of Energy on the Economy

As shown in Figure 2, money spent by Oregon households, businesses and governments on energy as a percent of total Oregon personal income has changed significantly since 1970. This shows how dependent Oregon's economy is on the cost of energy.

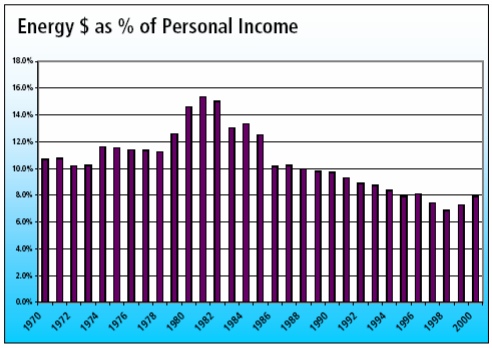


Figure 2: Energy expenditures as a percent of income.
With increased emphasis on energy conservation following the energy crises in the 1970s and 1980s, consumers were cushioned against price spikes starting in the 2000-2001 energy crisis.

The percentage declined from about 15 percent in 1981 to 10 percent in 1985. This was largely due to a drop in petroleum and natural gas prices. From 1985 to 1998, the percentage declined to about 7 percent, largely due to economic growth in less energy-intensive sectors, such as retail sales and electronics manufacturing. Since 1998, the percentage has grown due to rising energy prices. Energy use is falling, but not as fast as prices are rising.

The money Oregonians spend to import natural gas and oil is drained from the economy. In 2000, Oregon business, households and governments spent 1.2 percent of total personal income on natural gas and 3.8 percent on petroleum prod-

ucts. This does not include natural gas used for electric generation. Natural gas and oil price spikes tend to harm the Oregon economy more than the U.S. economy because Oregon imports 100 percent of its natural gas and oil compared to 15 percent and 56 percent, respectively, for the U.S. Areas of the U.S. that produce natural gas and oil see increased employment when prices spike, but Oregon does not.

Fuel Price and Use Changes — 1999 to 2003

Petroleum

From 1999 to 2003, petroleum prices for residential heating oil, on-highway diesel and regular gasoline increased 39, 25 and 30 percent, respectively (prices include taxes). Taxed gasoline use rose by 0.5 percent for this period. From 1999 to 2001, distillate sales (both highway diesel and heating oil) were down 0.1 percent.

In 2004, the combined effect of high oil and natural gas prices was especially hard on industry. Often, if one fuel rose the other did not, enabling factories to switch to a cheaper fuel. That was not possible in 2004 because they both rose.

Figure 3 shows the Oregon retail prices for regular gasoline and residential heating in dollars per gallon, without tax for 1999 through part of 2004. These prices have not been adjusted to remove the effects of general inflation.

Oregon prices have followed national trends. Regardless of U.S. crude oil production levels, Oregon retail prices will continue to be linked to world oil prices.

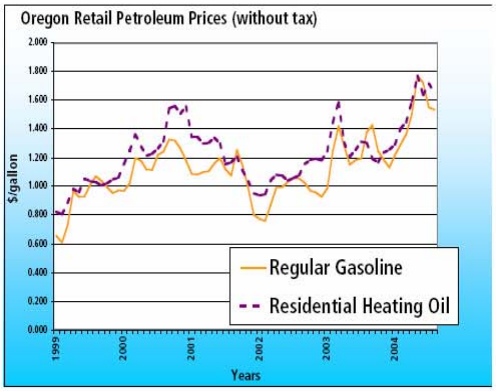


Figure 3: Oregon retail petroleum prices, without taxes included
This shows the volatility of retail gasoline and home heating oil prices.

Natural Gas

Oregon wholesale natural gas prices rose 168 percent between January 1999 and July 2004. Over the same period residential rates rose 94 percent. These prices have not been adjusted to remove the effects of general inflation. The percentage increases for commercial and industrial customers fell between the wholesale and residential price increases.

Figure 4 shows the price of wholesale gas purchased by Oregon gas utilities from January 1999 through July 2004 and average residential retail rates. While natural gas distribution and transport costs are regulated, wholesale gas costs are passed through to retail customers.

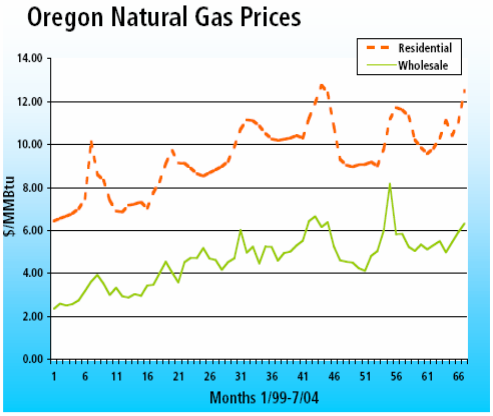


Figure 4: Oregon natural gas prices
After falling in the late 1980s, Oregon's natural gas prices spiked in 2001, declined and then rose again in 2004.

Electricity

Between 7 and 15 percent of the Oregon's electricity is generated from natural gas, depending on snow and water conditions. The share of gas-fired generation is increasing as loads grow and as most new plants are fired by natural gas. Electric utilities can reduce their exposure to fuel price spikes by developing renewable resources and buying more of their fuel in longer-term contracts. While these measures can be more expensive in the near term, the tradeoffs are part of the utility least-cost planning process.

From 1999 to 2003, retail electricity prices rose 29 percent. The increase was 23 percent for residential customers and higher for larger customers. Both investor-owned (IOUs) and consumer-owned utilities (COUs) were affected. Oregon utilities face substantially higher costs for new electricity resources compared to the costs of existing resources. For these same years, residential use fell 3 percent and combined commercial and industrial use fell 10 percent. These values do not include the closure of large aluminum smelters in Troutdale and The Dalles since 1999.

Due to higher natural gas prices, wholesale electric prices in 2004 were up sharply from 2003. This had only a modest impact on retail prices, in part, because demand growth has slowed. Oregon IOUs generate most of their own power. Oregon COUs buy most of their power from federal dams and the Columbia Generating Station (the commercial nuclear power plant at Hanford, Wash.), through the Bonneville Power Administration.

Energy Supply — Fossil Fuels

Petroleum Supply

Oregon imports 100 percent of its petroleum, and unlike other Western states, does not have refineries or internal crude oil resources. Taken together, Alaska, Arizona, California, Hawaii, Nevada, Oregon and Washington form a nearly self-contained system of petroleum production and consumption. Although the system is relatively stable, a major disruption in any part of the supply and distribution chain could create a severe and prolonged petroleum shortage.

Figure 5 maps the major sources and distribution of Oregon's petroleum products. Four refineries in the Puget Sound area of Washington provide more than 90 percent of Oregon's refined petroleum products. The Washington refineries transport their products to Oregon and Washington markets via the Olympic Pipeline and barges. The bulk of Oregon's oil enters through the Port of Portland and is distributed statewide by tanker trucks, Columbia River barge service and the Kinder Morgan pipeline, which extends to Eugene. More than 80 percent of the crude oil these refineries export to Oregon originates in the Alaska North Slope oil fields. The Trans Alaska Pipeline transports crude oil 800 miles from the oil

fields on the state's northern coast to the Valdez terminal on its southern coast. From there, barges and tankers ship the crude oil to the Washington refineries and other destinations. The Western Canada Sedimentary Basin is another significant source of crude oil for the refineries. The remaining crude, less than 5 percent, comes from the continental U.S., Mexico, Indonesia or the Middle East.

In addition to Washington, refineries in Salt Lake City and British Columbia provide nearly 10 percent of Oregon's refined petroleum products. Under normal conditions, only minor amounts arrive from California and the Pacific Rim countries of Indonesia, South Korea and Japan via tanker ships. Tanker trucks distribute these petroleum products statewide.

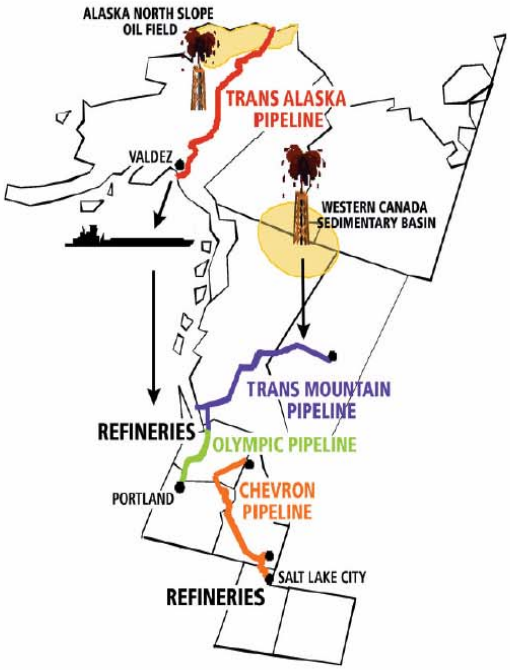


Figure 5: Sources of Oregon's petroleum.
Shows the interconnection of the source, refineries and transportation of Oregon's petroleum. The majority of the crude oil comes from Alaska.

Oregon has about 2,250 retail fueling stations, with more than 29,000 registered fuel pumps. Between 1997 and 2002, the state lost about 10 retail gasoline stations but gained approximately 6,000 retail fuel pumps. The difference between station and pump growth resulted from buyouts, remodels of retail gasoline stations, and installation of pumps at grocery and department stores.

Other Transport Fuels

Other fuels used for transportation in Oregon include ethanol, biodiesel, compressed natural gas, liquefied natural gas, liquefied petroleum gas (propane) and electricity. These alternative fuels are used in place of diesel and gasoline, although some of them are either used with, or partially derived from, petroleum products.

Federal policy directs utilities and states to adopt alternative fuels to reduce dependence on foreign petroleum or to improve air quality. Most alternative-fueled vehicles are eligible for Oregon residential and business energy tax credits and state energy loans.

Ethanol and biodiesel are the main alternatives to gasoline and diesel respectively. Ethanol is an alcohol fuel distilled primarily from corn. Biodiesel is oil, distilled primarily from soy. Both biofuels also can be produced from other types of biomass (plants and other organic matter).

Following ethanol, compressed natural gas and propane are Oregon's most common alternative fuels. However, they represent less than 0.04 percent of transport fuel use.

Hybrid (gas-electric) vehicles average 45 miles per gallon – twice that of the average passenger car. A hybrid recovers energy normally wasted when braking and uses it to power an electric motor that assists the gasoline engine. Hybrids also gain efficiency by having the gasoline engine operate at a constant optimum speed. As of October 2004,

Oregonians had registered about 4,000 hybrid vehicles, up from 800 at the end of 2002. More vehicle manufacturers are introducing hybrid models to the market.

Oregon's state fleet has about 77 hybrids, 150 com-pressed natural gas and 67 flex fuel (ethanol) vehicles, and more will be purchased. Tri-Met's MAX light rail transit system in the Portland area operates on electricity.

Petroleum Contingencies

To mitigate the effects of a petroleum emergency, the Oregon Department of Energy (ODOE) maintains the Oregon Petroleum Contingency Plan. The plan outlines alert and notification procedures as well as actions to supply gasoline and diesel fuel to the emergency services sector for vehicles, generators and onsite storage. Growing use of transportation petroleum in the West puts pressure on an already tight supply system.

The Valdez terminus of the Trans Alaska Pipeline can store up to 386 million gallons of crude oil. However, this represents, at most, one week of the pipeline's current output.

Distribution sites in the Portland area store less than one month's supply of refined petroleum products. Smaller stocks are stored at private distribution centers in Eugene, Medford, Bend, Pendleton, Coos Bay, Newport and Astoria. Local availability and retail prices are sensitive to supply, demand and delivery schedules. In the pas, distributors have occasionally limited allocations. In some cases, this forced service stations to curtail retail hours.

The Puget Sound refineries have operated above 90 percent capacity for the past decade. The refineries cannot accommodate dramatic demand increases and have no plans to increase production capacity. If refinery output decreased due to an emergency, Oregon would have to import petroleum products from distant refineries. The state could face shortages and steep cost increases.

Three of five British Columbia refineries have closed since 1996, significantly reducing additional refinery production. Five San Francisco Bay area refineries operate at capacity and have been converted to produce only products meeting California Air Resources Board standards. Increasing demand in the California market for these products makes it less likely these refineries will be able to supply the Oregon market.

The world's largest oil refinery, owned by SK Corporation in Ulsan, South Korea, could provide petroleum products using crude from Southeast Asia. Production has begun in the oil sands region of Alberta, Canada, but this will likely only replace declining crude oil supplies in North America.

Natural Gas Supply

Oregon imports 100 percent of its natural gas and receives it from British Columbia, Alberta, Wyoming, Colorado and New Mexico. Two connected interstate pipelines deliver the natural gas (Figure 6).

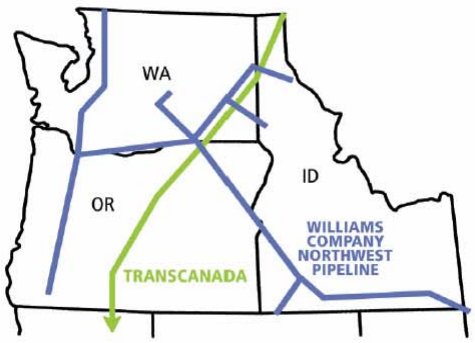


Figure 6: Pipelines serving Oregon

Two natural gas pipelines serve Oregon customers. The Williams Company pipeline and the Gas Transmission Northwest (GTN) pipeline owned by TransCanada bring product from the Rocky Mountains and Canada. Pacific Gas and Electric National Energy Group formerly owned the TransCanada line.

The Williams Company's Northwest Pipeline brings natural gas to Portland from British Columbia and the Rocky Mountain region of the U.S. British Columbia gas enters the U.S. near Sumas, Wash. and roughly follows Interstate 5. Gas from the Rockies comes into Oregon near Ontario. A lateral pipeline transports gas from Washougal, Wash. to the Portland area, the Willamette Valley and Grants Pass. Natural gas from Alberta arrives in a Gas Transmission Northwest (GTN) pipeline. It enters the U.S. near Kingsgate, Idaho, and moves through eastern Oregon, leaving the state near Malin, before traveling on to California and Nevada. A lateral line transports natural gas from Klamath Falls to Medford. The GTN pipeline is owned by TransCanada and connects with the Williams Northwest pipeline at Stanfield, Oregon.

Three natural gas utilities serve Oregon:

- Northwest Natural serves 80 percent of Oregon's retail customers, including the Willamette Valley and the coast.
- Avista Corporation serves parts of southern Oregon and La Grande.
- Cascade Natural Gas serves parts of central and eastern Oregon.

Northwest Natural receives natural gas from the Williams' pipeline. Northwest Natural owns underground gas storage facilities in Mist, Ore. and liquefied natural gas storage facilities in Newport and Portland. Northwest Natural also has contracts to use liquefied natural gas storage at Plymouth, Wash. and underground storage at Jackson Prairie, Wash.

Avista obtains natural gas from the Williams pipeline and the Williams-Grants Pass lateral as well as TransCanada's main pipeline and Medford lateral.

Cascade customers from Madras to Chemult receive natural gas from TransCanada's GTN pipeline. The Williams Northwest pipeline serves Cascade customers from Umatilla to Ontario. Cascade and Avista either own or have contracts to use natural gas storage facilities.

Several projects are underway to expand natural gas pipeline capacity in the U.S. and Canadian West. The largest of these is the Kern River Gas Transmission Company's $1.2 billion pipeline expansion designed to meet growing demand for natural gas in Utah, Nevada and California.

Although pipeline additions will likely keep pace with growing demand, U.S. domestic production may not. A drilling boom in 2001 did little to increase U.S. production. By early 2002, domestic production had returned to 2000 levels despite current high wholesale prices.

From 2001 to 2003, U.S. gas production declined almost 3 percent and Canadian imports declined by 8 percent, despite significantly higher prices. In order to make up for declining domestic production, the U.S. would have to import natural gas from abroad.

Natural gas produced overseas has to be liquefied for ocean transport. It is expensive to liquefy, transport, and regasify, and it will take time to build the tankers and production facilities. One liquefied natural gas (LNG) regasification plant is proposed for Coos Bay and three others are being discussed for Columbia and Clatsop counties. It is unlikely any of these will be ready before 2008; there will also be increasing worldwide competition for the gas.

Three possible new sources could fill the gap at wholesale prices of $4 per thousand cubic feet or less:

- Pipelines to reserves in Prudhoe Bay, Alaska and MacKenzie Delta, Canada
- Imported liquefied natural gas
- Deep offshore exploration of the Gulf of Mexico

These will require huge investments of time and money. Natural gas prices for Oregon and the

U.S. likely will remain volatile until these new sources are available.

Natural Gas Regulation

The Federal Energy Regulatory Commission regulates siting of interstate natural gas pipelines as well as prices for the use of pipelines. The Oregon Energy Facility Siting Council sites and regulates large intrastate pipelines.

The Oregon Public Utility Commission (PUC) regulates the rates Oregon's natural gas utilities charge their retail customers. Wholesale natural gas prices are not regulated. Many industrial customers buy directly from the wholesale market.

Retail natural gas rates generally pass along the wholesale cost of natural gas to retail customers. The PUC sets retail rates so utility companies have the opportunity to earn a fair rate of return on their investments.

State statute requires natural gas utilities to offer conservation programs. Utilities provide free energy audits and weatherization incentives for residential customers. They also provide energy audits for commercial customers, but charge for this service.

Natural gas utilities also have to prepare integrated resource plans for the PUC. These plans outline contracts to meet natural gas demand, proposed pipeline expansions, new storage facilities, and energy conservation budgets and programs. In 2002, Northwest Natural began new conservation and low-income bill assistance programs.

Natural Gas Contingencies

A sustained loss of pipelines connecting Oregon to any of its sources of natural gas would disrupt the state's economy, particularly manufacturing. However, barring a major earthquake or other catastrophic event, it is unlikely a sustained disruption would occur. In the event of a disruption, utilities could acquire alternative supplies. This would impact wholesale costs and retail rates, but only for sustained interruptions.

Because natural gas customers have electricity, a gas pipeline interruption could put stress on the electric system, which would face increased electrical loads. Reduced gas supplies for gas-fired power plants would also strain the electric system.

Electricity Supply

Figure 7 shows the mix of resources for Oregon's utilities. This also include biomass self-generation (such as wood waste) by industrial customers and renewable energy certificates (green tags) purchased by customers or on their behalf by their utility. Green tags are the environmental benefits that take place when renewable energy replaces fossil-fuel energy.

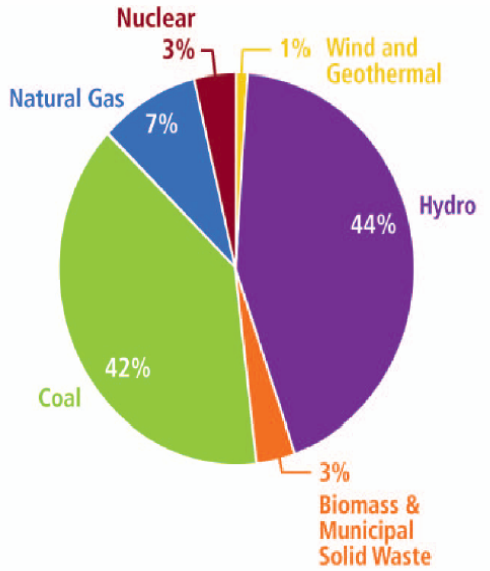


Figure 7: Where Oregon gets its electricity.
Oregon's 2003 fuel mix shows that electricity comes mainly from hydropower and that generated by coal.

Oregon's fuel mix varies based on water and snow (hydro) conditions. For example, natural gas generation in 2003 was 7 percent or about half the 2001 level. In 2001, hydro generation was down and gas generation filled much of the gap. Coal power comes from the Boardman plant in Oregon and from plants in Utah, Wyoming, and Montana. Nuclear power is from the Columbia Generating Station at Hanford, Wash. Biomass refers to generation from pulping liquors at paper factories, woodwaste and waste methane gas. Municipal solid waste (MSW) refers to the generation plant in Marion County. MSW accounts for only about 6 percent of combined biomass and MSW generation. New wind facilities have been added since 2001, but in 2003, wind was still less than 1 percent of total generation.

From 2001 to 2003, the Northwest added approximately 3,350 megawatts (MW) of new generation to the system; most of it fired by natural gas, including 1,675 MW in Oregon. One megawatt roughly equals enough electricity for the instantaneous demand of 750 to 1,000 homes at once.

The power supply should be adequate for several years, even in a drought. However, adequate resources do not guarantee stable wholesale prices. The West is dependent on natural gas-fired power plants. If natural gas prices spike, power prices likely will follow.

Electricity Conservation

Electric energy conservation is making a comeback, if tax credit and other incentive programs are a measure. In 2000, the combination of the Oregon Department of Energy's Residential Energy Tax Credit and Business Energy Tax Credit programs stimulated savings of 58.9 million kilowatt-hours (kWh). In 2001, the savings nearly doubled to 109.2 million kWh. By 2003, the savings reached 860.3 million kWh – more than 14 times the energy saved in 2000.

This dramatic increase in electric energy saving can be attributed to several factors including:

- A West Coast energy crisis in 2001 that saw energy prices soar as a result of the collapse of the California energy markets.
- Volatile and increased natural gas prices that have raised the cost of generating electricity.
- Expansion of energy efficiency efforts by the Oregon Department of Energy, utilities and other energy efficiency delivery organizations to help the public identify and implement energy projects.

The continued volatility and long term upward trend in electricity prices likely will help keep electric energy savings moving upward in Oregon.

Electricity Contingencies

Earthquakes and drought pose the greatest natural risks for Oregon's electricity supply. A drought would be especially problematic if accompanied by a natural gas shortage or the loss of major transmission lines or power plants. Extremely cold weather also strains supplies.

The Bonneville Power Administration (BPA), Pacific Power and PGE have contingency plans for dealing with short- and long-term electricity shortages. The PUC approves plans from Pacific Power and PGE. ODOE and Oregon Emergency Management notify local agencies in case of emergencies.

PGE and Pacific Power have programs to pay customers for reducing use if there is a long-term shortage. During severe long-term shortages, the PUC could require all Oregon electricity consumers to reduce monthly use, relative to the prior year.

During a short-term shortage, utilities ask their customers to make voluntary reductions. If these fall short, utilities can black out individual substations for one or two hours. These events are called rotating outages or rolling blackouts. Critical substations serving hospitals, communications or public safety are exempt. If a substation serves only a few large customers, and those customers reduce their use by the same proportion as the outage, the substation is exempt. For some industrial customers, rotating outages are more disruptive than reducing output or shutting down equipment to achieve equivalent savings.

The Oregon Department of Energy is responsible for planning, preparedness and response to various emergencies that affect the state. They include nuclear emergencies at fixed facilities, radioactive waste transport incidents on Oregon highways, petroleum disruptions or shortages, and electricity emergencies involving the State's 38 consumer- owned utilities.

Immediately following September 11, ODOE conducted vulnerability assessments on the electric, nuclear and petroleum industries. The assessments showed that while we cannot plan for every contingency, the region's nuclear, petroleum, and energy industries have implemented appropriate measures to reduce the likelihood of a terrorist event on a facility, shipment, a pipeline, or an electrical grid.

Energy Issues Facing Oregon

Energy and the Economy

Energy price and supply affect Oregonians. For example, energy price increases caused Oregonians to spend 50 percent more per unit of energy to heat their homes in 2002 than they did in 1998. Energy conservation and efficiency, along with renewable resources can help insulate Oregonians from volatile energy prices. This benefits the state's economy.

Energy efficiency and renewable energy result in direct local economic improvement. Project construction creates a one-time surge in economic activity, while operation and maintenance create long-term jobs. Every $100 million of investment in renewable energy creates about 1,250 full time equivalent jobs and nearly $200 million in economic benefits, which increase tax revenues by about $1 million. [1]

Efficiency and renewable energy can also meet a significant portion of Oregon's incremental energy needs, in some cases at a lower cost than that of conventional fuels. For example, when natural gas prices rose to about $7 per million Btu that translated to about 5.6 cents per kWh, which is significantly higher than the cost of wind energy.

Between 1990 and 2002, utilities in the Pacific Northwest invested $2.4 billion in conservation, resulting in savings of 2,600 average megawatts (aMW) annually. This precluded generating the output of five large coal plants and avoided significant environmental cost. That $2.4 billion investment is recovered in electricity bill savings every 18 months. [2]

In 2004 alone, Oregonians invested nearly $200 million in efficiency and renewable energy. These investments support Oregon's economy by increasing business activity, cutting energy costs, and making Oregon business more competitive.

Economic development and energy agencies from Oregon, Washington and British Columbia commissioned Poised for Profit: How Clean Energy Can Power the Next High-Tech Job Surge in the Northwest. This 2001 report showed that the clean energy sector could be twice the size of the aircraft industry within 20 years and generate as many as 30,000 new jobs. The study estimated this sector includes more than 225 companies with revenues, and research and development funding exceeding $2 billion.

Local efficiency and renewable energy investments boost revenues for Oregon designers, vendors, manufacturers, and service providers in a wide range of manufacturing and construction trades. Energy cost savings build each year from these investments and stay in Oregon's economy.

Businesses that make efficiency or renewable energy improvements are more competitive, because of lower operating costs and in many cases better control over production and product quality. In addition, Oregon business becomes less dependent upon foreign oil and natural gas supplies, which have experienced sharp price increases.

For example, developing biodiesel and ethanol production from Oregon renewable resources will provide local business with numerous opportunities. In-state production also offers long-term

[1] Based on Economic Impact Analysis of Energy Trust of Oregon Program Activities, Final Report, by ECONorthwest, Portland, April 2003.

[2] Per communications with Tom Eckman, Conservation Program Director, Northwest Power and Conservation Council, September 16, 2004. Assumes average avoided cost – or value of savings – of 5.5¢/kWh, or $55/MWh. In 2001, when West Coast market prices for electricity spiked to $250/MWh and higher, the savings realized in the Pacific Northwest would have been appreciably greater.

benefits to the environment and the economy.

A Minnesota study suggests that local economic benefits are about 10 times higher for locally owned and operated businesses when compared to those from projects owned by corporations outside the region.

Central Oregon may serve as an example of an efficiency and renewable energy development cluster. The nine-county central Oregon corridor (Wasco, Sherman, Gilliam, Wheeler, Deschutes, Jefferson, Crook, Klamath, and Lake counties) possesses diverse renewable resources including solar, wind, geothermal, and biomass. The corridor can build on several dozen renewable energy-related companies manufacturing fuel cell applications, photovoltaic system inverters and other technologies.

Oregon businesses are recognized for their experience developing renewable energy. Institutes in the higher education system are dedicated to the full range of energy efficiency and renewable resources. The scientists at Oregon's universities are a deep resource for technology and information in this sustainable industry. Oregon's economy can benefit from their unique expertise. For example, microelectronics, fuel cell applications, power controllers, and renewable resource technical services are supported by Oregon incentives. The combination of scientific expertise and state incentives positions Oregon businesses to export these technologies.

Petroleum – Price Increases and Production Peaks

Oregon should expect continued high gasoline and other oil price prices that could negatively affect our economy, which remains heavily dependent on oil. About half the energy products Oregon uses are refined oil, most of it for transportation. In 2000, Oregonians spent 2.6 percent of their total personal income on gasoline and 4.3 percent on all oil products combined.

The price Oregonians pay for petroleum products depends on world oil prices. Middle East production strongly influences the world price. The Middle East produced 28 percent of the world's oil in 2001 and controls two-thirds of the world's oil reserves. There have been four world price spikes in the last 30 years, in 1973, 1979, 1990 and 2004. These were due to high world oil demand and the Yom Kippur War, the Iran-Iraq War, the Persian Gulf War, and the Iraq War, respectively. As recent events indicate, the Middle East remains unsettled.

Another potential problem is long-term price trends. World oil production may peak in the next decade and begin a long-term decline. Meanwhile, world demand for oil continues to grow. Increased demand will maintain or increase already high oil prices.

While U.S. oil production peaked in 1970, most experts think that worldwide production will peak within five to ten years. This is based on a projected maximum global resource base of 2.2 trillion barrels, which has held steady since the 1950s.

Production from most non-OPEC sources, such as Canada, Mexico, and the North Sea, likely already has peaked. Production from many OPEC nations has reached a plateau, and is unlikely to increase before it begins to decline.

The oil peak does not mean we are about to run out of oil. It means we have used about half the Earth's oil — the easiest and cheapest half to find and produce. After the peak, prices may rise sharply. This would have a major impact on the U.S. and world economies, because oil accounts for about 40 percent of the energy we use, including 95 percent of U.S. transportation energy. All the major recessions of the past 35 years were preceded by sharp increases in the price of oil.

The state has little ability to mitigate the economic impacts of a sustained fuel price increase after it occurs. Oregonians can reduce their vulnerability to oil prices by decreasing the miles they drive, buying vehicles that get more miles per gallon, and increasing the use of alternative fuels.

The most significant options to reduce vehicle miles traveled relate to work commutes, which includes increased transit use, van/carpooling, and telework. Improved commuter options are:

- Increasing incentives for employers to reduce single-occupant commuting. Employers can pay for transit passes and can develop telework sites or encourage working from home.
- Expanding incentives to encourage vanpooling and carpooling, such as carpool parking discounts and high-occupancy vehicle lanes.
- Starting commuter rail along existing rail lines.
- Expanding transit service.

High efficiency vehicles, including hybrids, offer the greatest potential for reducing gasoline use in the near term. However, the most significant option to improve vehicle efficiencies is to encourage improvement in the federal Corporate Average Fuel Economy (CAFE) standard. Congress has not increased fuel economy standards for new vehicles since 1985. The report of the Governor's Global Warming Advisory Group, *Oregon Strategy for Greenhouse Gas Reductions*, provides a number of recommended actions that also reduce use of petroleum.

For Oregon's overall petroleum supply, the Oregon Department of Energy is responsible for allocating gasoline and diesel during critical emergencies. ODOE's Petroleum Contingency Plan ensures a coordinated response with the state's petroleum suppliers, law enforcement,

other state agencies, and the counties. The revised plan will include a database with county-specific information on fuel use, designated emergency fueling stations, and maps of emergency routes.

Natural Gas – Price Increases and Production Peaks

As with petroleum, the recent spikes in natural gas prices may seem minor once world production peaks and begins to decline. Rather than spike and decline, natural gas prices would likely remain high.

Natural gas accounts for 20 to 25 percent of U.S. primary energy use. Natural gas is a clean, high-value resource that could substitute for oil in many uses. However, like oil, natural gas is non-renewable and production will peak and decline. For North American natural gas, that appears to be happening now.

From 2001 to 2003, U.S. gas production declined almost 3 percent and Canadian imports declined 8 percent, despite significantly higher prices. In addition, world natural gas production eventually will peak. Discoveries of new fields peaked in 1970, and for the past three years, the world has used more natural gas than it has found.

Because of these production declines, natural gas prices are more than double what they were five years ago. High natural gas prices hurt the economy.

To make up for declining domestic production, the U.S. would need to import natural gas from abroad. However, natural gas produced overseas must be liquefied for ocean transport. This is expensive, as is regasification, and it will take time to build the tankers and production facilities. One LNG regasification plant is proposed in Coos Bay and three in Columbia and Clatsop counties. It is unlikely any LNG facility will be ready before 2008 and even then, there will be increasing worldwide competition for the gas. Much of it likely will go to countries closer to the source of production where it can be moved easier and cheaper by pipeline. Oregon will get product with a higher delivered price.

Oregon wholesale natural gas prices rose 168 percent between January 1999 and July 2004. Over the same period, residential rates rose 94 percent. This is largely responsible for the drop in natural gas use for residential, commercial and industrial sectors of 3, 8 and 37 percent respectively. While the reduced use in the residential and commercial sectors was due primarily to price increases, the economic recession added to reductions in the industrial sector.

Natural gas prices influence electric prices. Because roughly 8 percent of Oregon's electricity is generated from natural gas, gas prices influence retail electric prices. The share of gas-fired generation is increasing as loads grow and since most new power plants are fired by natural gas. Electric utilities can reduce their exposure to fuel price spikes by developing renewable resources and buying more of their fuel in longer-term contracts. These measures can be more expensive in the near term. These tradeoffs are part of the utility least-cost planning process.

Natural gas prices continued to rise in late 2004. Oregonians can reduce their vulnerability to natural gas price spikes by weatherizing their homes and installing premium-efficiency equipment in homes, buildings and factories. Natural gas utilities and others offer conservation programs.

Public schools (K-12) in Pacific Power and Portland General service territories are eligible for $6

million per year for electric, natural gas and oil conservation. In addition, ODOE recently received funds from an overcharge settlement to cover energy efficiency measures in Oregon K-12 public schools served by municipal utilities, people's utility districts, and electric cooperatives.

The Oregon Department of Energy offers tax credits and loans for conservation in buildings and factories and programs to reduce natural gas use in state facilities.

Expanding state, utility and non-profit conservation programs would reduce Oregon's vulnerability to natural gas price spikes.

City of Portland Peak Oil Resolution

RESOLUTION No. 36407

Establish a Peak Oil Task Force to assess Portland's exposure to diminishing supplies of oil and natural gas and make recommendations to address vulnerabilities (Resolution)

WHEREAS, global reserves of oil and natural gas are finite and sufficient substitutes are unlikely to be available in the immediate future; and

WHEREAS, U.S. oil and natural gas production have peaked and are now in decline, ensuring our nation's continued and growing dependence on oil and natural gas imported from politically unstable regions; and

WHEREAS, a growing body of energy industry experts believe that the world has already arrived at, or will soon arrive at, the peak of global oil production, which will be followed by an inevitable decline in available supply thereafter; and

WHEREAS, global demand for oil and natural gas continue to increase; and

WHEREAS, following the global peaks of oil and natural gas production, the interaction of decreasing supply and increased demand will cause the price of oil and natural gas to become more volatile; and

WHEREAS, the United States Department of Energy's National Energy Technology Laboratory has stated that, "The problems associated with world oil production peaking will not be temporary, and past 'energy crisis' experience will provide relatively little guidance. The challenge of oil peaking deserves immediate, serious attention, if risks are to be fully understood and mitigation begun on a timely basis"; and

WHEREAS, the City of Portland and its citizens and businesses depend on oil and natural gas for their economic welfare and their most critical activities, including transportation and food supply; and

WHEREAS, a large majority of money spent on fossil fuels leaves Oregon and provides no local economic benefit, while many of the solutions to lessening dependence on fossil fuels result in local jobs and substantial economic benefits;

WHEREAS, Portland residents and businesses are not currently aware of the full implications of an impending decline and will greatly benefit from an objective source of information on this topic; and

WHEREAS, the City of Portland has adopted the *Local Action Plan On Global Warming*, the success of which depends upon reducing carbon dioxide emissions from burning fossil fuels; and

WHEREAS, the City of Portland has a national reputation for planning and actions aimed at maintaining the City's social values, equity, and quality of life and can take a leadership role in what may become one of the greatest political economic and societal issues of the next half century; and

WHEREAS, the Oregon Department of Energy and METRO share the City's concerns about the uncertainty of future oil supplies and has offered to provide technical assistance in assessing the local implications of peak oil;

NOW, THEREFORE, BE IT RESOLVED, a Peak Oil Task Force will be established to assess Portland's exposure to diminishing supplies of oil and natural gas and make recommendations to address vulnerabilities. The Task Force will be lead and staffed by the Offices of Sustainable Development and will coordinate with the Office of Transportation, the Bureau of Planning and other applicable bureaus. It will include up to 11 members representing a broad range of community and business interests.

BE IT FURTHER RESOLVED, the Task Force's charge is:

a. To acquire and study current and credible data and information on the issues of peak oil and natural gas production and the related economic and other societal consequences;

b. To seek community and business input on the impacts and proposed solutions;

c. To develop recommendations to City Council in this calendar year on strategies the City and its bureaus can take to mitigate the impacts of declining energy supplies in areas including, but not limited to: transportation, business and home energy use, water, food security, health care, communications, land use planning, and wastewater treatment. These recommendations will be considered as amendments to the Local Action Plan on Global Warming when it is revised in 2007 and integrated into citywide long term strategic planning; and

d. To propose methods of educating the public about this issue in order to create positive behavior change among businesses and residents that reduce dependence on fossil fuels.

Adopted by the Council, May 10, 2006
Commissioner Sam Adams
Commissioner Randy Leonard
Commissioner Dan Saltzman
Commissioner Erik Sten
Mayor Tom Potter
Prepared by: Brendan Finn
May 10, 2006

GARY BLACKMER
Auditor of the City of Portland
By: /S/ Susan Parsons
Deputy

Existing Local Plans and Policies

The City of Portland has a number of plans and policies already in place that are relevant to discussions of peak oil vulnerabilities and recommendations. This section provides context and specific excerpts from relevant state and local planning and policy documents as they relate to five key areas of impact: transportation, land use, food, housing, and building energy use. The primary reference documents include:

- City of Portland Comprehensive Plan
- City of Portland and Multnomah County Local Action Plan on Global Warming

Additionally, City staff reviewed the following for background:

- Metro 2040 Growth Concept
- Metro Regional Transportation Plan (RTP)
- City of Portland Transportation System Plan (TSP)
- City of Portland Freight Management Plan
- Oregon Biennial Energy Plan 2005-2007
- Oregon Strategy on Greenhouse Gas Reductions
- Oregon Renewable Energy Action Plan

We have provided references for these plans at the end of each policy section for those who wish to pursue them further.

Transportation

Overview
Sections of the transportation element of the Comprehensive Plan relevant to peak oil are excerpted below. These policies describe how the city will develop infrastructure to allow for safe, efficient alternatives to auto travel (bicycling, walking, public transportation) and development of infrastructure and plans to promote fuel efficient auto travel (multiple-occupancy trips, transit-oriented development).

The Portland Comprehensive Plan policy on energy was complemented by the 1993 Carbon Dioxide Reduction Strategy to address the issue of global warming. The CO_2 strategy was revised in 2001 and adopted as the Local Action Plan on Global Warming (LAPGW) by the City of Portland and Multnomah County. By setting specific actions and goals for local agencies and community initiatives, LAPGW sets a reduction target of 10 percent below 1990 levels by 2010. The plan directly addresses cutting emissions by setting goals for various sectors. Section C is reproduced below, as it specifically addresses transportation.

In July 2006, Portland City Council adopted an ordinance establishing renewable fuel standards for most transportation fuels sold in Portland. The ordinance requires that all gasoline sold in Portland contain 10% ethanol beginning July 1, 2007 and that all fuel sold in Portland for the purpose of operating diesel motor vehicles be a minimum blend of 5%

biodiesel by July 2007 and 10% biodiesel by July 2010. The ordinance also established as binding policy the City's current practice of fueling its diesel vehicles and construction equipment with 20% biodiesel, as has been the case since 2005. The full text of the ordinance is included in this section.

One additional City policy document, the Freight Management Plan, was reviewed. However, the plan does not address fuel consumption or efficiency outside of identifying the sources of fuel consumed in the City of Portland and that measures to reduce trucking idling should be considered.

Below is a table summarizing the City of Portland's annual gasoline and diesel fuel consumption by bureau.

Table 1: City of Portland transportation fuel use by bureau, FY '04-'05 (gallons)

Bureau	Diesel	Gasoline
Development Services	56	42,097
Environmental Services	15,476	39,322
Fire	95,953	51,952
General Services		
Printing & Distribution	19	4,648
Communication	795	3,679
Facilities	24	4,849
Fleet	7,512	46,380
Government Relations		905
Parks & Recreation	49,128	109,164
Police	16,126	650,913
Transportation		
Traffic Mangement	63	37,887
Maintenance	359,857	91,896
Water	91,712	103,363
Total	***636,721***	***1,187,186***

Portland Comprehensive Plan

2.12 Transit Corridors

Provide a mixture of activities along Major Transit Priority Streets, Transit Access Streets, and Main Streets to support the use of transit. Encourage development of commercial uses and allow labor-intensive industrial activities which are compatible with the surrounding area. Increase residential densities on residentially-zoned lands within one-quarter mile of existing and planned transit routes to transit-supportive levels. Require development along transit routes to relate to the transit line and pedestrians and to provide on-site pedestrian connections.

2.17 Transit Stations and Transit Centers

Encourage transit-oriented development patterns at transit stations and at transit centers to provide for easy access to transit service. Establish minimum residential densities on residentially-zoned lands within one-half mile of transit stations and one-quarter mile of transit centers that support the use of transit. The design and mix of land uses surrounding transit stations and transit centers should emphasize a pedestrian- and bicycle-oriented environment and support transit use.

5.4 Transportation System

Promote a multi-modal regional transportation system that encourages economic development.

Objectives:

a) Support regional transportation improvements to facilitate the efficient movement of goods and services in and out of Portland's major industrial and commercial areas. Ensure access to intermodal terminals and related distribution facilities.
b) Support the maintenance and efficient use of the transportation infrastructure for local, national, and international distribution of goods and services.
c) Work closely with public agencies, such as Tri-Met, and the private sector to deliver an efficient and effective transportation system and network. Improve transit connections between residential communities and work sites.
d) Support transit-supportive development and redevelopment along designated transit streets and in the vicinity of transit stations.
e) Promote safe and pleasant bicycle and pedestrian access to and circulation within commercial areas. Provide convenient, secure bicycle parking for employees and shoppers.
f) Encourage a wide range of goods and services in each commercial area in order to promote air quality and energy conservation.
g) Pursue special opportunities for alternative modes of transportation to serve as attractors themselves. Such projects include water taxis, streetcars and bicycle/pedestrian facilities and amenities.
h) Pursue transportation and parking improvements that reinforce commercial, industrial and residential districts and promote development of new commercial, industrial, and residential districts.

6.7 Bicycle Classification Descriptions

Maintain a system of bikeways to serve all bicycle users and all types of bicycle trips.

Objectives:

a) City Bikeways are intended to serve the Central City, regional and town centers, station communities, and other employment, commercial, institutional, and recreational destinations.
b) Land Use. Auto-oriented land uses should be discouraged from locating on City Bikeways that are not also classified as Major City Traffic Streets.

c) Design. Consider the following factors in determining the appropriate design treatment for City Bikeways: traffic volume, speed of motor vehicles, and street width. Minimize conflicts where City Bikeways cross other streets.
d) Improvements. Consider the following possible design treatments for City Bikeways: bicycle lanes, wider travel lanes, wide shoulders on partially improved roadways, bicycle boulevards, and signage for local street connections.
e) On-Street Parking. On-street motor vehicle parking may be removed on City Bikeways to provide bicycle lanes, except where parking is determined to be essential to serve adjacent land uses, and feasible options are not available to provide the parking on-site.
f) Bicycle Parking. Destinations along City Bikeways should have long-term and/or short-term bicycle parking to meet the needs of bicyclists.
g) Traffic Calming. When bicycle lanes are not feasible, traffic calming, bicycle boulevards, or similar techniques will be considered to allow bicyclists to share travel lanes safely with motorized traffic.

6.8 Pedestrian Classification Descriptions

Maintain a system of pedestrian-ways to serve all types of pedestrian trips, particularly those with a transportation function.

Objectives:

a) Pedestrian Districts

Pedestrian Districts are intended to give priority to pedestrian access in areas where high levels of pedestrian activity exist or are planned, including the Central City, Gateway regional center, town centers, and station communities.

- Land Use. Zoning should allow a transit-supportive density of residential and commercial uses that support lively and intensive pedestrian activity. Auto-oriented development should be discouraged in Pedestrian Districts.
- Institutional campuses that generate high levels of pedestrian activity may be included in Pedestrian Districts. Exceptions to the density and zoning criteria may be appropriate in some designated historic districts with a strong pedestrian orientation.
- Streets within a District. Make walking the mode of choice for all trips within a Pedestrian District. All streets within a Pedestrian District are equal in importance in serving pedestrian trips and should have sidewalks on both sides.
- Characteristics. The size and configuration of a Pedestrian District should be consistent with the scale of walking trips. A Pedestrian District includes both sides of the streets along its boundaries, except where the abutting street is classified as a Regional Trafficway. In these instances, the land up to the Regional Trafficway is considered part of the Pedestrian District, but the Regional Trafficway itself is not.
- Access to Transit. A Pedestrian District should have, or be planned to have, frequent transit service and convenient access to transit stops.

- Improvements. Use the Pedestrian Design Guide to design streets within Pedestrian Districts. Improvements may include widened sidewalks, curb extensions, street lighting, street trees, and signing. Where two arterials cross, design treatments such as curb extensions, median pedestrian refuges, marked crosswalks, and traffic signals should be considered to minimize the crossing distance, direct pedestrians across the safest route, and provide safe gaps in the traffic stream.

b) **Pedestrian-Transit Streets**
Pedestrian-Transit Streets are intended to create a strong and visible relationship between pedestrians and transit within the Central City.

- Land Use. Pedestrian-Transit Streets respond to significant public investments in public transportation, including light rail, the transit mall, and streetcar, and enhance the pedestrian environment adjacent to high-density land uses.
- Improvements. Improvements should include wide sidewalks to accommodate high levels of pedestrian traffic, urban design features that promote pedestrian activity, and visual signals to motor vehicles to recognize the priority of pedestrian and transit vehicles.

6.17 Coordinate Land Use and Transportation

Implement the Comprehensive Plan Map and the 2040 Growth Concept through long-range transportation and land use planning and the development of efficient and effective transportation projects and programs.

6.19 Transit-Oriented Development

Reinforce the link between transit and land use by encouraging transit-oriented development and supporting increased residential and employment densities along transit streets, at existing and planned light rail transit stations, and at other major activity centers.

Objectives:

a) Consider the existing or planned availability of high-quality transit service when adopting more intensive residential, commercial, and employment designations.Focus medium-density and high-density development, including institutions, in transit-oriented developments along transit lines.
b) Require commercial and multifamily development to orient to and provide pedestrian and bicycle connections to transit streets and, for major developments, provide transit facilities on a site or adjacent to a transit stop.
c) Examine the benefits of limiting drive-through facilities in existing or planned areas of high-intensity development and high levels of pedestrian, bicycle, and transit activity when planning studies are being done for these areas.

6.22 Pedestrian Transportation

Plan and complete a pedestrian network that increases the opportunities for walking to shopping and services, schools and parks, employment, and transit.

Objectives:

a) Promote walking as the mode of choice for short trips by giving priority to the completion of the pedestrian network that serves Pedestrian Districts, schools, neighborhood shopping, and parks.
b) Support walking to transit by giving priority to the completion of the pedestrian network that serves transit centers, stations, and stops; providing adequate crossing opportunities at transit stops; and planning and designing pedestrian improvements that allow adequate space for transit stop facilities.
c) Improve the quality of the pedestrian environment by implementing pedestrian design guidelines to ensure that all construction in the right-of-way meets a pedestrian quality standard and by developing special design districts for Pedestrian Districts and main streets.
d) Increase pedestrian safety and convenience by identifying and analyzing high pedestrian collision locations; making physical improvements, such as traffic calming, signal improvements, and crossing improvements in areas of high pedestrian use; and supporting changes to adopted statutes and codes that would enhance pedestrian safety.
e) Develop a citywide network of pedestrian trails that increases pedestrian access for recreation and transportation purposes and links to schools, parks, transit, and shopping as well as to the regional trail system and adjacent cities.

6.23 Bicycle Transportation

Make the bicycle an integral part of daily life in Portland, particularly for trips of less than five miles, by implementing a bikeway network, providing end-of-trip facilities, improving bicycle/transit integration, encouraging bicycle use, and making bicycling safer.

Objectives:

a) Complete a network of bikeways that serves bicyclists' needs, especially for travel to employment centers, commercial districts, transit stations, institutions, and recreational destinations.
b) Provide continuous bicycle facilities and eliminate gaps in the bike lane system.
c) Install bicycle signage along bikeways where needed to define the route and/or direct bicyclists to a destination or other bikeway.
d) Increase bicyclist safety and convenience by making improvements, removing physical hazards such as dangerous storm grates, and supporting changes to adopted statutes and codes that would enhance the safety of bicyclists.
e) Provide short-term and/or long-term bicycle parking in commercial districts, along main streets, in employment centers and multifamily developments, at schools and colleges, in industrial developments, at special events, in recreational areas, at transit facilities such as light rail stations and park-and-ride lots, and at intermodal passenger stations.
f) Encourage the provision of showers and changing facilities for commuting cyclists, including development of such facilities in commercial buildings and at ‘Bike Central’ locations.
g) Increase the number of bicycle-transit trips.

h) Promote bicycling as safe and convenient transportation to and from school.

6.24 Public Transportation

Develop a public transportation system that conveniently serves City residents and workers 24 hours a day, seven days a week and can become the preferred form of travel to major destinations, including the Central City, regional and town centers, main streets, and station communities.

Objectives:

a) Support light rail transit and bus connections as the foundation of the regional transit system, with completion of the system to connect all regional centers, downtown Vancouver, major attractions, and intermodal passenger facilities as a high priority for the region.
b) Base decisions about light rail transitway alignments and their connections to other regional facilities on individual corridor studies.
c) Expand primary and secondary bus service to meet the growing demand for work and non-work trips, operate as the principal transit service for access and mobility needs, help reduce congestion, and support the economic activities of the City.
d) Implement transit-preferential measures on Major Transit Priority Streets to achieve travel times competitive with the automobile and to improve service reliability.
e) Consider the use of alternative forms of transit, including vanpools and dial-a-ride in low-density areas and other forms of transit such as water taxis.
f) Support a public transit system and regional transportation strategies that address the special needs of the transportation disadvantaged and provide increased mobility options and access.
g) Locate major park-and-ride lots only where transit ridership is increased significantly, vehicle miles traveled are reduced, transit-supportive development is not hampered, bus service is not available or is inadequate, and the surrounding area is not negatively impacted.
h) Develop streetcar lines in Portland to connect new or redeveloping neighborhoods to employment opportunities and other destinations, including shopping, education, and recreation.

6.28 Travel Management

Reduce congestion, improve air quality, and mitigate the impact of development generated traffic by supporting transportation choices through demand management programs and measures and through education and public information strategies.

Objectives:

a) Develop neighborhood-based programs to promote and support multimodal strategies and trip reduction strategies and programs.
b) Meet the access and mobility needs of businesses and employees in key employment and regional centers with customized alternative transportation programs that result in reduced congestion and improved air quality.

c) Support and encourage the growth of car sharing among City residents and businesses through actions that expand the supply of car sharing vehicles at convenient locations and actions that increase the demand for car sharing services.
d) Require institutions to regulate parking facilities, first to provide short-term parking for visitors and, second, to minimize the amount of employee parking through demand management measures such as carpooling, ridesharing, flexible work hours, telecommuting, parking management and employer-subsidized transit passes.
e) Require institutions to mitigate excessive parking impacts on residential areas.
f) Require institutions and other large employers to participate in programs to reduce single-occupant automobile trips.

Local Action Plan on Global Warming, Section C: Transportation, Telecommunications and Access

Objective 1: Improve the quality, convenience, affordability, and awareness of walking, bicycling, teleworking, public transit, ridesharing, and vehicle sharing.

Government Actions

2003

1) Require City and County agencies to offer bus tickets to visitors who arrive by transit in any situation where the agency validates parking.
2) Implement City and County policies to encourage transit whenever appropriate and to provide employees with transit tickets for travel on business.
3) Expand City and County transit-pass subsidy programs.

2010

4) Reduce per employee vehicle miles traveled in City and County administrative vehicles by 20 percent by 2010 by promoting teleconferencing and the availability of pedestrian, bicycle, transit, and rideshare options for employees on business.
5) Promote City and County telework and flexible hours policies and provide education to agency managers to encourage consistent application of the policies. Enable 25 percent of City and County employees to telework or work compressed schedules to avoid commuting at least one day every two weeks.
6) Expand the participation of City and County agencies in vehicle-sharing programs.

Community Initiatives

2003

1) Support expanded transit lines and increased frequency of service on major transit arterials.
2) Expand the number of businesses that offer transit tickets to shoppers who request them.
3) Work with Tri-Met to improve access to transit service.
4) Encourage shared parking opportunities such as movie theaters with primary parking needs in evenings and churches or other facilities with weekend-only parking needs.

5) Support additional park-and-ride lots in locations where substantial VMT reductions can be achieved.
6) Provide additional services such as secure, covered bicycle parking, coffee and newspapers during peak hours, and other amenities.
7) Continue and expand projects that increase pedestrian accessibility to transit stops, neighborhood shopping areas, schools, churches, and parks.
8) Help transit riders to show their neighbors, friends, and co-workers how easy it is to take transit.
9) Support the expansion of Tri-Met's "Fareless Square" to appropriate areas.
10) Continue to provide maps highlighting alternative modes of transportation and preferred routes for those modes.
11) Publicize and participate in campaigns to promote options to single-occupancy vehicle travel.
12) Implement an area-wide, internet-based rideshare program to encourage use of carpools and vanpools.
13) Establish a storefront "transportation options center" in downtown Portland to help residents and visitors learn and use a variety of travel alternatives.
14) Support bicycling and walking tours and transportation fairs.
15) Provide secure, covered bicycle parking at schools, in commecial districts, and at other destinations.

2010

16) Provide transit passes for all Portland residents funded through a household levy or business tax.
17) Continue the City and County's signal optimization plans until all major streets and roads are optimized for vehicles, bicycles, and pedestrians.
18) Continue to improve Portland's pedestrian and bicycle infrastructure, and meet the needs of pedestrians and both children and adult cyclists.
19) Promote telework, compressed workweeks, and other flexible-schedule work options.
20) Encourage the establishment and use of home and satellite offices.
21) Establish a quick-response system to encourage telework during winter storms, summer ozone alerts, and major road construction projects.
22) Support the availability and use of tele- and video-conferencing facilities.
23) Promote vehicle sharing to individuals and businesses.
24) Enhance transportation management associations (TMAs) and encourage the development of TMAs in all regional centers to make more efficient use of existing transportation resources.
25) Establish neighborhood-level ride-share cooperatives to encourage neighbors to carpool and reduce both work and non-work trips.
26) Continue and expand education efforts in schools to promote safe transportation alternatives to single-occupancy vehicles and smart use of cars (e.g. trip chaining, ride sharing, and car sharing).

Objective 2: Make the private cost of driving reflect the full costs to society

Community Initiatives

2003

1) Work with businesses to encourage all employers who offer subsidized parking to employees also to offer a parking "cash out"—an equivalent payment to employees who do not require vehicle parking.

2010

2) Extend parking pricing to all appropriate commercial areas to reduce single-occupancy vehicle use.
3) Support the use of auto insurance premiums based on the number of miles a car is driven.
4) Support the use of congestion pricing on appropriate regional roadways.
5) Work with financial institutions to promote location-efficient mortgages.
6) Encourage the state to add a fee to vehicle-inspection charges to fund transportation options education.
7) Investigate a City-wide parking permit and/or state-wide registration fee based on a vehicle's greenhouse gas emissions. Revenue will be used to reduce use of single occupancy vehicles.

Objective 3: Increase the use of highly fuel-efficient and alternative-fuel engines in on-road and off-road vehicles as well as in stationary applications.

Government Actions

2003

1) Purchase a minimum of 25 City and five County hybrid gasoline-electric vehicles with fuel efficiency of at least 45 mpg.
2) Educate all employees on fuel-efficient driving practices, such as avoiding unnecessary idling.
3) Implement EPA's "Best Environmental Practices for Fleet Maintenance" in the County's Fleet Services Shop.

2010

4) Increase the average fuel efficiency of passenger vehicles in the City and County motor pools to 35 mpg.

Community Initiatives

2003

1) Strongly advocate raising the federal Corporate Average Fuel Economy standards for new automobiles to 45 mpg and for light duty trucks to 35 mpg.

2010

2) Work with the state to provide loans and other financial incentives to promote the purchase of 50,000 vehicles with fuel efficiency of at least 45 mpg by business, government, and individuals.
3) Encourage the use of low- or no-CO_2 technologies in non-road vehicles and equipment, such as electric forklifts and medium-duty construction equipment.
4) Work with vehicle maintenance providers to educate consumers about the potential savings and impact on fuel consumption of maintaining vehicles properly and practicing fuel-efficient driving techniques.
5) Support programs to retire and recycle fuel-inefficient vehicles.
6) Promote efficient transportation options such as high-speed rail for commuting between Northwest urban centers.

Objective 4: Change the pattern of urban development to be more compact, more bicycle and pedestrian friendly, to provide for mixed uses, and to offer a range of mobility choices.

Community Initiatives

2003

1) Promote growth through redevelopment and infill that maintains or improves the quality of life for existing neighborhoods.
   a) Promote proximate commuting (i.e., living near a workplace).
   b) Support continued use of transportation demand management strategies.
2) Continue to implement the City's Transportation System Plan, which includes policies to reduce vehicle miles traveled, increase non-motorized vehicle trips, and support the connection between land use and transportation.
3) Partner with surrounding communities and Metro to implement the Regional Transportation Plan and the 2040 Growth Concept it complements, including light rail lines, rapid bus, frequent bus service, high-occupancy vehicle lanes, and the addition of new and improvement of existing intermodal connections.
4) Implement new parking ratios in City Title 33 and support programs that allow for innovative new development to occur with a minimum number of parking spaces.

As amended July 5, 2006

ORDINANCE No.

Mandate minimum blends of biodiesel and ethanol in petroleum-based fuels sold in Portland and require city-owned vehicles to maximize use of renewable fuels (Ordinance; add Code Chapter 16.60)

The City of Portland ordains:

SECTION 1. The Council finds:

1. Oil is a non-renewable fossil fuel that cannot fulfill the long-term energy needs of the world.

2. The United States is dependent on oil as a source of fuel.

3. The United States' dependency on oil serves to its disadvantage politically, environmentally, and economically.

4. It is the responsibility of government to recognize the shrinking supply of oil and proactively reduce citizens reliance on oil.

5. Biodiesel and ethanol are viable alternatives to diesel and gasoline as fuel for motor vehicles.

6. Biodiesel and ethanol can be produced from feedstock grown by farmers in Oregon which will improve the State and local economy.

7. Biodiesel and ethanol can be readily blended with petroleum diesel and gasoline.

8. At a 5% blend in diesel fuel, known as B5, biodiesel is considered an additive and is approved by engine manufacturers.

9. All diesel vehicles can run on B5 without modification.

10. A 5% blend of biodiesel in petroleum diesel improves the lubricity of the fuel, reducing engine wear and improving performance.

11. Ethanol is currently present in gasoline in Portland at a level of 10%, known as E10.

12. All gasoline vehicles can run on E10 without modification.

13. Mandating 5% biodiesel and 10% ethanol will create a dependable demand for each that will catalyze the creation of a dependable supply.

14. A dependable supply will increase the availability of higher blends of biodiesel and ethanol.

15. The addition of 5% biodiesel in all diesel fuel and 10% ethanol in all gasoline will reduce Portland's petroleum fuel consumption by millions of gallons annually.

16. The City should maximize its use of alternative fuels in city-owned vehicles.

17. Other cities around the State and the Country should take similar steps to reduce America's reliance on oil.

NOW, THEREFORE, the Council directs:

a. Portland City Code Chapter 16.60 is amended as shown in Exhibit A.

b. The Office of Sustainable Development shall notify all known fuel distributors and vendors of the requirements of Portland City Code Chapter 16.60 on or before November 1, 2006.

c. The Office of Sustainable Development and the Bureau of Development Services shall report to the City Council annually with recommendations for code amendments or revisions to advance the City's transition to renewable fuels.

d. City owned vehicles that operate on diesel shall use fuel with a biodiesel content of not less than 20% to maximize the City's use of renewable fuels. This is binding City policy and should be included in the Portland Policy Documents.

e. City-owned vehicles that operate on gasoline shall use fuel with an ethanol content of 10%. City-owned gasoline powered vehicles with the capability to operate on 85% ethanol shall be required to do so to maximize the City's use of renewable fuels. This is binding City policy and should be included in the Portland Policy Documents.

f. The Commissioner of Public Safety shall convene a work group including but not limited to representatives from the Office of Sustainable Development and biodiesel feedstock growers, distributors, customers and vendors. The work group shall develop recommendations to align the requirements of this ordinance with the region's ability to meet the mandated biofuel demand while maximizing the use of regional feedstock. The work group shall produce recommendations to the Commissioner of Public Safety within 90 days of passage of this ordinance, and the Commissioner of Public Safety shall present a report to Council on the findings within 120 days of passage of this ordinance. [7/5/05 Sten amendment]

Passed by the Council:
Commissioner Randy Leonard
T. Kovatch
June 21, 2006

Gary Blackmer
Auditor of the City of Portland
By:

Deputy

As amended July 5th

Exhibit A

Title 16 Vehicles and Traffic
Chapter 16.60 Motor Vehicle Fuels

16.60.010 Definitions.

As used in this Chapter, the following terms shall be defined as provided in this section:

A. "B5 Fuel" means a fuel mixture consisting of 5% Biodiesel and 95% Diesel Fuel.

B. "B10 Fuel" means a fuel mixture consisting of 10% Biodiesel and 90% Diesel Fuel.

C. "B20 Fuel" means a fuel mixture consisting of 20% Biodiesel and 80% Diesel Fuel.

D. "Biodiesel blend stock" means 100% biodiesel fuel utilized for the purpose of blending with diesel fuel.

E. "Biodiesel fuel" means the monoalkyl esters of long chain fatty acids derived from plant or animal matter that meet the registration requirements for fuels and fuel additives established by the federal Environmental Protection Agency and standards established by the American Society of Testing and Materials (ASTM).

F. "Biofuel" means any fuel that is derived from plant or animal matter that meets the registration requirements for fuels and fuel additives established by the federal Environmental Protection Agency and standards established by the American Society of Testing and Materials (ASTM). For the purposes of this Chapter, Biofuel shall include Biodiesel and Ethanol.

G. "Diesel" means petroleum based liquid that is suitable for use as a fuel in diesel powered vehicles.

H. "E10" means a fuel mixture of 10% ethanol and 90% gasoline.

I. "E85" means a fuel mixture of 85% ethanol and 15% gasoline.

J. "Ethanol" means ethyl alcohol, a flammable liquid used or sold for the purpose of blending or mixing with gasoline.

K. "Feedstock" means the plant or animal matter from which a biofuel is derived.

L. "Fuel" means all gasoline or diesel sold within the City of Portland for the purpose of operating motor vehicles on public roadways.

M. "Fuel distributor" means any entity that conducts wholesale fuel sales or otherwise provides fuel within the City of Portland.

N. “Fuel vendor” means any entity that conducts retail sales of or otherwise provides fuel within the City of Portland.

O. “Gasoline” means any fuel sold for use in spark ignition engines.

P. “Motor Vehicle” means every inanimate vehicle which is self-propelled. For the purposes of this Chapter, the definition of motor vehicle shall not include aircraft, watercraft, or locomotives.

16.60.020 Biofuel Requirements

A. 1. On and after July 1, 2007, all diesel fuel sold by fuel distributors to fuel vendors shall contain a minimum blend of 5% Biodiesel (B5 fuel). The biodiesel blend stock shall meet the 2006 Edition of ASTM D 6751, Standard Specification for Biodiesel (B100) Blend Stock for Distillate Fuels.

2. On and after July 1, 2007, all diesel fuel sold by fuel vendors shall contain a minimum blend of 5% Biodiesel (B5 fuel). The biodiesel blend stock shall meet the 2006 Edition of ASTM D 6751, Standard Specification for Biodiesel (B100) Blend Stock for Distillate Fuels.

B. 1. On and after July 1, 2010, all diesel fuel sold by fuel distributors to fuel vendors shall contain a minimum blend of 10% Biodiesel (B10 fuel). The biodiesel blend stock shall meet the 2006 Edition of the ASTM D 6751, Standard Specification for Biodiesel (B100) Blend Stock for Distillate Fuels, and applicable regulatory standards in place on and after July 1, 2010.

2. On and after July 1, 2010, all diesel fuel sold by fuel vendors shall contain a minimum blend of 10% Biodiesel (B10 fuel). The biodiesel blend stock shall meet the 2006 Edition of the ASTM D 6751, Standard Specification for Biodiesel (B100) Blend Stock for Distillate Fuels, and applicable regulatory standards in place on and after July 1, 2010.

C. 1**.** On and after July 1, 2007, all gasoline sold by fuel distributors to fuel vendors shall contain a minimum blend of 10% ethanol (E10 fuel). This requirement shall remain in effect on a year round basis.

2. On and after July 1, 2007, all gasoline sold by fuel vendors shall contain a minimum blend of 10% ethanol (E10 fuel). This requirement shall remain in effect on a year round basis.

D. Fuel vendors shall be required to conspicuously place signage denoting the type of biofuel mixture available for sale by the fuel vendor in accordance with the labeling guidelines or rules established by the Oregon Department of Agriculture. B5 fuel shall be labeled “B5 Biodiesel Blend.”

16.60.030 Exemptions

A. Any vendor who offers a biodiesel blend of 20% (B20 fuel) or greater shall be exempt from the requirements of Section 16.60.020 (A) and (B), and may also provide for sale, on the same site or a contiguous site, diesel fuel which does not contain biodiesel. The B20 biodiesel blend stock shall meet the 2006 Edition of the ASTM D 6751, Standard Specification for Biodiesel (B100) Blend Stock for Distillate Fuels, and applicable regulatory standards in place on and after July 1, 2007.

B. The Director of the Bureau of Development Services may temporarily suspend or modify the minimum biofuel content requirements of this Chapter based on a determination that such requirements are temporarily infeasible due to economic or technical circumstances. The Director's determination shall be made by filing a report with the City Council.

C. The requirements of this Chapter do not apply to fuel used for the operation of railroad locomotives, watercraft or aircraft.

D. Nothing in this Chapter is intended to prohibit the production, sale, or use of motor fuel for use in federally designated flexibly fueled vehicles capable of using up to eighty-five percent ethanol fuel blends.

16.60.040 Enforcement and Notice of Violation.

A. The Director of the Bureau of Development Services, or designee, upon determining that a violation of this code or regulations duly adopted pursuant to this Chapter has occurred, shall issue a written notice of the violation by certified mail to the fuel vendor or fuel distributor identifying the violation and applicable penalty.

B. The fuel vendor or fuel distributor shall, upon receipt of a notice of violation, correct the violation and pay to the City the stated penalty or appeal the finding of a violation to the Code Hearings Officer within 10 days of receipt of the notice.

C. A determination issued pursuant to Section 16.60.040.A may be appealed to the Code Hearings Officer, as provided for in Chapter 22.10 of City Code.

16.60.050 Penalties.

Violations of this Chapter may be punishable by fines as follows:

A. A fine of up to $5,000 for the first violation;

B. A fine of up to $10,000 for each subsequent violation.

16.60.060 Disclosure.

For all sales of biodiesel blended products by fuel distributors inside the City of Portland, the distributor must provide a bill of lading or shipping manifest disclosing biodiesel content, stating volume percentage, gallons of biodiesel per gallons diesel base stock, or an ASTM “Bxx” designation where “xx” denotes the volume percent biodiesel included in the blended product.

16.60.070 Additional Regulations.

A. The Bureau of Development Services is authorized to promulgate administrative rules and take other actions reasonable and necessary to enforce this code.

Overview
Sections of the urban development element of the Comprehensive Plan relevant to peak oil are excerpted below. These policies are closely tied to the transportation element and describe how land use patterns should reflect connections to transit and reduce vehicle miles traveled.

Portland Comprehensive Plan

2.11 Commercial Centers

Expand the role of major established commercial centers which are well served by transit. Strengthen these centers with retail, office, service and labor-intensive industrial activities which are compatible with the surrounding area. Encourage the retention of existing medium and high density apartment zoning adjacent to these centers.

2.15 Living Closer to Work

Locate greater residential densities near major employment centers, including Metro-designated regional and town centers, to reduce vehicle miles traveled per capita and maintain air quality. Locate affordable housing close to employment centers. Encourage home-based work where the nature of the work is not disruptive to the neighborhood.

Food

Overview
In 2002 Portland City Council and the County Board of Commissioners adopted resolutions to establish the Portland/Multnomah Food Policy Council (FPC). The City and County recognized that issues of food production and distribution significantly affect public health, land use, economy and quality of life. The Council was formed due to the acknowledgement that there was no existing agency or body of government dedicated to addressing the implications of local government policy, programs, operations and land use rulings on the local food system.

The FPC was charged with providing ongoing advice and input to City and County staff on food related issues and options for improving local land use polices related to food production, distribution and methods for building regional demand for locally produced foods and food products. While neither the Resolution nor the FPC's Governing Principles explicitly call out the impacts of peak oil on local food production and distribution, it is implicit to their charge.

Food Policy Council Governing Principles

Embedded within the Governing Principles are the following binding action items for the City of Portland and Multnomah County that will be relevant to developing policy to mitigate impacts of increasing costs and availability of fuel and petrochemicals.

1) Support an economically viable and environmentally and socially sustainable local food system;
2) Enhance the viability of regional farms by ensuring the stability of the agricultural land base and infrastructure and strengthening economic and social linkages between urban consumers and rural producers;
3) Ensure ready access to quality grocery stores, food service operations and other food delivery systems;
4) Promote the availability of a variety of foods at a reasonable cost;
5) Promote and maintain legitimate confidence in the quality and safety of foods available; and
6) Promote easy access to understandable and accurate information about food and nutrition.

Currently the FPC has several key projects that are addressing areas that are relevant to the peak oil discussion. The Diggable City project is an inventory of public lands to find space for small scale agriculture within the metropolitan area. The goal of this project is to provide access to agriculture within the urban center that could include education, community gardens, Community Supported Agriculture and low-income farming. Other main interests of the FPC are a Schools and Institutions Purchasing program with local

growers and suppliers to encourage institutions to develop polices to source foods and food products locally and making sure that regional food production, distribution, access and affordability become part of long-term planning within the City of Portland's Vision PDX, Metro's New Look and the State of Oregon's Big Look projects. Peak oil will be a significant impetus for the promotion of local food production.

Housing

Overview
Sections of the housing element of the Comprehensive Plan relevant to peak oil are excerpted below. These policies describe how the city will support housing pattens that increase transit ridership and protect vulnerable populations.

Portland Comprehensive Plan

4.3 Sustainable Housing

Encourage housing that supports sustainable development patterns by promoting the efficient use of land, conservation of natural resources, easy access to public transit and other efficient modes of transportation, easy access to services and parks, resource efficient design and construction, and the use of renewable energy resources.

Objectives:

a) Place new residential developments at locations that increase potential ridership on the regional transit system and support the Central City as the region's employment and cultural center.
b) Establish development patterns that combine residential with other compatible uses in mixed-use areas such as the Central City, Gateway Regional Center, Station Communities, Town Centers, Main Streets, and Corridors.
c) Encourage the development of housing at transit-supportive densities near transit streets, especially where parks or schools are present, to ensure that the benefits of the public's investment in those facilities are available to as many households as possible.
d) Foster flexibility in the division of land and the siting of buildings, and other improvements to reduce new development's impacts on environmentally sensitive areas.
e) Use resource efficient technologies and materials in housing construction that increase the useful life of new and existing housing.

4.13 Humble Housing

Ensure that there are opportunities for development of small homes with basic amenities to ensure housing opportunities for low-income households, members of protected classes, households with children, and households supportive of reduced resource consumption.

Objectives:

a) Ensure that regulations facilitate the option of development of small homes.
b) Reduce barriers to the development and finance of small homes.

Building Energy Use

Overview
The City of Portland created its first energy policy over 25 years ago with the 1979 Energy Policy. This policy was integrated into the Portland Comprehensive Plan as goals for increasing energy efficiency and renewable energy production. The policy was revised in 1990 with goals to be achieved by 2000. The Energy Policy was later complemented by the 1993 Carbon Dioxide Reduction Strategy to address the issue of global warming and establishing a reduction target of 20 percent below 1990 emissions by 2010. Both the CO_2 Strategy and the Energy Policy were replaced in 2001 with the current Local Action Plan on Global Warming, a joint effort of the City of Portland and Multnomah County.

The Plan directly addresses cutting emissions by setting goals for various sectors including energy efficiency in buildings and sourcing energy for electricity from renewable resources.

Sections B and D are reproduced below, which address energy efficiency in buildings and renewable energy respectively.

Local Action Plan on Global Warming: Section B. Energy Efficiency in Buildings

Objective 1: Reduce greenhouse gas emissions from City of Portland and Multnomah County facilities to 10 percent below 1990 levels by 2010 through energy-efficiency measures.

Government Actions

2003

1) Invest in all energy-efficiency measures with simple paybacks of 10 years or less.
2) Develop and adopt energy- and resource-efficient building standards for all City and County new construction and major renovation projects.
3) Establish City and County policies to purchase ENERGY STAR® or equivalent products, when available, for any equipment that uses electricity, natural gas, or fuel oil.
4) Require all City and County construction projects to exceed energy code by 20 percent on new construction and 10 percent on retrofits.

2010

5) Convert traffic signals to LED technologies.
6) Improve energy efficiency in City and County facilities by 10 percent.
7) Invest in building commissioning for new City and County facilities and retrocomissioning for facilities larger than 25,000 square feet.

8) Convert street lights and traffic signals to more efficient technologies as they become available.

Objective 2 Reduce forecast greenhouse gas emissions in the residential sector by 10 percent by 2010.

Community Initiatives

2003

1) Weatherize 250 homes occupied by low-income households through the City's Block-By-Block program and 500 homes through the County's weatherization program.
2) Facilitate the installation of energy-conservation measures in 3,500 multi-family units.
3) Support the implementation of local residential energy-conservation programs funded through the electricity system benefits charge or utility funds.
4) Implement neighborhood-based outreach efforts to combine and promote energy and water conservation, solid waste reduction, safety, and livability.
5) Require green building and energy-efficiency measures, including ENERGY STAR® or equivalent appliances, lighting, and heating equipment in City-funded affordable housing and other development projects.
6) Support residential conservation programs through new agreements in franchises with local utilities.

2010

7) Provide green building design assistance and technical resources to Portland residential developers, designers, homebuilders, and residents. Impact at least 5,000 new units or major remodels.
8) Work with Community Action Programs to weatherize 10,000 low-income homes in Multnomah County.
9) Weatherize 1,250 homes occupied by low-income households through the City's Block-By-Block program and 2,500 homes through the County's weatherization program.
10) Facilitate the installation of energy-conservation measures in 15,000 multi-family units by 2010.
11) Work closely with the Northwest Energy Efficiency Alliance to promote local access to household resource-efficiency products.
12) Improve the maintenance of residential heating, ventilation, and air conditioning equipment by educating consumers and schoolchildren.
13) Work with the state and other partners to offer financing for the purchase of high-efficiency furnaces, heat pumps, air-conditioning systems, replacement windows, insulation, water heaters, appliances, and other large energy-using systems.
14) Promote energy-efficient construction and renovation of attached single- and multi-family dwelling units, including accessory units.
15) Broaden standard residential energy audits to include review of major appliances, education of residents, and direct installation of efficient lighting and water-saving devices.

16) Improve the efficiency, effectiveness, and control of residential outdoor lighting through regional efforts and retail promotions.
17) Develop a consortium of local and state support for more stringent federal efficiency standards for furnaces, refrigerators, water heaters, air conditioners, other appliances, and lighting products.
18) Explore requiring weatherization of residential properties at time of sale. Bring properties up to the 1992 code, at a minimum.

Objective 3 Cut forecast greenhouse gas emission in the commercial, industrial, public, and non-profit sectors by 10 percent by 2010.

Community Initiatives

2003

1) Work with the 100 largest local business, industrial, and institutional energy consumers to establish and meet energy-efficiency and greenhouse gas-reduction targets.
2) Actively promote the implementation of local commercial and industrial energy-conservation programs funded through the electricity system benefits charge or utility funds.
3) Provide green building design assistance and technical resources to Portland developers, designers, and builders. Develop local standards for green buildings and help local buildings meet national energy-efficiency and green building standards such as LEED™, ENERGY STAR®, and Earth Advantage®. Impact at least 10 million square feet of commercial and institutional space by 2010.
4) Facilitate the use of energy-service performance contracts, when appropriate, by businesses, government, and non-profit agencies.
5) Reduce heating and cooling loads by promoting light-colored roofs and paving materials, planting trees, and increasing vegetative cover.
6) Support amendments to the State Business Energy Tax Credit and State Energy Loan Program to encourage green building practices and make the tax credit more accessible to organizations.

2010

7) Help small businesses, non-profit organizations, and public agencies gain access to energy efficiency services.
8) Promote opportunities to improve operations and maintenance practices in local buildings, including resource-conservation managers.
9) Continue to advocate strengthening the Oregon state building code to include all cost-effective energy-efficiency measures.
10) Work with industry to identify opportunities to improve energy efficiency in process applications, including waste-heat recovery for cogeneration.
11) Support the establishment of a City energy plans examiner and a required field inspection of energy systems, with technical consultation available at the planning stage.
12) Develop guidelines for the installation of combustion distributed generation systems to facilitate low-cost interconnection and encourage increased efficiencies.

13) Support small business conservation programs through new agreements in utility franchises.
14) Investigate sliding-scale building permit fees with rebates for high performance green buildings and higher fees for conventional buildings.

Local Action Plan on Global Warming: Section D: Renewable Energy Resources

Objective: Acquire 170 average megawatts of new renewable energy resources by 2010.

Government Actions

2003

1) Purchase 10 percent of City government electricity load from new renewable resources by 2003.

2010

2) Purchase 100 percent of City government electricity load from new renewable resources.
3) Fully develop the generation potential of anaerobic digester gas produced at the City's wastewater treatment plant.
4) Install solar, geothermal, and other renewable energy applications at appropriate City and County facilities.
5) Explore cost-effective opportunities to invest directly in new larger-scale renewable projects like wind, photovoltaic, geothermal, and landfill gas systems.

Community Initiatives

2003

1) Encourage residents and businesses to purchase at least 10 percent of their electricity from new renewable sources by promoting green power as a community ethic.
2) Support the use of the electricity system benefits funding allocated to renewables to leverage the development of new renewable resources.

2010

3) Include renewable resource incentives or requirements in utility franchise agreements.
4) Promote a green-power purchase by aggregating public-sector entities.
5) Support the deployment of small-scale renewable energy systems in mobile applications.
6) Provide technical assistance to builders and developers to include solar water heaters and photovoltaics in rooftop and building-integrated systems.
7) Support code revisions that facilitate low-cost interconnection of photovoltaic and other renewable electricity systems.

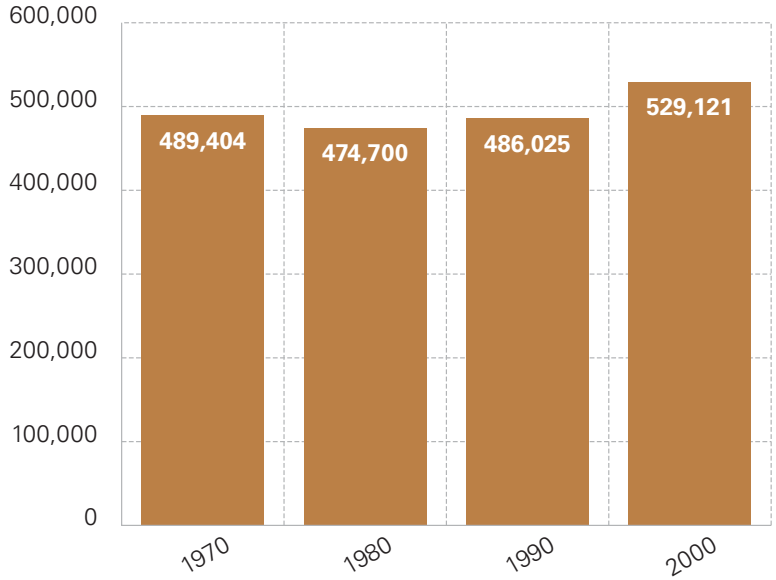
8) Support legislation requiring 20 percent of all power sold to rate-regulated customers be from new renewable resources.

The City of Portland has experienced consistent growth since the 1980s through annexations, migration, and natural growth.

The metropolitan area has gained nearly a million people since 1970.

Population Growth, 1970–2000

Source: U.S. Census



The graph shows Portland's population has grown through immigration and natural growth, as well as annexation, when the city boundaries are held constant using current 2000 city boundaries.

The following pages document a number of important trends in Portland and the region. These trends include: impressive population growth during the 1990s, the dramatic increase of Hispanic populations, the shift from family to nonfamily households within the city, the decline in the number of households with children, the overall decline in median household size, and the shift in the median age of residents in Portland neighborhoods. Also mapped is projected population growth for the region in the year 2020.

Population

After a consistent loss of population in the city during the post World War II decades, Portland has grown steadily since 1980 when tracking the population within the current boundaries of the city. The following map shows which areas of the region are gaining the most people and which areas lost population in the 1990s.

Since the 1970s, married family households have declined in both absolute numbers and as a percentage of population in the city.

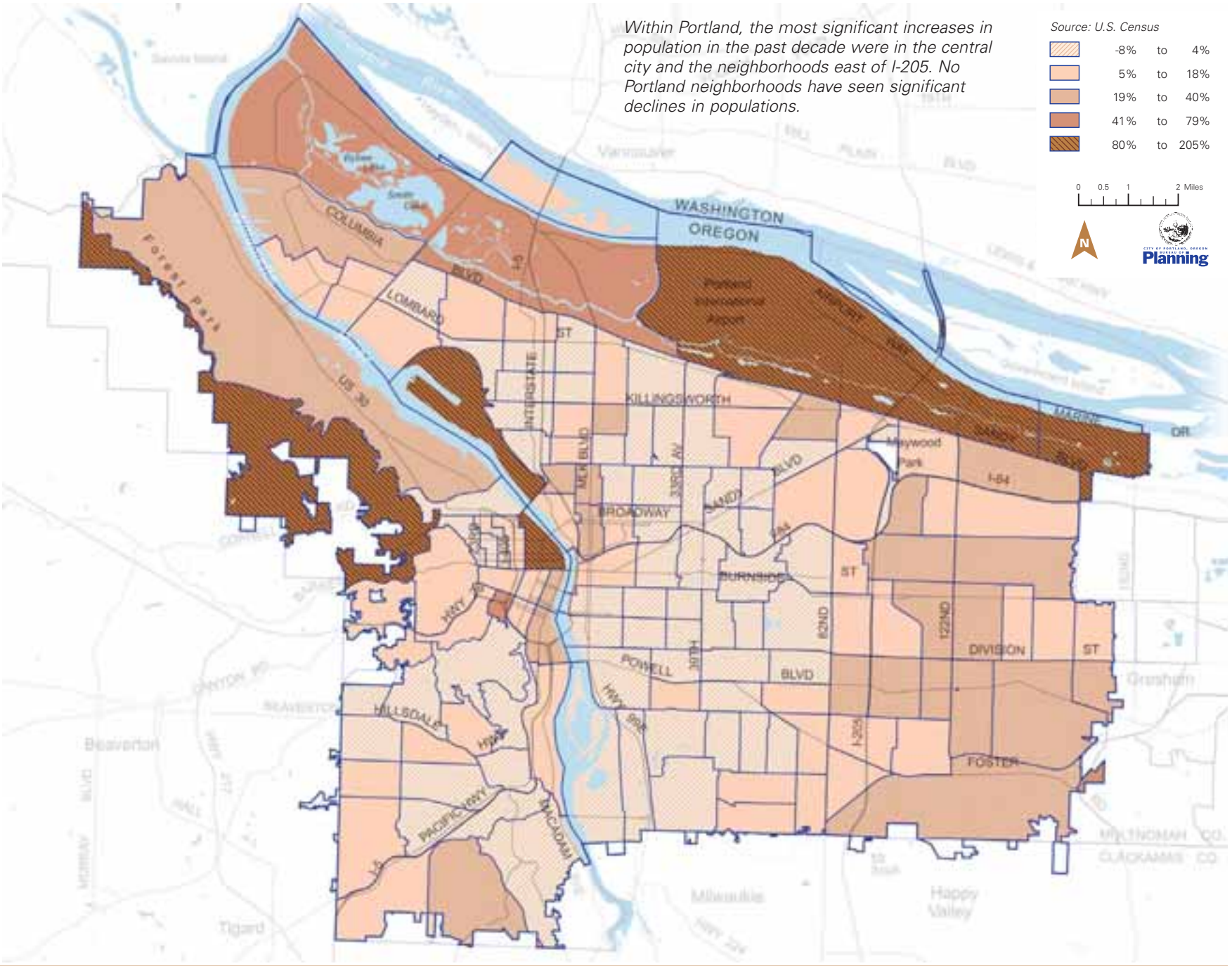
During the 1990s, Portland also experienced a significant change in population composition. Whites have declined slightly as a percentage of the population, and there was a large rate of increase in Hispanic and Asian households. The growth in Hispanic households dramatically exceeded estimates as shown in the charts on page 7. According to the Multnomah County Health Department, between 1990 and 2000 the number of births by Multnomah County resident Hispanics increased 242 percent (404 to 1,380), while the percentage of non-Hispanic Whites decreased 16 percent (7,595 to 6,375).

The average size of Portland households has also changed. Many inner city neighborhoods are declining in population. However, this decline is not a result of a decline in the number of housing units (stemming in the past from the demolition of older homes with little redevelopment), but is due to a long-standing decline in average household size. So, while household size is decreasing, the number of households is increasing.

Interestingly, several inner city neighborhoods have seen a decline in the percentage of families with school-aged children, but have also seen a decline in the overall median age of residents during the last ten years. This supports several findings that these neighborhoods have become attractive to young adults, single or married, who have delayed child rearing or have chosen not to have children. Elderly adults also make up a smaller share of these neighborhood residents, as many have retired to other communities.

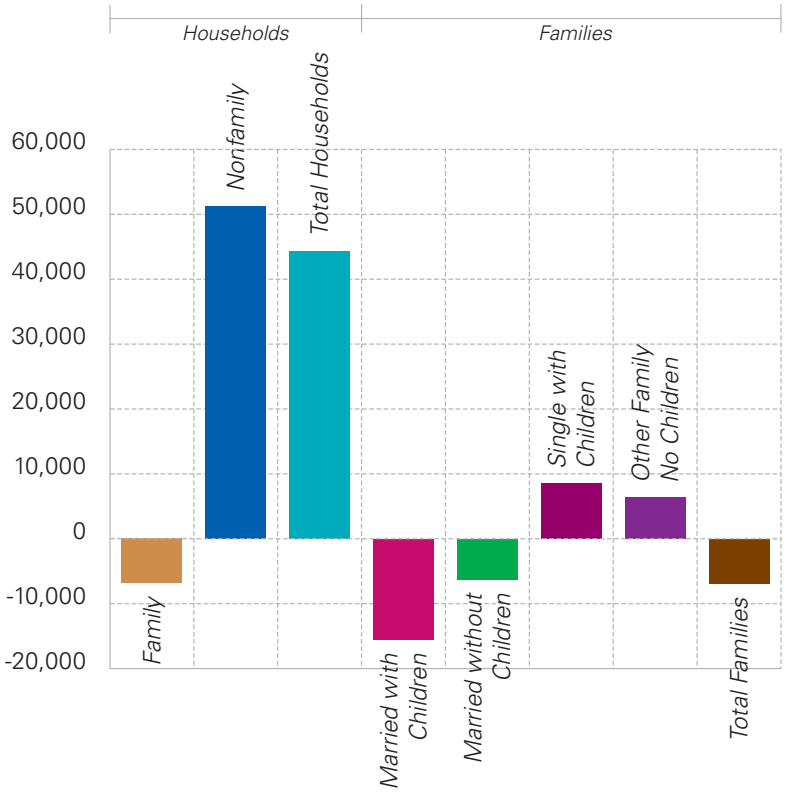
PERCENT CHANGE IN POPULATION BY CENSUS TRACT 1990–2000

Within Portland, the most significant increases in population in the past decade were in the central city and the neighborhoods east of I-205. No Portland neighborhoods have seen significant declines in populations.



Change in Families by Type, 1970–2000

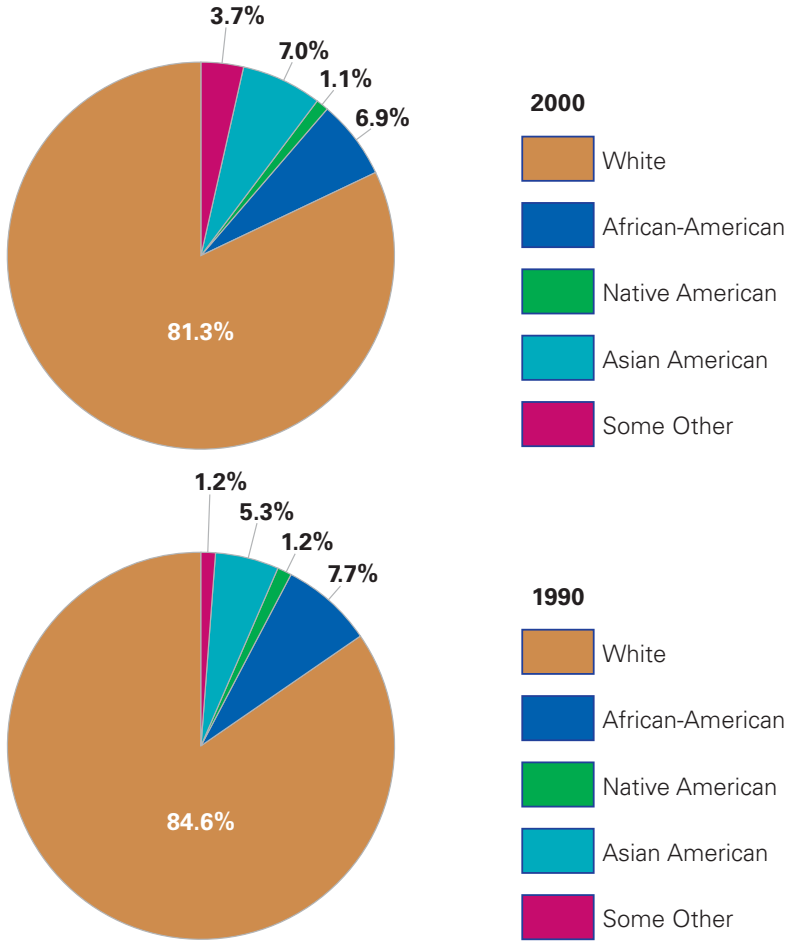
Source: U.S. Census



Between 1970 and 2000, married family households have experienced absolute declines in the city.

Population Composition

Source: U.S. Census



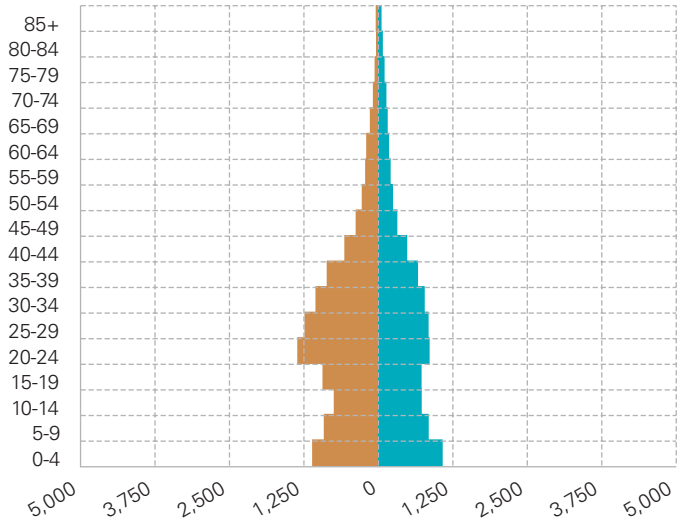
Change in Composition of Major Racial Groups.

The African-American population held steady while the Asian-American population experienced significant growth. The biggest news is the growth of the Hispanic population (see population chart on next page).

Multnomah County Hispanic Population, 1990–2000

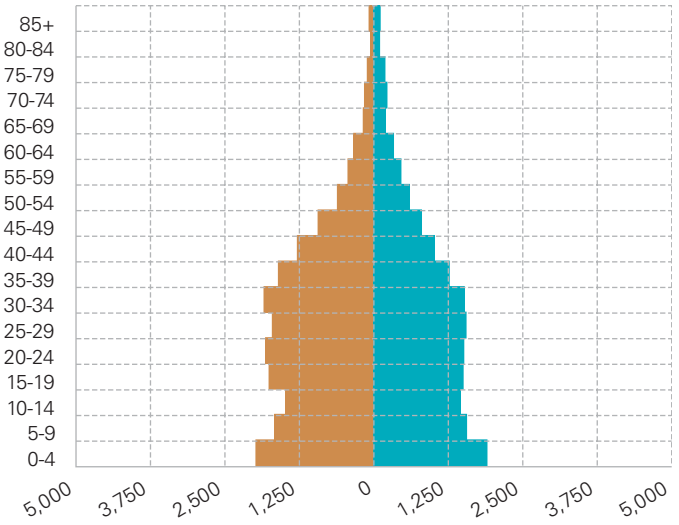
Source: U.S. Census

1990 Actual

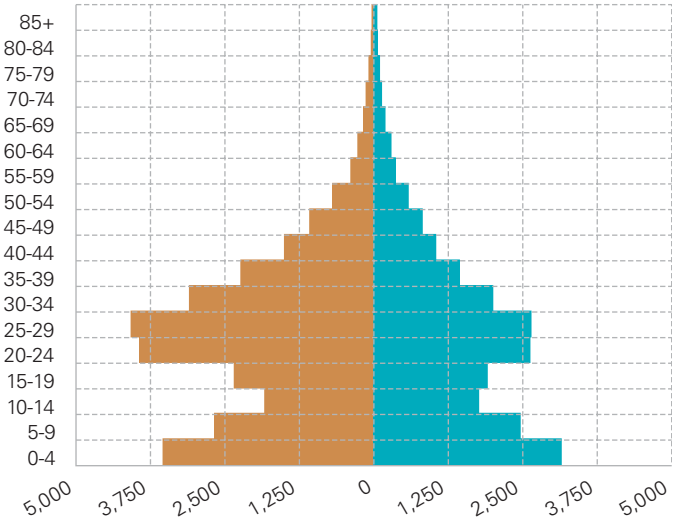


This chart shows the unexpected (and underestimated) increase in Hispanic households from 1990-2000.

1999 Estimated



2000 Actual



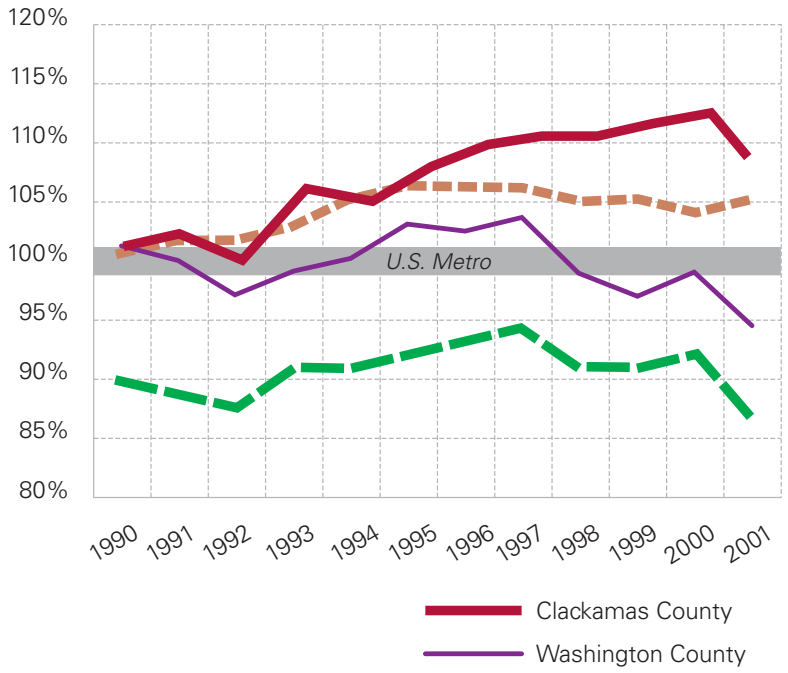
INCOME & POVERTY

As a result of economic expansion in the 1990s, the average personal income in Portland exceeded the national average. Despite this strong growth, the total number of people living in poverty increased in many Portland neighborhoods, particularly in east Multnomah County as well as in inner ring suburbs west and east of the city. Overall, however, the percentage of total city population living in households below the poverty line declined slightly from 14 percent in 1990 to 13 percent in 2000. Of more concern are the findings that a larger share of persons in poverty are made up of children under the age of 18.

City staff and members of the community identified a perceived shift in poverty from the north and northeast areas to farther east and southeast. The data do not support a physical shift in poverty; rather poverty is becoming more dispersed throughout the city and the metro area. Relative status (as measured by income) among various neighborhoods has not radically shifted.

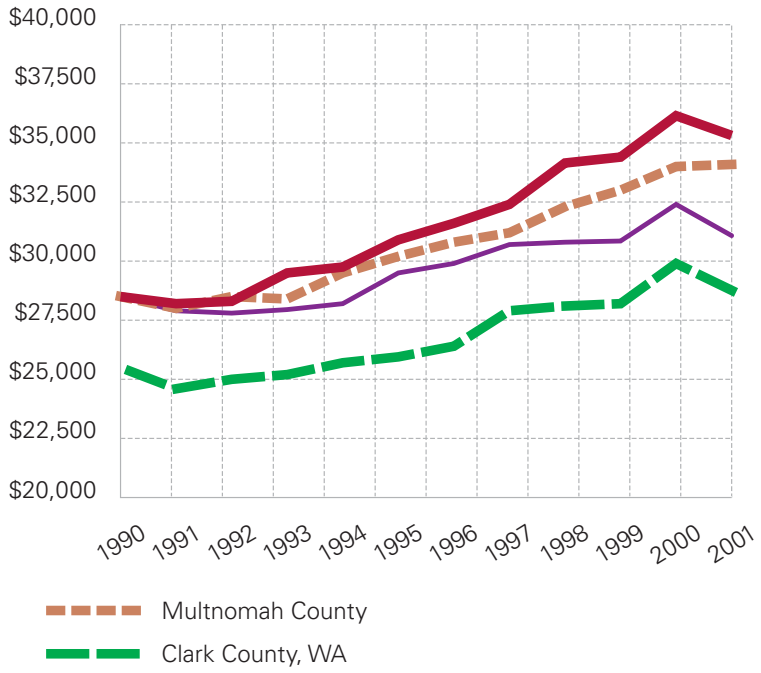
Per Capita Income

Regional County Comparisons as a percent of U.S. Metro Average
Source: U.S. Bureau of Economic Analysis



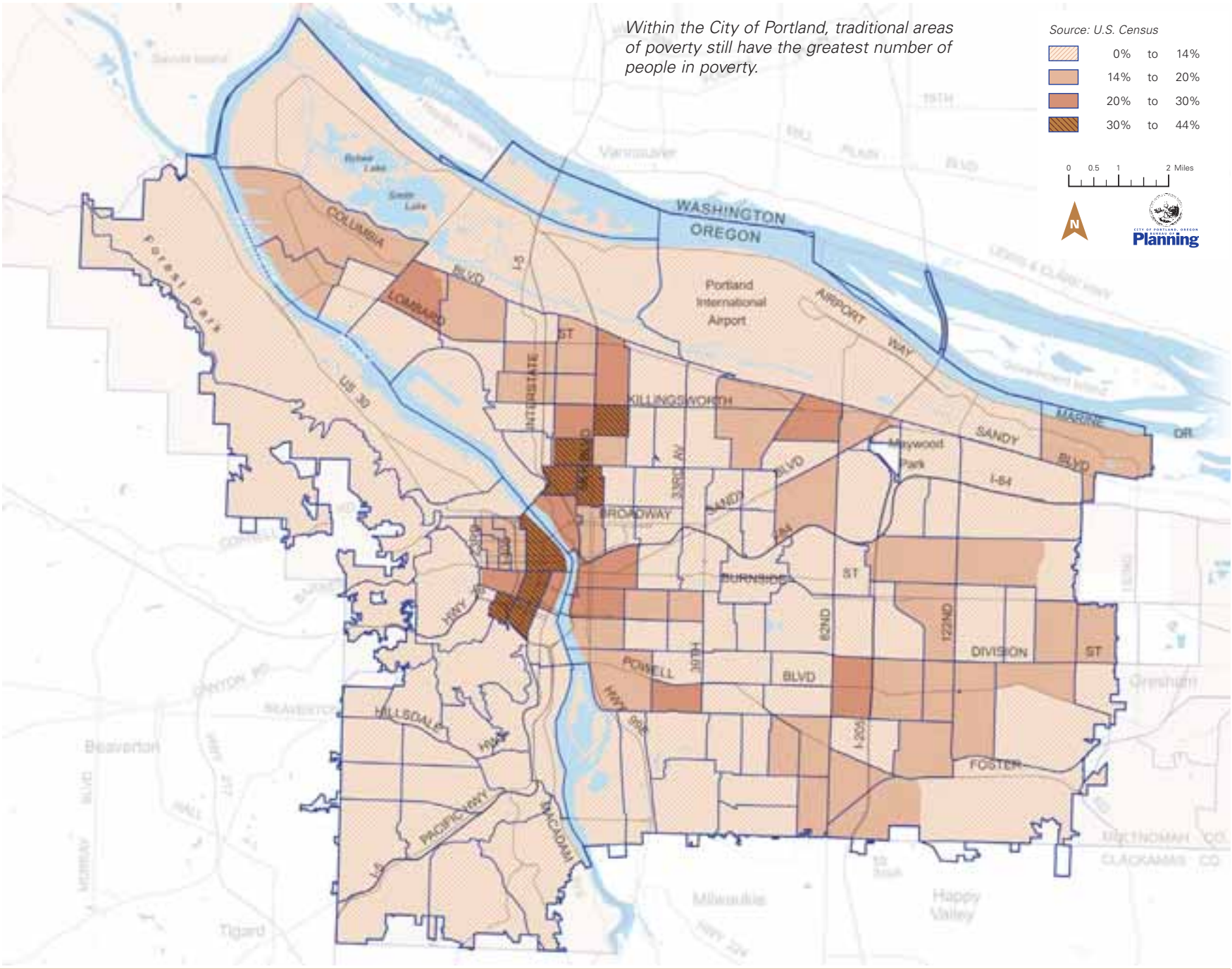
Per Capita Income

Regional County Comparisons
Source: U.S. Bureau of Economic Analysis



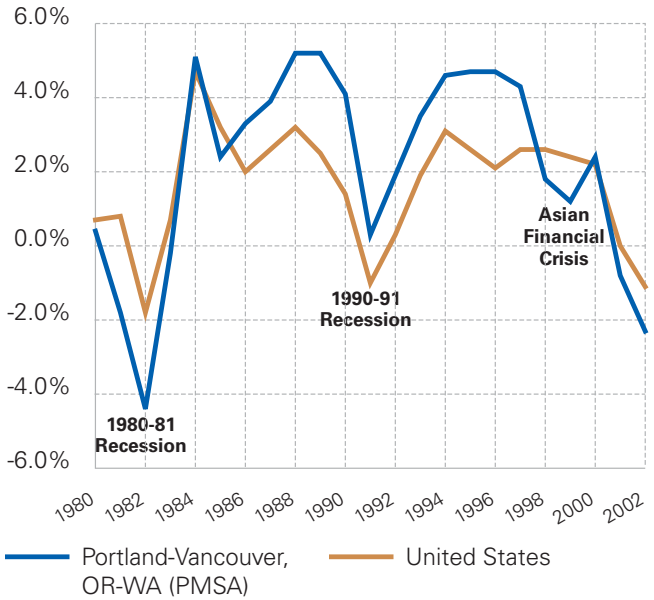
PERCENT OF PEOPLE BELOW POVERTY LEVEL BY CENSUS TRACT 2000

Within the City of Portland, traditional areas of poverty still have the greatest number of people in poverty.



Annual Job Growth Rates: Portland Primary Metropolitan Statistical Area (PMSA) and U.S., 1980–2002

Source: Oregon Employment Department



As measured by the *Wall Street Journal,* the Portland metropolitan region has the 23rd largest economy in the U.S. — $88.6 billion.

In the 1990s, economic growth in the region exceeded the national average in most sectors.

Manufacturing accounted for a significant portion of the region's growth, providing high-wage jobs but resulting in a more volatile regional economy.

The distribution of goods, the information industry, and finance sectors are well established in Portland.

The following pages document selected trends in the city, regional, state, and national economy. Included is an attempt to measure how innovative the region is by — reporting on patent activity, comparing city job growth relative to suburban job growth, analyzing potential industries of the future, and illustrating the global dependence of Portland's economy.

Job Growth

Since 1970, the region experienced strong growth in employment within all sectors of the economy. In the 1990s, manufacturing declined in the nation, but the Portland region experienced more than a 25 percent gain in employment in the manufacturing sector. In the past, the region's diversity among sectors has provided insulation against the most cyclical extremes of the national economy. In the 1990s, the region was more subject to national trends as shown in the comparison of economic cycles between Portland and the nation. The annual job growth rate chart on page 23 also illustrates that Portland's economy is closely tied to the national economy.

Patents

The Portland region more than doubled the number of patents issued during the 1990s. The region ranks in the top 30 metropolitan areas for patents, but pales in comparison to the large research centers in San Jose, Boston, and Chicago.

Where Portland Stands

During the prosperous 1990s, the City invested considerable resources in public infrastructure, including public transit improvements, street repairs, parks and open space purchases, and library construction and renovations. Many of these improvements were funded by general fund surpluses, tax increment financing, federal grants and special purpose levies passed by Portlanders.

However, the current economy highlights many vulnerabilities. Portland has continued to lose headquarter status of many national companies. The increasing share of manufacturing jobs has made Portland more susceptible to a cyclical economy. The lack of a top tier research university directs much public and private funding elsewhere.

According to the latest in a series of reports by the St. Louis East-Gateway Coordinating Council, which measures the relative political, social, and economic well being of 34 of the nation's largest metropolitan areas, the Portland regional economy exhibits an uneven performance in terms of statistical rankings during the late 1990s.

Portland scores high:

- Manufacturing job growth (7th)
- Unemployment rate (5th)
- African-American owned businesses (2nd)
- Women owned businesses (6th)

Portland scores in the middle:

- Overall job growth (16th)
- New Economy Index (14th)
- Number of patents issued (17th)
- Gross value of exported goods (10th)

Portland scores low:

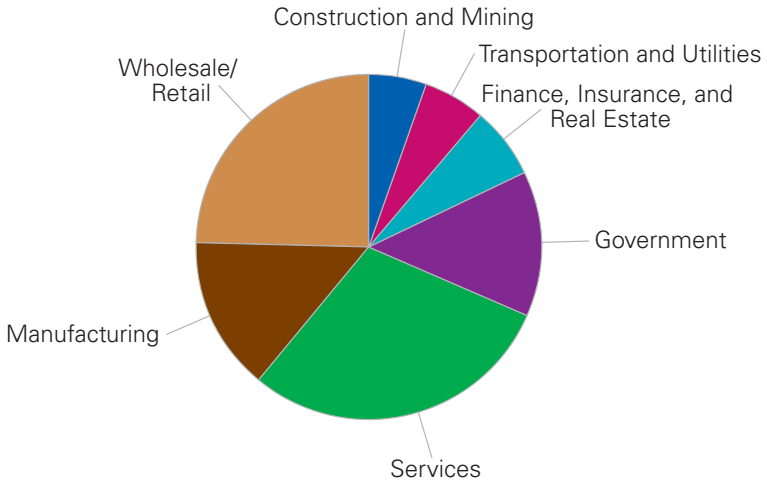
- Average earnings per job (31st)

Comparisons among 34 metropolitan areas

- Ranked 16th in percent increase in job growth from 1996–2000
- Ranked 7th in percent increase in manufacturing employment 1996–2000
- Ranked 31 in earnings per job (average in dollars) 1999
- Ranked 5th in average unemployment rate 1997–2001
- Ranked 11th in growth in business establishments (percentage change) 1996–1999
- Ranked 2nd in firms owned by African-Americans (per 100,000 African-Americans) 1997
- Ranked 6th in firms owned by women (per 100,000 women) 1997
- Ranked 30th in growth in gross metropolitan product (percent change per capita) 1997–2000
- Ranked 28th in gross metropolitan product (per capita in dollars) 2000
- Ranked 18th in ratio of bank loans to deposits 2001
- Ranked 17th in number of utility patents granted 1999
- Ranked 10th in foreign export of goods (in millions of dollars) 1999
- Ranked 14th in New Economy Index 2001

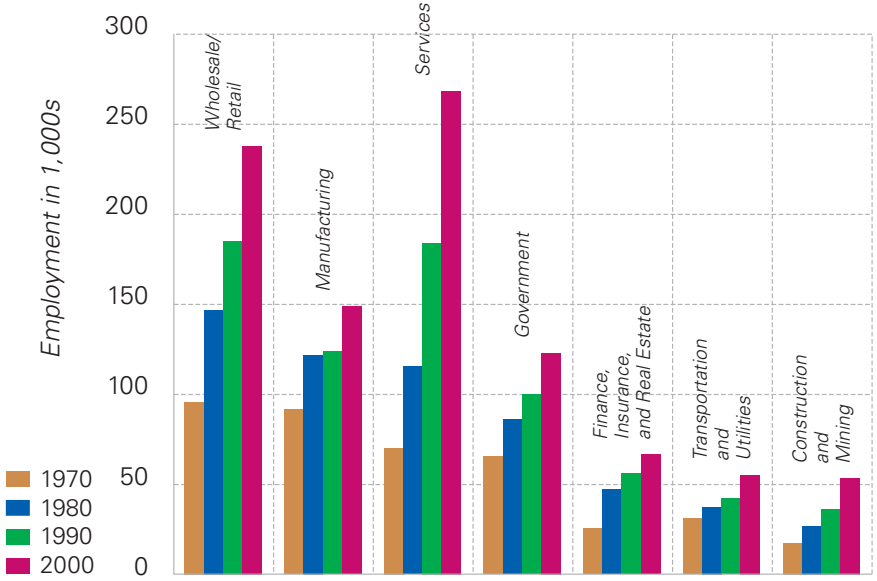
Employment by Industry, 2002

Source: Oregon Employment Department



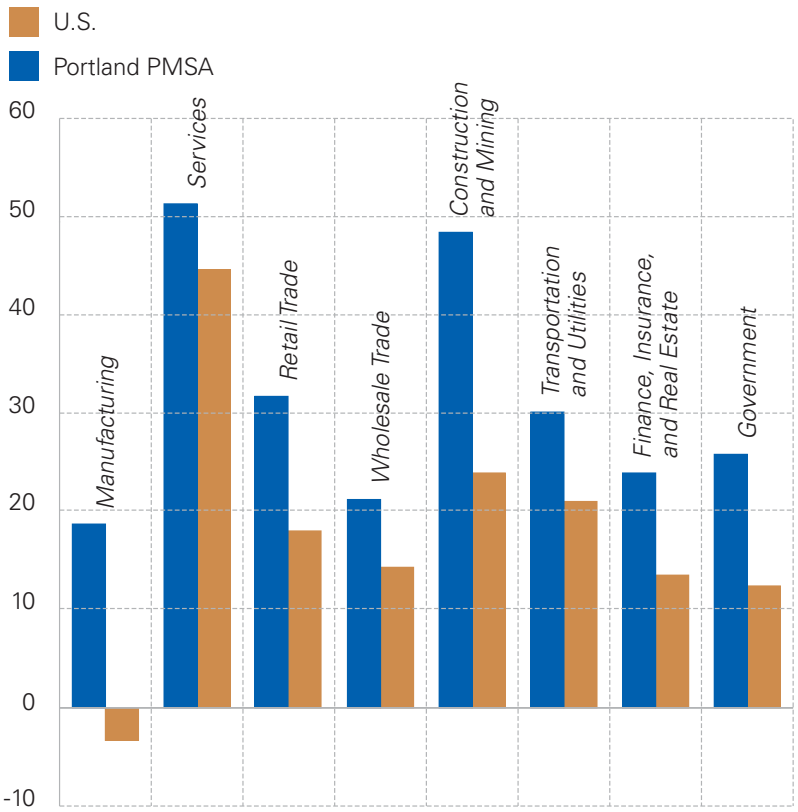
Employment by Industry, 1970–2000

Source: Oregon Employment Department



Employment Growth by Industry 1990–2000

Source: Oregon Employment Department

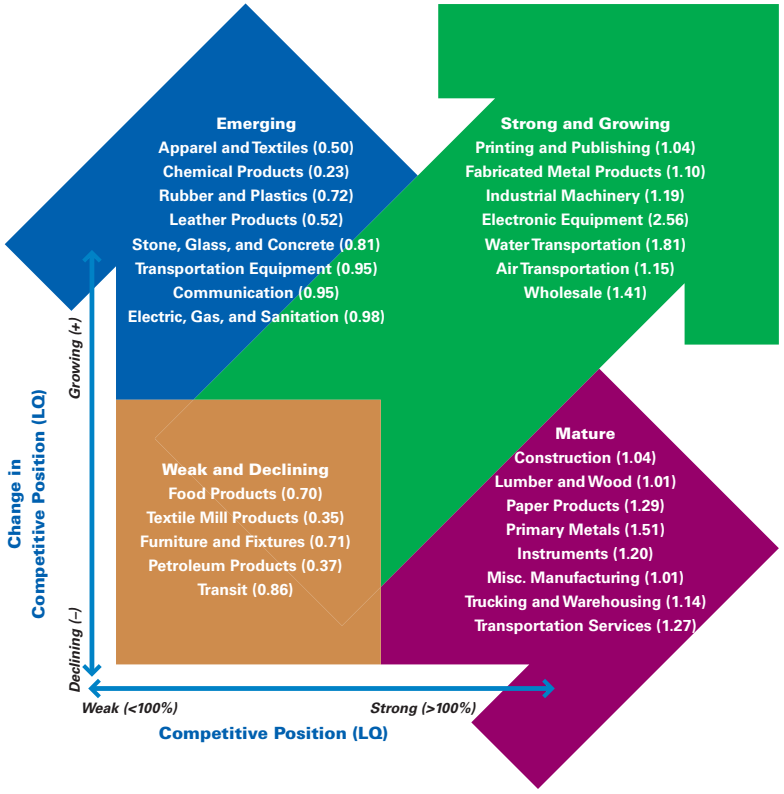


PMSA includes the cities of Portland and Vancouver (Clackamas, Clark, Columbia, Yamhill, Multnomah, and Washington Counties)

Potential Growth Clusters

Source: Portland Harbor Lands Study

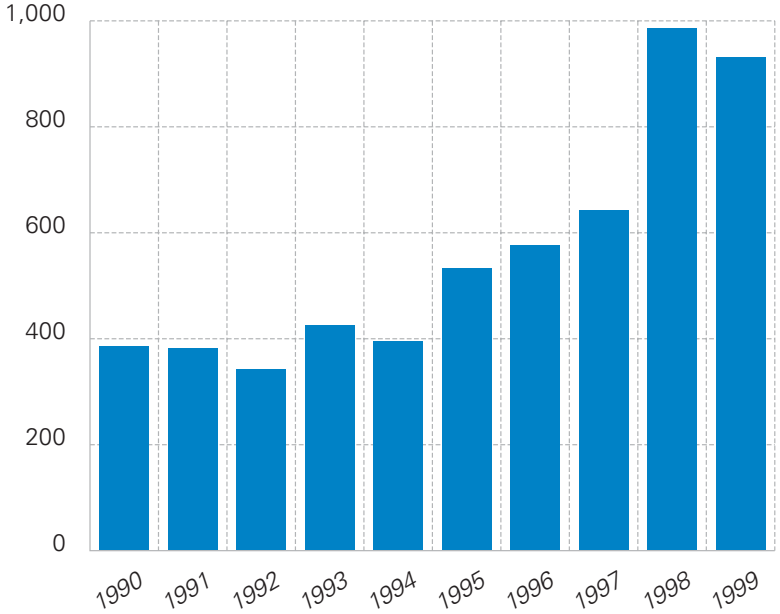
Cluster analysis identifies economic sectors at varying stages of their "life spans" and helps determine which industries to nurture as future job generators.



Patents Issued: Portland-Vancouver PMSA

Source: U.S. Patent and Trademark Office

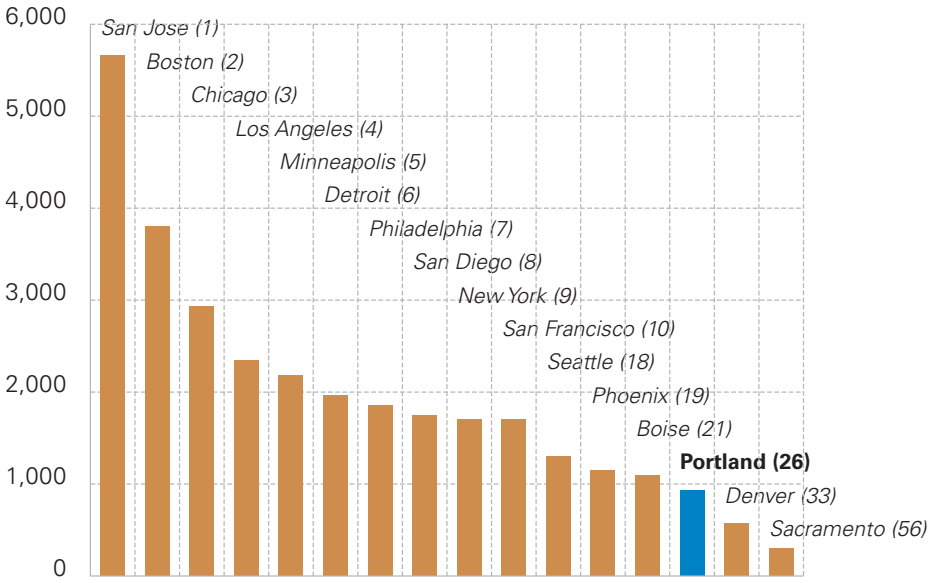
During the last ten years, the number of local patents issued more than doubled.



Ranking of Selected Cities by Patents Issued, 1999

Source: U.S. Patent and Trademark Office

By 1999 Portland was among the top 30 metro areas, but still fell short of the country's major centers of inventive creativity.



Sources of Household Income: Various Areas, 2000

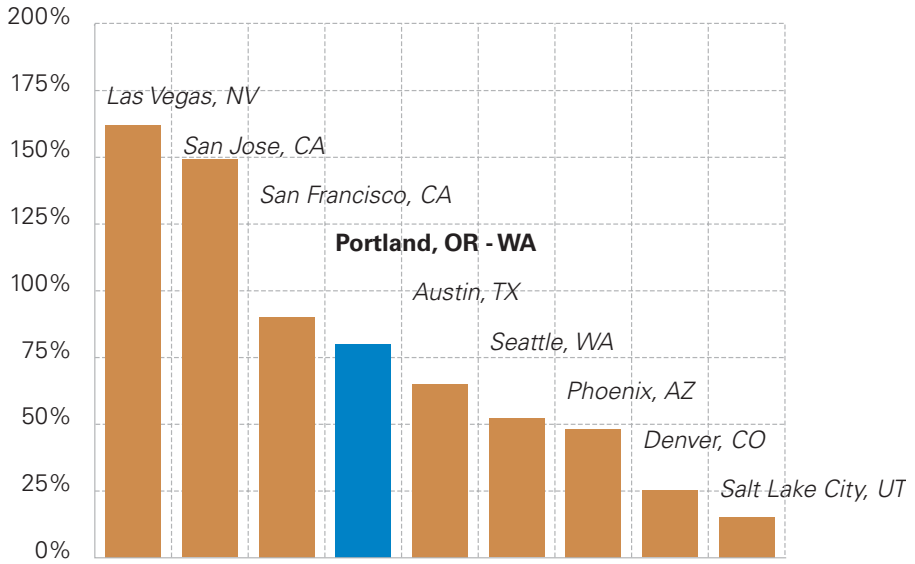
Source: U.S. Census

Percent of Households Receiving:	**Portland**	*Rest of the PMSA*	*Oregon*	*U.S.*
Wage, Salary and self-emplyment income	**82.9%**	84.2%	80.4%	81.1%
Social Security Retirement Benefits	**21.6%**	21.7%	26.8%	26.2%
Other Retirement Income	**13.2%**	15.5%	16.9%	16.9%
Supplemental Social Security	**3.5%**	2.3%	3.4%	3.8%
Cash Public Assistance	**2.7%**	1.9%	2.9%	2.6%
Food Stamp Benefits	**8.2%**	5.2%	8.1%	6.1%

About the same percentage of Portland residents receive welfare and food stamps as suburban residents. This is consistent with state and national trends.

City Job Growth Relative to Suburban Job Growth, 2000

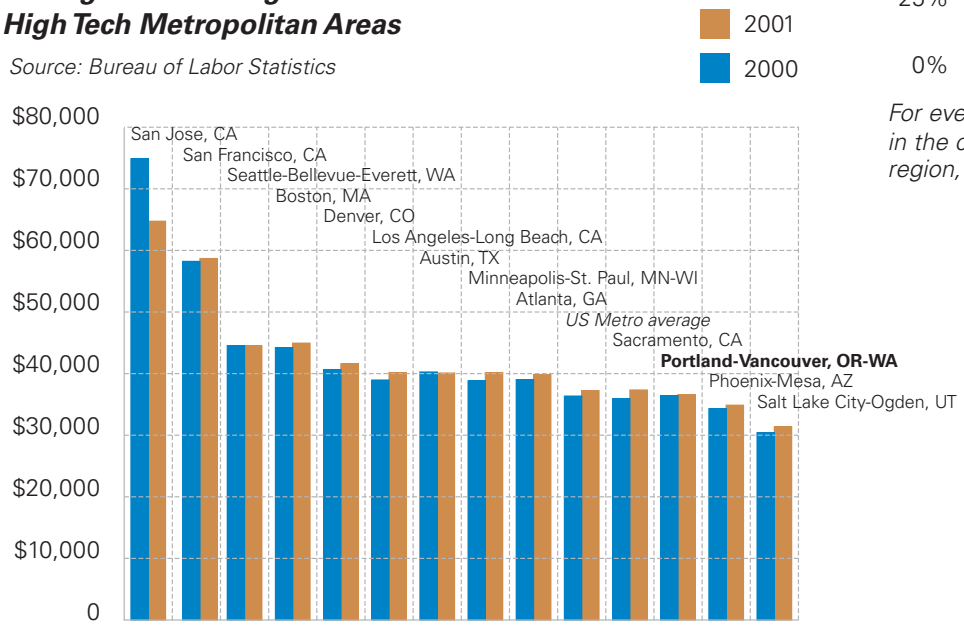
Source: New Economic Observatory



For every 100 jobs created in the suburbs, Portland gained roughly 75 new jobs in the city. While Portland is no longer the dominant center of job growth in the region, it remains a significant location for job growth.

Average Annual Wages: High Tech Metropolitan Areas

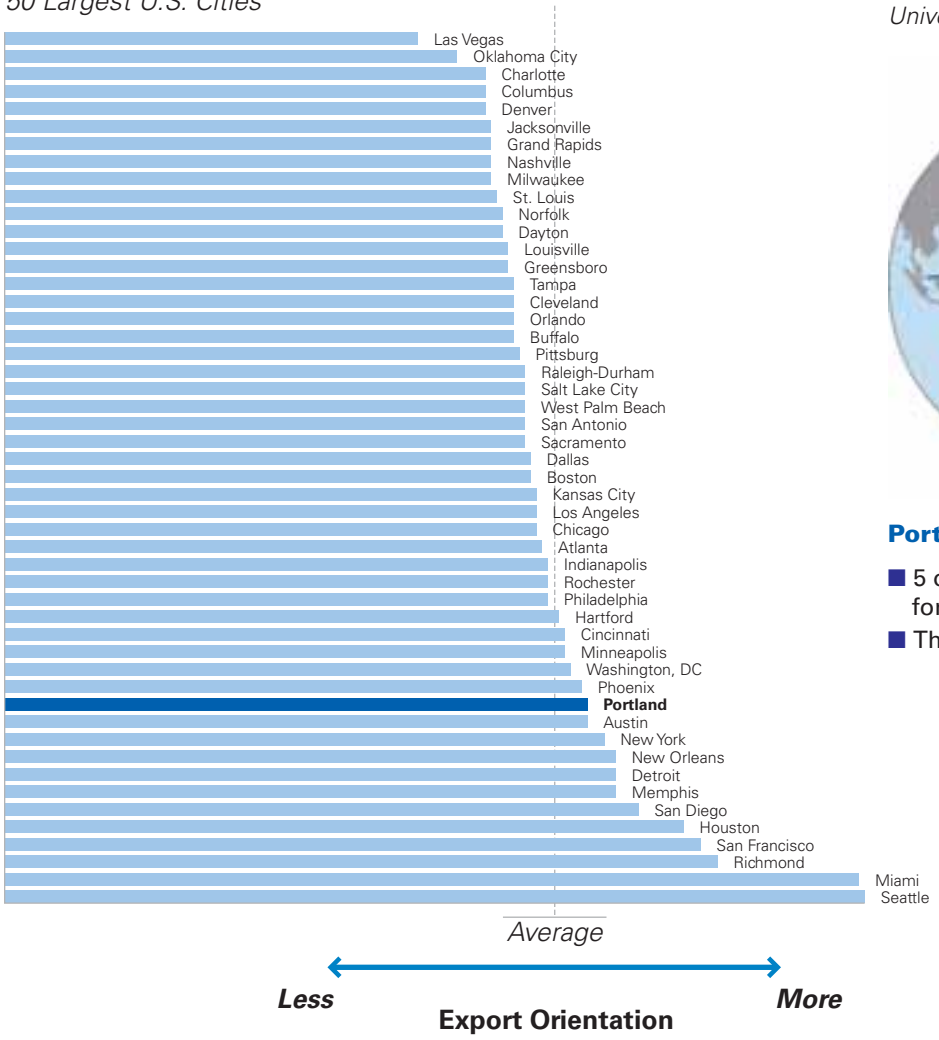
Source: Bureau of Labor Statistics



Portland's Economy is Globally Dependent

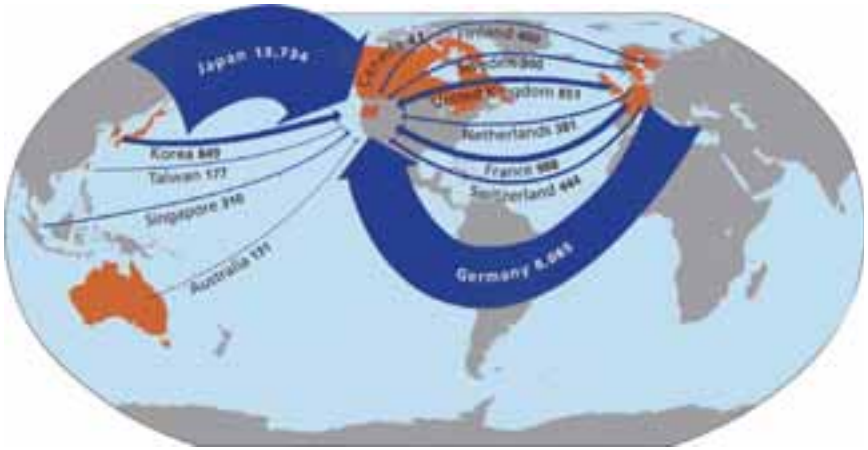
Source: Metropolitan New Economy Index, 2001

50 Largest U.S. Cities



Jobs in Oregon Provided by Foreign Owned Companies by Country, 2000

Source: Atlas of Oregon, 2nd Edition, Copyright 2001, University of Oregon Press.



Port Statistics

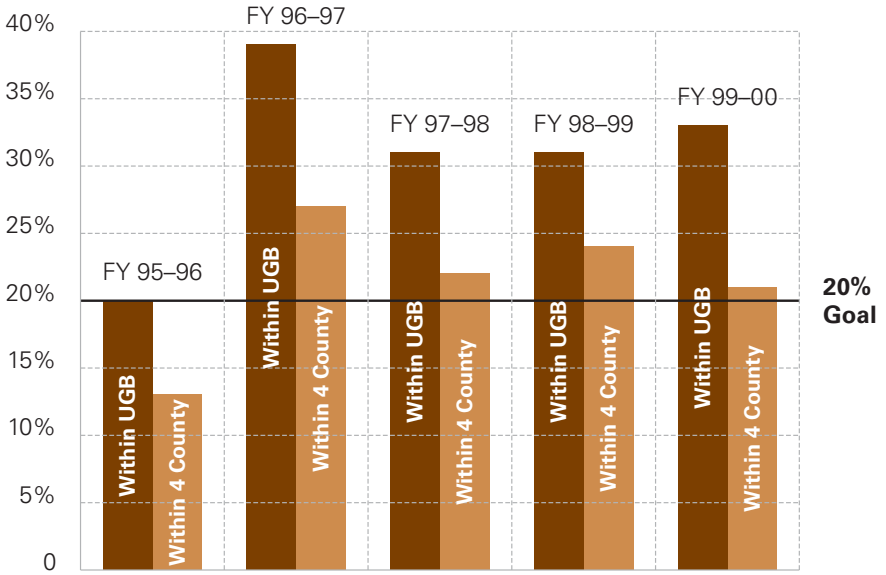
- 5 of 11 top international air origin and destination markets are in Mexico for 2002
- The top Oregon air export market is Japan in both value and weight

The graphic at left illustrates the extent to which the 50 largest U.S. metro areas' manufacturing workforce is employed producing goods for foreign export. The Portland region ranks high, in part due to the volume and value of high-tech exports produced there.

Portland achieved its regional housing production goals during the last half of the 1990s.

Percent of New Housing Units

Source: Metro Data Resource Center



During the mid 1990s, Portland adopted a goal to capture at least twenty percent of regional growth. As measured by the level of residential permit activity, the City has achieved that goal during the last half of the 1990s within those portions of the metro counties within the urban growth boundary.

GOALS

Providing affordable housing and opportunities for homeownership to residents are long term goals of the City. There is a goal to attract a respectable share of all new housing built in the region in an effort to stem the flight of new housing to the neighboring suburbs. The following pages provide evidence that Portland is making progress with these goals.

In the mid 1990s, City Council adopted a goal to capture at least 20 percent of regional growth. As measured by the level of residential permit activity, the City has achieved that goal during the last half of the 1990s within those portions of the metro counties within the urban growth boundary. But it may become more difficult to reach these goals as inner city development becomes more expensive and surrounding cities make expansion by annexation less likely.

Housing prices in the city have increased in the past decade with some census tracts experiencing over a 200 percent increase in median housing values. The good news is that no census tracts experienced a decline in housing values. While the increase in housing values is a concern for affordability and needs to be monitored, Portland is still considered affordable when compared to other West Coast cities. See the Arts and Culture section for a more detailed discussion.

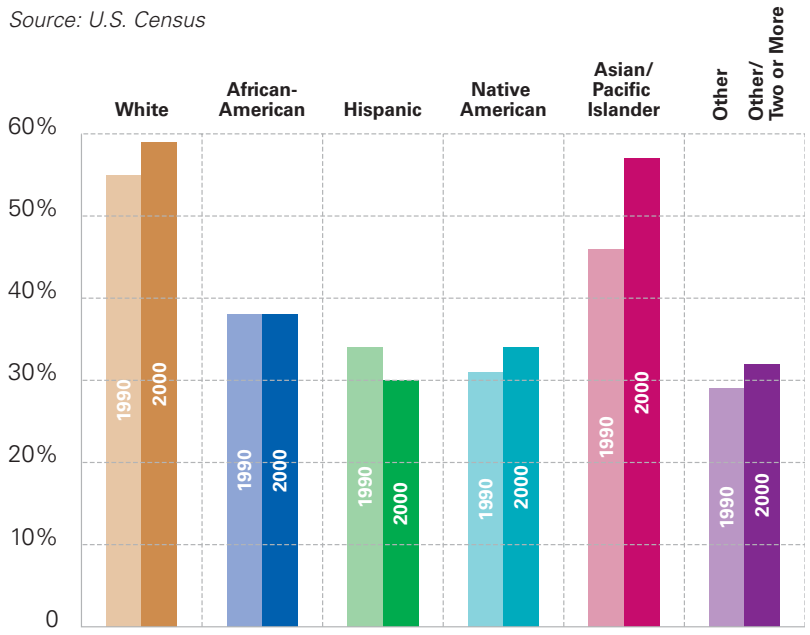
Portland had a citywide homeownership rate of 56 percent in 2000, up three percent since 1990. This is respectable progress when compared with other cities in the region, some of which showed a decline in homeownership rates. Portland's homeownership rate now exceeds that of some of its suburban neighbors for the first time since World War II.

Homeownership rates vary widely among racial and ethnic groups. Hispanics are the only major ethnic group showing a decrease in their homeownership rates. This is likely due to a large number of recent and "less established" immigrants (see the Population section for a more detailed discussion of the Hispanic population changes). Asian-American homeownership rates are approaching those of white households. The only minority not making significant gains in homeownership is African-Americans.

HOME OWNERSHIP

Home Ownership by Group

Source: U.S. Census



Ownership rates vary widely among racial and ethnic groups. By 2000, Whites and Asian/Pacific Islanders increased their ownership rates to slightly under 60%. There is a large gap between these two groups and all other groups, which are in the 30-40% percent range. The Hispanic homeownership rate actually declined over the decade, which may be the result of the rapid growth in Hispanic households and their younger than average age. African-American homeownership saw virtually no change. The Native American and Other/ Mixed groups saw modest increases in ownership rates, but not enough to close the gap with the highest ownership groups.

Home Ownership by Location

Source: U.S. Census

City	2000 Ownership Rate	Change from 1990 to 2000
Beaverton	48%	1%
Hillsboro	52%	-6%
Vancouver	53%	10%
Wilsonville	54%	-6%
Gresham	55%	-3%
Portland	**56%**	**3%**
Tigard	58%	1%
Milwaukie	60%	2%
Oregon City	60%	4%
Lake Oswego	71%	3%
West Linn	79%	0%

Portland's rate of homeownership has exceeded some of the larger suburban jurisdictions for the first time since WW II.

Portland owns some $14.7 billion dollars in infrastructure assets.

New segments of the regional light rail system and bicycle network were built, consistent with the region 2040 plan.

The City's program to eliminate Combined Sewer Overflows is complete for the Columbia Slough, and is over halfway complete for the Willamette River.

Evolving service standards and aging assets press on the City's capital budget.

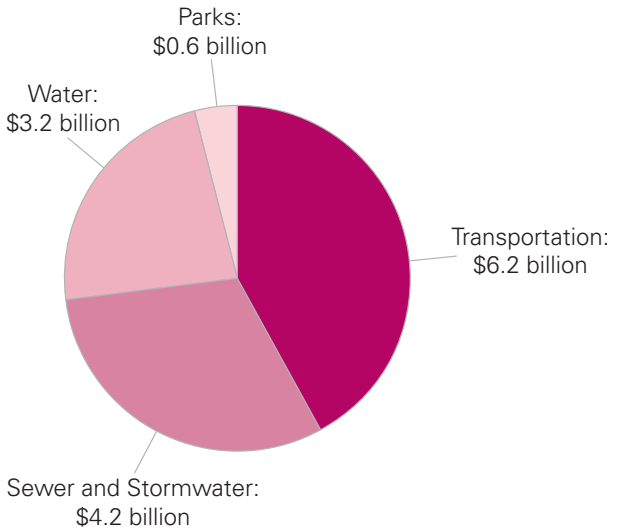
Portland is not keeping up with basic maintenance needs of transportation and park assets.

The City of Portland Provides a Full Range of Services.

- The City's water distribution system, fed by Bull Run water and backup groundwater from aquifers, serves over 140,000 homes and about 18,000 businesses. Another 300,000 people in 19 suburban cities and water districts receive City water through wholesale customer connections. Bull Run water was first delivered to Portland in 1895.
- The Bureau of Environmental Services (BES) owns and operates more than 2,200 miles of pipes and 93 pump stations that transport sewage to two treatment plants. BES provides sewer and stormwater drainage services to more than 500,000 people in an area that covers 85,000 acres (see p. 66 for a map of combined sewer areas in the city).
- Transportation assets include bridges, street lights, traffic signals, and street pavement to accommodate transit, bikes, and pedestrians, along with autos and trucks.
- Park and recreation facilities include community centers, swimming pools, playgrounds, sports fields, trails, and natural open space areas.
- The City also provides civic services, such as police, fire, emergency communications, and structured parking.

Taxpayer's Investment in Capital Assets

Source: City of Portland Capital Management Resource Team, 2002



Annual Funding Gap

The City is not adequately investing for capital maintenance. It is estimated that an extra $35 million annually is required to reach a sustainable level of maintenance. Two bureaus—Environmental Services and Water—report no annual funding gap based on forecasted rate increases and two bureaus—Parks and Transportation—report the largest annual funding gaps for capital maintenance. The assets in highest need are parks major buildings, street pavement, parks green infrastructure, parks furnishings, and traffic signals.

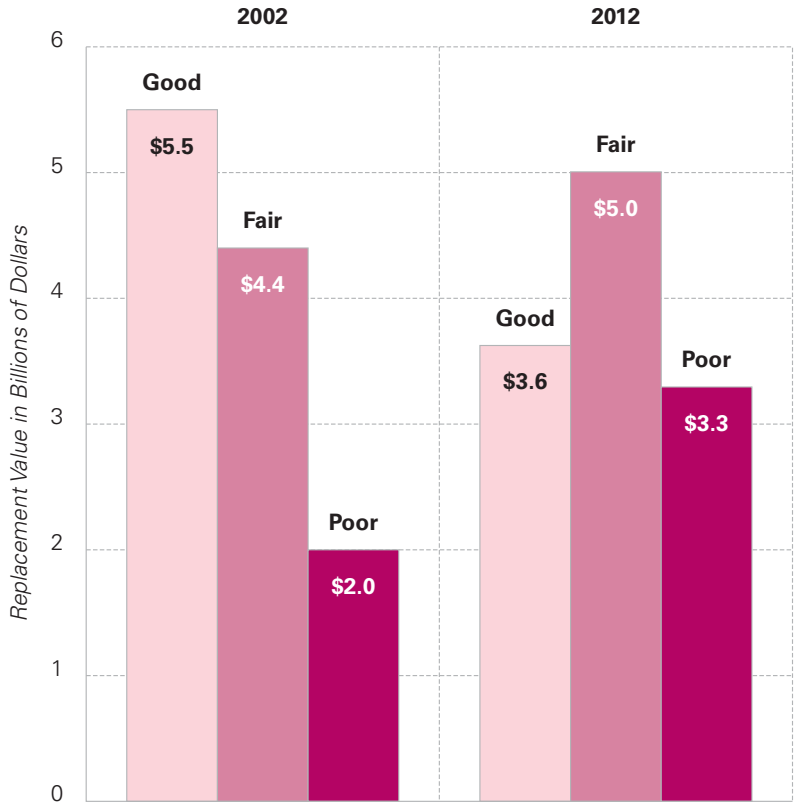
Existing and Future Conditions

- Currently, 46 percent of the capital assets are in good condition, 37 percent are in fair condition, and 17 percent are in poor condition.
- At current spending levels, in ten years there will be a shift out of good condition and a rise in poor condition. Close to $2 billion of assets may slip out of good condition, and over $1 billion of assets may drop into poor condition.

Infrastructure Investment Needs

Source: City of Portland Capital Management Resource Team, 2002

Current and Projected Replacement Values
(Condition not available for $2.8 billion of assets)

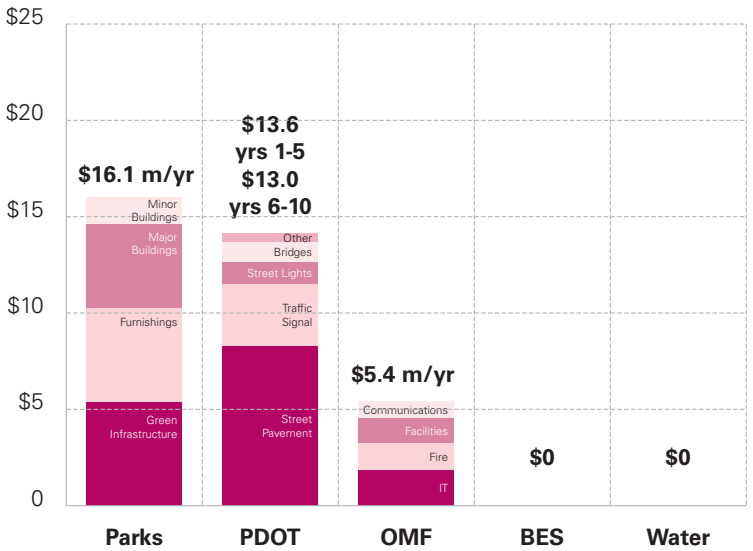


- A survey of conditions shows the most dramatic drop out of good condition for these assets:
  street lights (80 percent to 12 percent);
  streets (56 percent to 32 percent);
  water transmission (36 percent to 3 percent); and
  major parks buildings (30 percent to 3 percent).
- For transportation and parks assets, the maintenance backlog is growing. From 1980 to 2000, the street pavement backlog has grown 76 percent, from 285 to 502 miles. The preferred backlog goal is 250 miles.
- The longer it takes to repave streets or improve parks facilities, the higher the cost. For instance, it may cost four times as much to rebuild a street as to repave it. Some causes of this backlog are rising construction costs, shrinking revenues from the state gas tax, and limited General Fund allocations to capital maintenance.
- In addition, there are numerous streets not built to City standards and a number of planned or recommended bike and pedestrian paths that need funding for construction. The Bureau of Parks and Recreation is assessing residents' needs for park facilities and attempting to measure which areas are deficient in parks and parks facilities.

Current Funding Gap in Capital Maintenance in $ Millions

Source: City of Portland Capital Management Resource Team, 2002

Total Capital Maintenance Gap: $35



LIGHT RAIL, PEDESTRIAN, & BICYCLE NETWORKS

EASTSIDE MAX — 1986

WESTSIDE MAX — 1998

AIRPORT MAX — 2001

Progress in Transportation Infrastructure

The network of light rail has grown significantly since the first section of light rail opened from downtown Portland to Gresham in 1986. Since then a line was opened to Hillsboro in 1998, the airport in 2001, and the interstate line is expected by spring 2004. Each new addition has surpassed projected ridership. The maps show the progression of the network and a new line currently being planned for the I-205 corridor connecting Gateway Town Center and Clackamas Town Center.

The city and region are making progress in developing an extensive pedestrian and bike network. Since 1973, the bicycle network consisting of bike paths, bike lanes, and designated bike streets has increased significantly and gives Portland an enviable image as a bike friendly city.

BIKE NETWORK — 1973

BIKE NETWORK — 1983

INTERSTATE MAX — 2004

I-205 MAX — 2008

FUTURE MAX CORRIDORS

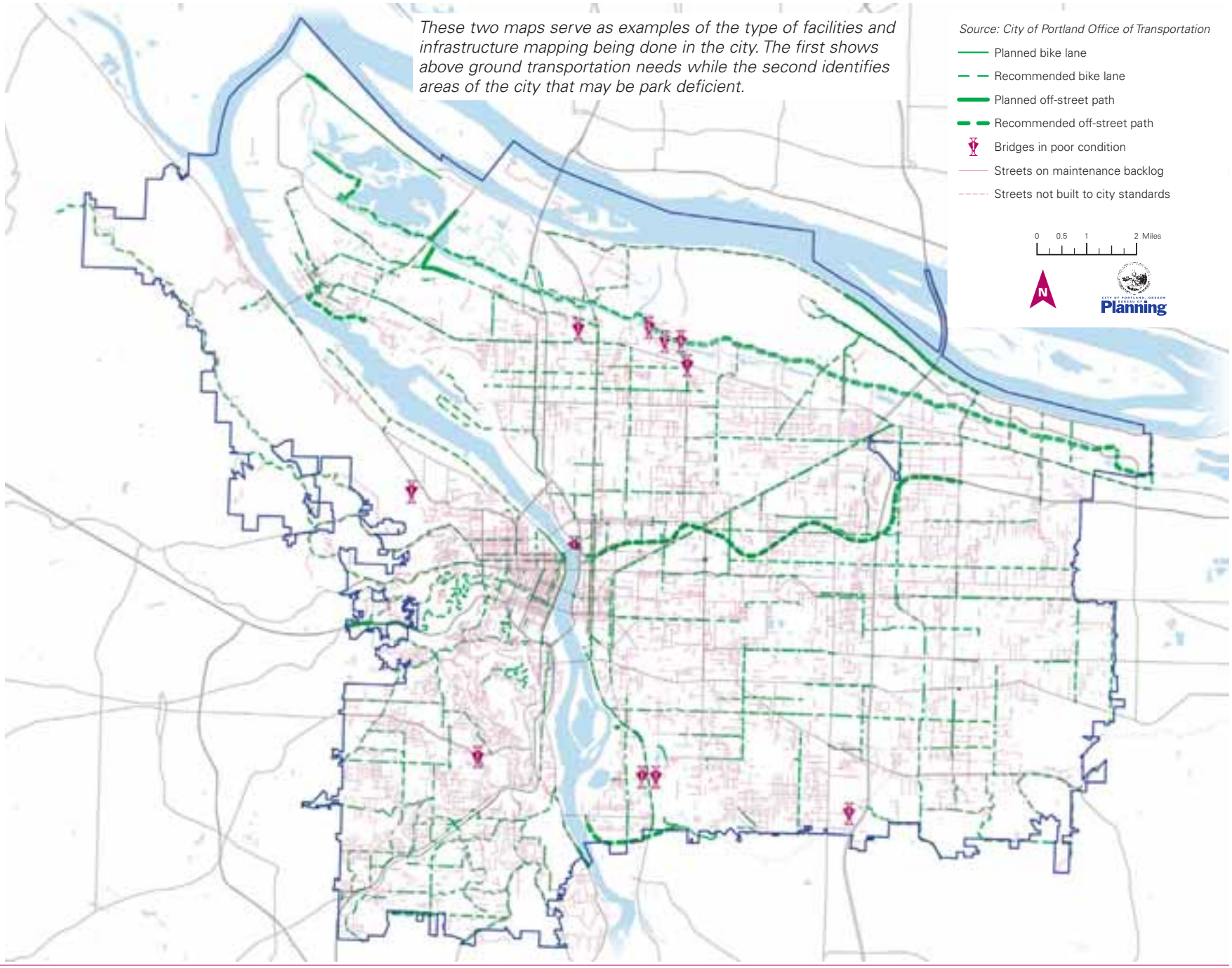
BIKE NETWORK — 1993

BIKE NETWORK — 2003

BIKE NETWORK — 2016

TRANSPORTATION SYSTEM

These two maps serve as examples of the type of facilities and infrastructure mapping being done in the city. The first shows above ground transportation needs while the second identifies areas of the city that may be park deficient.



Air quality and water quality in the Willamette River improved.

Portland made progress addressing point source pollution and solid waste recycling.

The *Endangered Species and Clean Water Acts* pose evolving challenges.

OVERVIEW

This section looks at the broad definition of environmental concerns, from recycling and airport noise to energy conservation and transit usage. Presented are statistics and trends related to the health of Portland's air and water, the status of trees in the urban area, and a map of Portland streams that do not meet water quality standards.

Hydrology and Water Quality

Water quality in the Willamette River has improved from historic lows in the 1940s through the 1970s.

Despite progress, Portland rivers and streams violate water quality standards for physical, chemical, and biological parameters including, but not limited to, temperature, bacteria, habitat modification, nutrients, and toxics.

Impervious surfaces cover anywhere from 30 percent to 60 percent of the land area in Portland's urban watersheds, resulting in large fluctuations in streamflow citywide, flooding problems (particularly in the Johnson Creek watershed), and sewer backups in basements in many Portland neighborhoods.

Fish and Wildlife Habitat

Steelhead trout and Chinook salmon have been listed as "threatened" under the federal *Endangered Species Act* for the Lower Willamette Valley which includes Portland's watersheds.

Urbanization has reduced and degraded Portland's fish and wildlife habitats through removal of vegetation, installation of impervious surfaces, and stream channel modification.

Air Quality

Portland's air quality showed steady improvement in terms of carbon monoxide and particulate matter, although the region still regularly experiences air quality advisory days during the hottest part of summer. Air pollutants of greatest concern in Oregon include:

- ground-level ozone, commonly known as smog
- carbon monoxide (mostly from motor vehicles)
- fine particulate matter (mostly from wood smoke and dust).

Tree Canopy

One study conducted by American Forests reports that within the Metro urban growth boundary, the tree cover decreased from 19 percent in 1984 to 12 percent in 2000. The same study found that the average tree canopy for the larger Willamette/ Lower Columbia region was 24 percent in 2000, compared to 46 percent in 1972. Maps on the following pages show the comparison for the Metro region between 1984 and 2000.

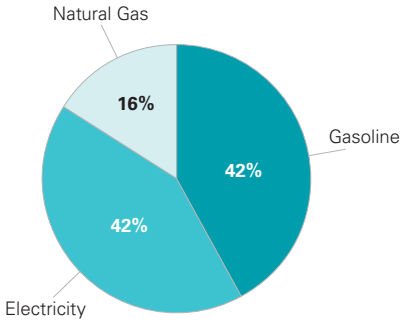
Another study in progress by Portland State University reports that the tree canopy within the City of Portland covers 26.3 percent, up from 25.1 percent three decades ago. The report also suggests that 50 out of 102 Portland neighborhoods have increased tree coverage since 1972, mostly in Northwest and Southwest Portland. These are older, established neighborhoods that have fairly steep terrain and fewer roads.

Airport Noise

The recent Noise Exposure and Land Use Compatibility Study for the airport tentatively concludes that the noise contours (footprint) will expand beyond the 1996 contours in the near future. As a result, concerns over increasing noise levels from an increasing number of flights will continue as a local and regional issue.

Carbon Dioxide Emissions Sources, Multnomah County, 2002

Source: Portland Office of Sustainable Development



Greenhouse Gasses

In 1993, Portland became the first U.S. city to adopt a carbon dioxide reduction strategy. In the past decade, the City has made impressive gains in energy efficiency, transportation options, recycling, and tree planting when compared to national averages.

Carbon dioxide emissions per capita decreased four percent between 1990 and 2002.

Solid Waste

Portland households dispose almost half the waste compared to the national average. Annually, Portland garbage haulers ship about 1.2 million tons of garbage to landfills in eastern Oregon and other sites. That number grows by 24,000 tons every year.

Portland boasts a recycling rate of household waste among the highest in the country at 53 percent.

Energy Consumption and Conservation

Overall energy use in all Portland sectors (excluding transportation) increased ten percent between 1990 and 2000, although per capita energy use in Multnomah County decreased from 169.1 million British thermal units (BTU) in 1990 to 156.1 in 2002.

City Bureau's conservation efforts have resulted in more than $2 million in savings per year on energy bills.

Water Consumption and Conservation

Portland households consumed 15 percent less water in 2000 than 1992, reducing their average monthly consumption from 72 to 69 gallons per capita per day – a savings of $33 per year for each household.

Less than half of Portland households water their lawn in the summer months.

Green Building

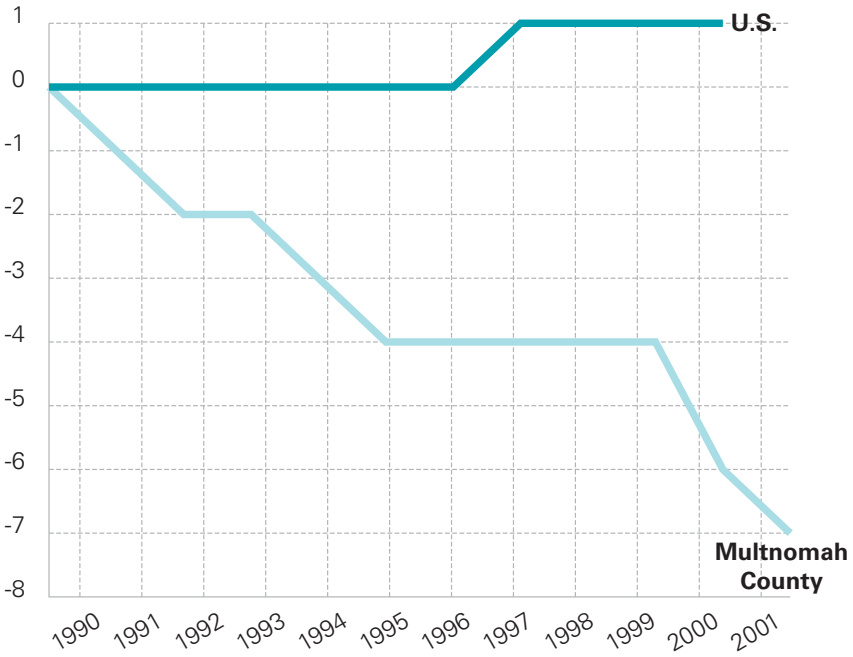
To date, Portland has 26 Leadership in Energy and Environmental Design (LEED) certified projects, more than any other city in the U.S. Seattle comes in second with 20 projects and other cities are in single digits.

As of February 2003, 41 commercial and mixed-use buildings, totaling 3.1 million square feet, are implementing green building design and construction practices. Portland's Green Investment Fund and the Portland Development Commission's green affordable housing requirements added another 1,314 units of efficient, durable, and healthy housing to the city.

CARBON DIOXIDE EMISSIONS

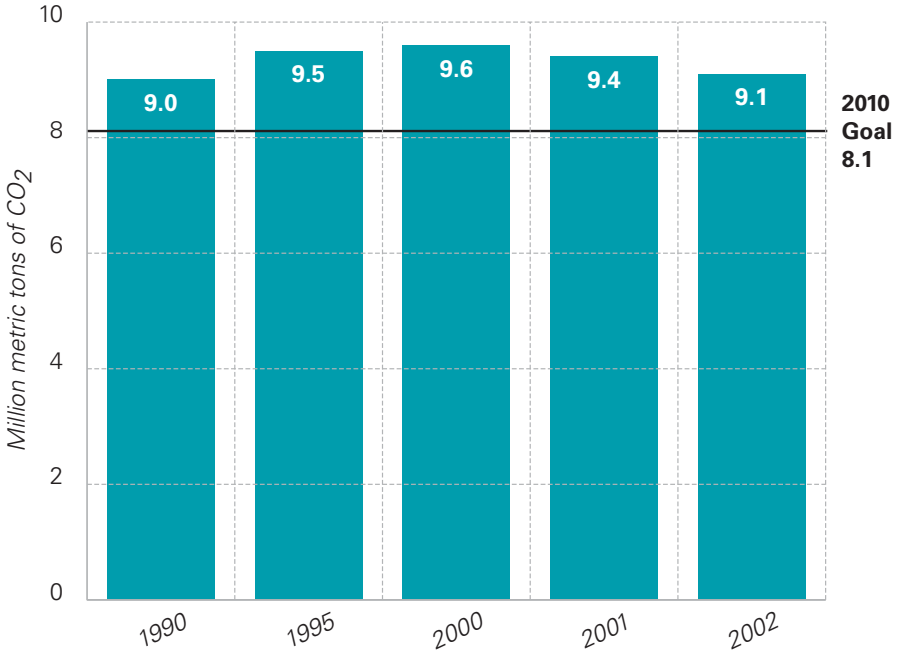
Multnomah County vs. U.S. Per Capita CO_2 Emissions Percent Change from 1990 Levels

Source: Portland Office of Sustainable Development



Total CO_2 Emissions in Multnomah County, 1990–2002

Source: Portland Office of Sustainable Development

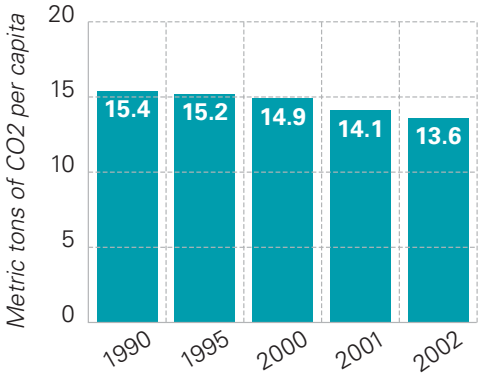


Portland is doing well reducing the per capita CO2 emissions as compared to the rest of the nation.

City Council in 2000 adopted a goal of reducing the total amount of CO2 emitted to 8.1 metric tons by the year 2010. Portland is struggling to meet that goal.

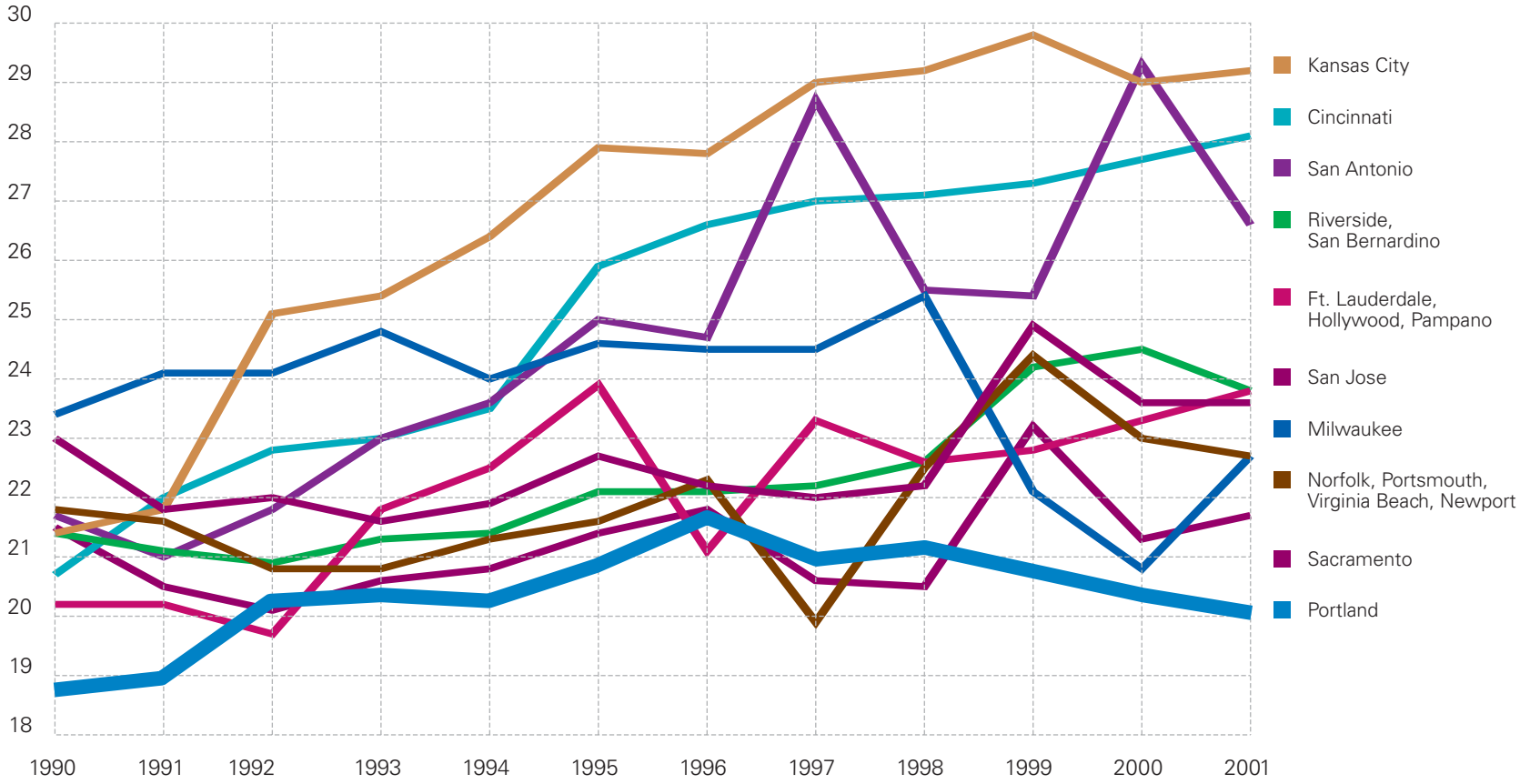
Per Capita Carbon Dioxide Emissions Multnomah County, 1990–2002

Source: EIA, http://www.eia.doe.gov/



Vehicle Miles Traveled Per Capita In Portland Metro Area Compared With Cities of Similar* Population Size

Source: Federal Highway Administration



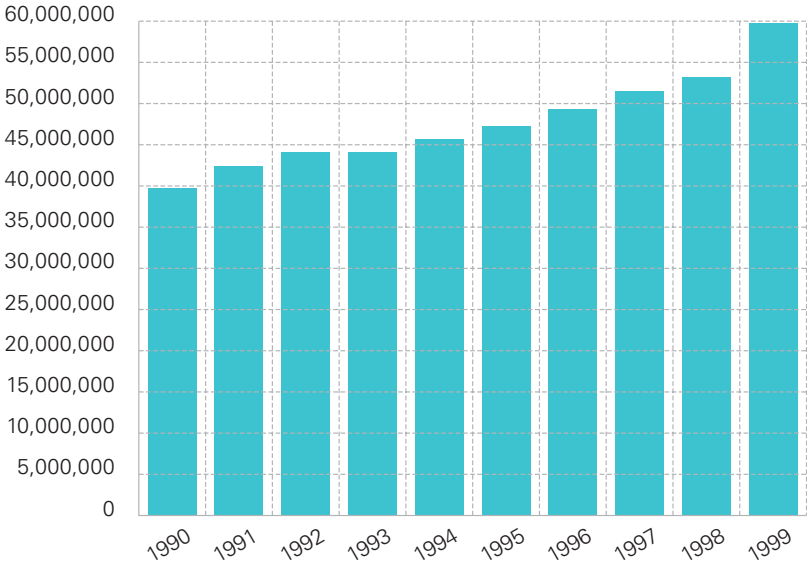
Vehicle miles traveled is the average number of miles a person drives each day. Portland metro area residents drive less on average than residents in U.S. cities of comparable size.

**Within 250,000 plus and minus of Portland's Estimated Population for Each Year*

TRANSIT USAGE, ENERGY USE BY FUEL

Transit Usage

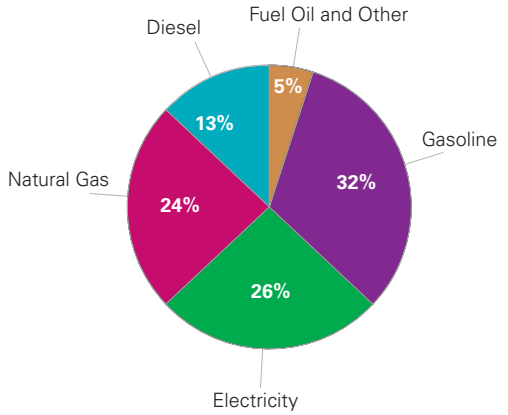
Source: TriMet
TriMet ridership increased 50 percent between 1990 and 1999.



The number of people using transit continues to increase each year, partially due to population increases.

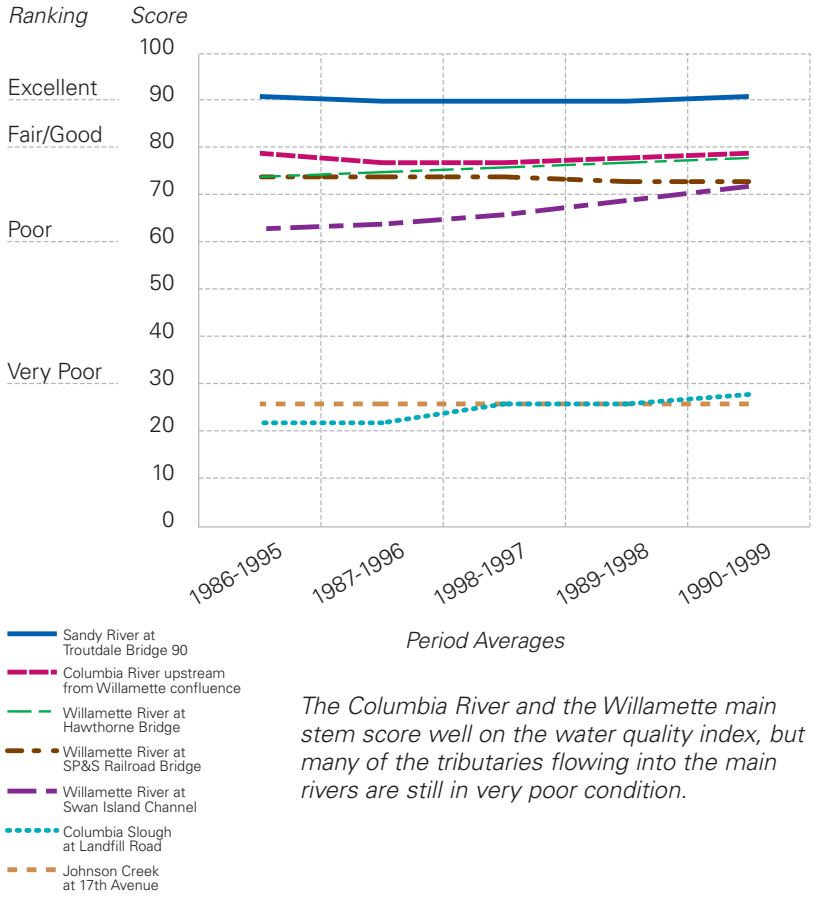
Forms of Energy Used in Multnomah County, 2002

Source: Portland Office of Sustainable Development



Water Quality Index Scores, Multnomah County

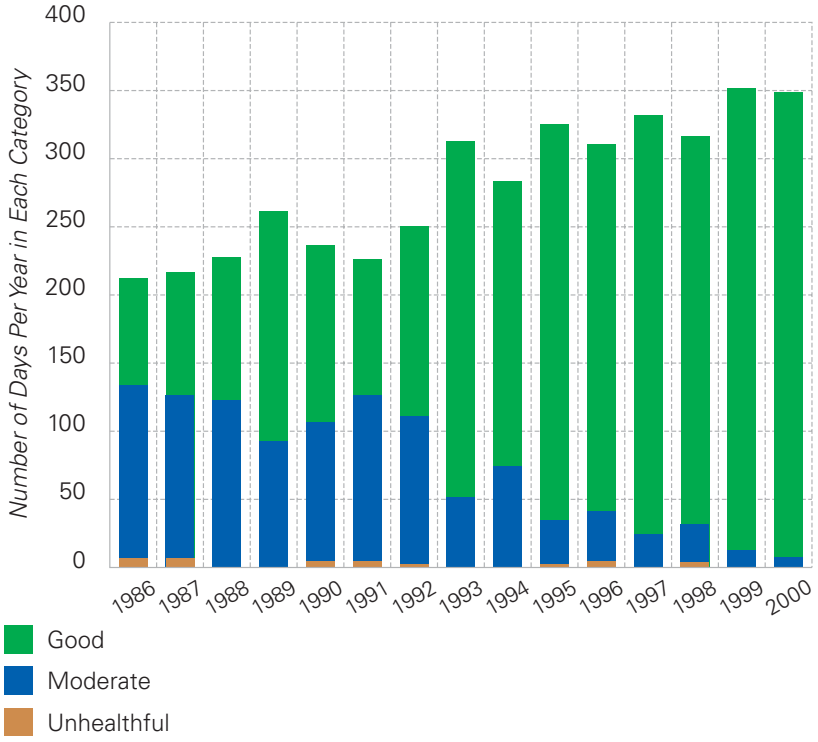
Source: Oregon Department of Environmental Quality



The Columbia River and the Willamette main stem score well on the water quality index, but many of the tributaries flowing into the main rivers are still in very poor condition.

Air Pollution Index, Portland-Vancouver Area

Source: Department of Environmental Quality, Air Quality Divison



Air quality has improved steadily, but hot summer days still prompt DEQ to issue Hot Weather Health Watch for smog-sensitive individuals.

Over the past ten years, public ratings of neighborhood livability have increased.

New residential development is scattered throughout the city, but 58 percent of new multifamily units are in Metro 2040 center areas.

Metro 2040 centers continue to be zoned for higher densities than the market is currently building.

The design of infill development is often characterized as disappointing or substandard.

OVERVIEW

As noted in previous sections, significant growth in the City of Portland and region has occurred in the past decade.

Neighborhood Satisfaction

Citywide, perceived neighborhood livability has increased. Some neighborhoods have experienced significant gains in perceived livability in the past ten years, while other neighborhoods are stagnant or remain at lower perceived livability levels.

The most recent data indicate that neighborhood satisfaction may have peaked, with recent declines in many areas, particularly for water, sewer, streets, and police.

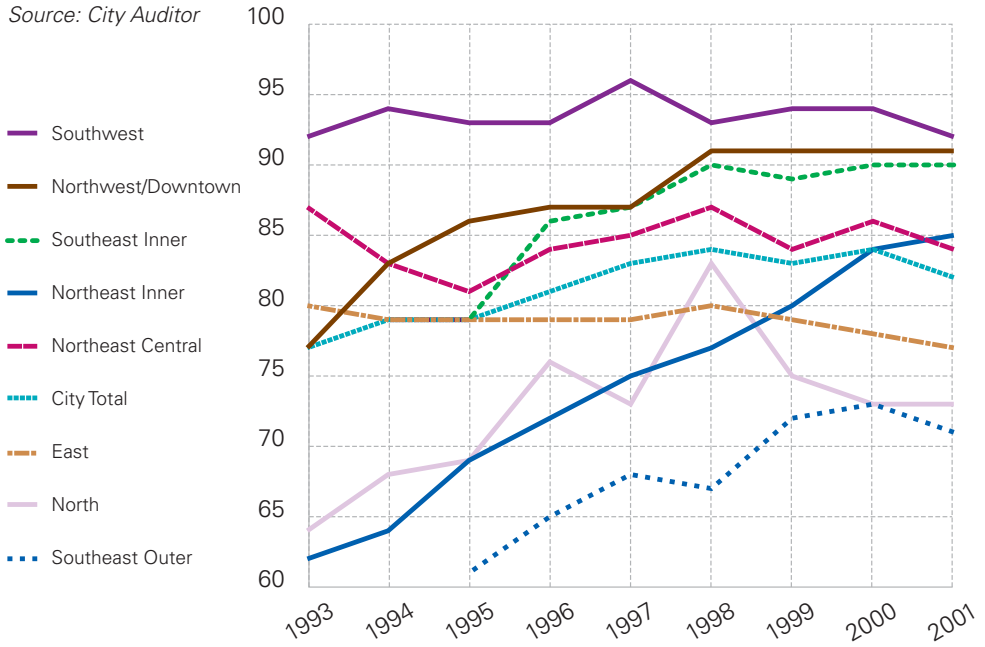
Crime

Despite a few recent increases in crime statistics, serious personal and property crimes in Portland have declined in the last decade. Generally, areas on the westside and on the eastside close to downtown have experienced the greatest percentage decrease in crime.

Car thefts and other "household victimization"—crimes such as vandalism, theft, and burglaries— are still at high levels. Graffiti removal efforts and environmental design efforts can abate the impact and occurrence of these crimes.

Neighborhood Livability — Percent Responding "Good" or "Very Good"

Source: City Auditor



Residential and Nonresidential Permit Activity

Residential permit information shows single family development scattered fairly evenly throughout the city. There are noteworthy concentrations of single family activity in Outer Southeast Portland and the area of Forest Heights in the northwest. The data show that 58 percent of multifamily units (apartments, rowhouses, and duplexes) were built in 2040 mixed use areas (centers and main streets) between 1997 and 2002. Over 70 percent of the larger projects with 40 or more units were built in 2040 areas.

Urban renewal districts provide some foci of multifamily residential development activity, although these urban renewal districts do not correspond entirely with Metro's *2040 Growth Concept* map.

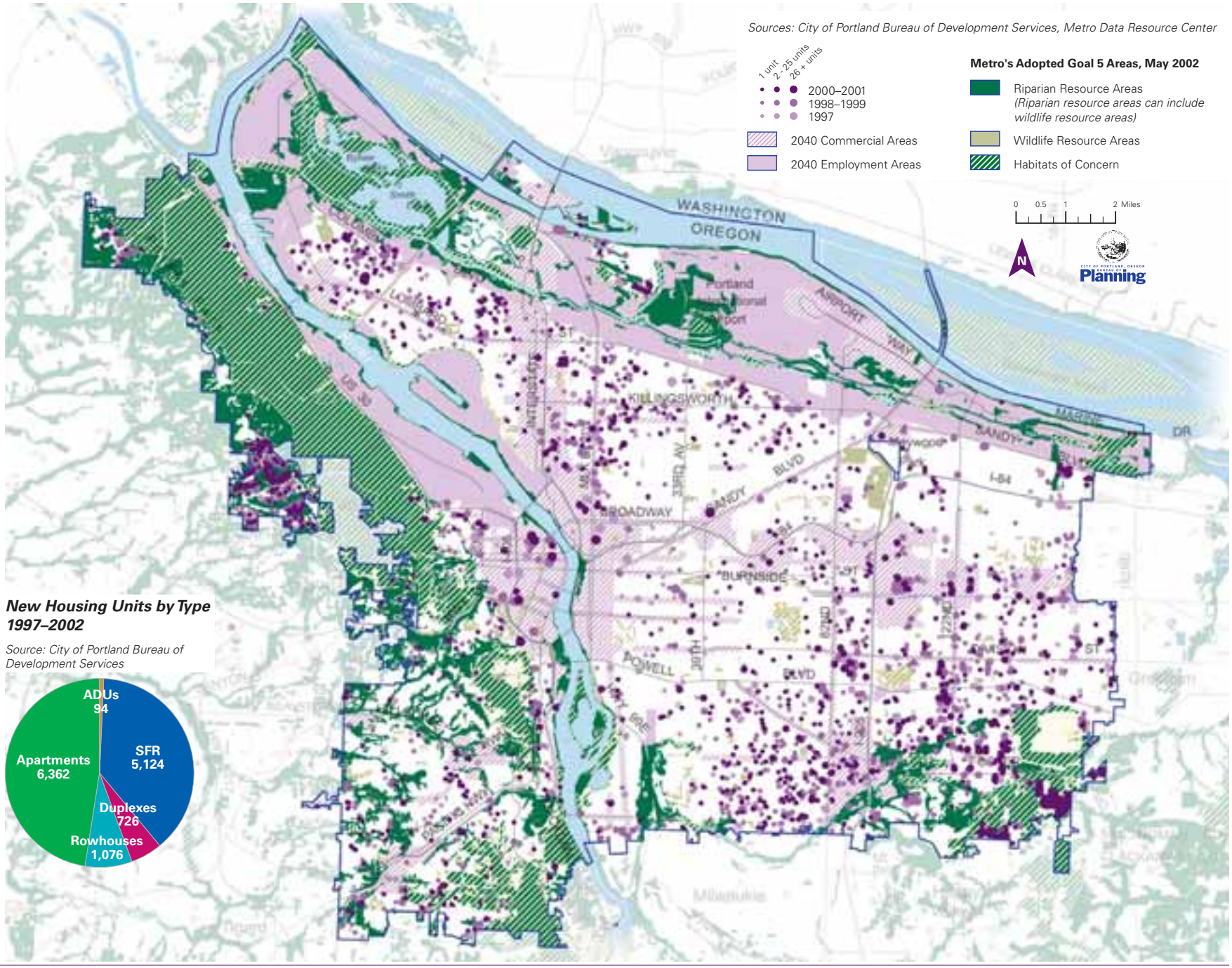
The 2040 analysis design type areas depicted on the following pages were developed by the Bureau of Planning for Metro's *Urban Growth Management Functional Plan* compliance purposes in February 1999. Most boundaries are not official and have not been adopted by the City. Specific boundaries will change as specific local planning processes occur. Therefore, additional work is needed by the City to fully implement the *2040 Growth Concept*.

Despite the positive development trends in the 2040 centers, little development is being built at the densities allowed in these areas. This suggests that the zoning in many 2040 centers is still considerably ahead of the market.

A closer look at recent development in 2040 areas reveals that it has required public subsidy in one form or another. For example, innovative projects that embody transit orientation, mixed-income, or mixed-use goals have been the products of public-private partnerships assisted with public funds such as block grants, tax increment financing, or limited property tax abatements. Brownfield redevelopment has also required public-private partnerships, such as South Waterfront Park and River Place.

An additional finding is that Portland's commercial areas exhibit differing levels of vitality. Only a few of the 2040 centers are meeting Metro's goals for urban form and mix of goods and services. Commercial areas' health is determined by a combination of factors, particularly physical form, market niche, surrounding demographics, and accessibility.

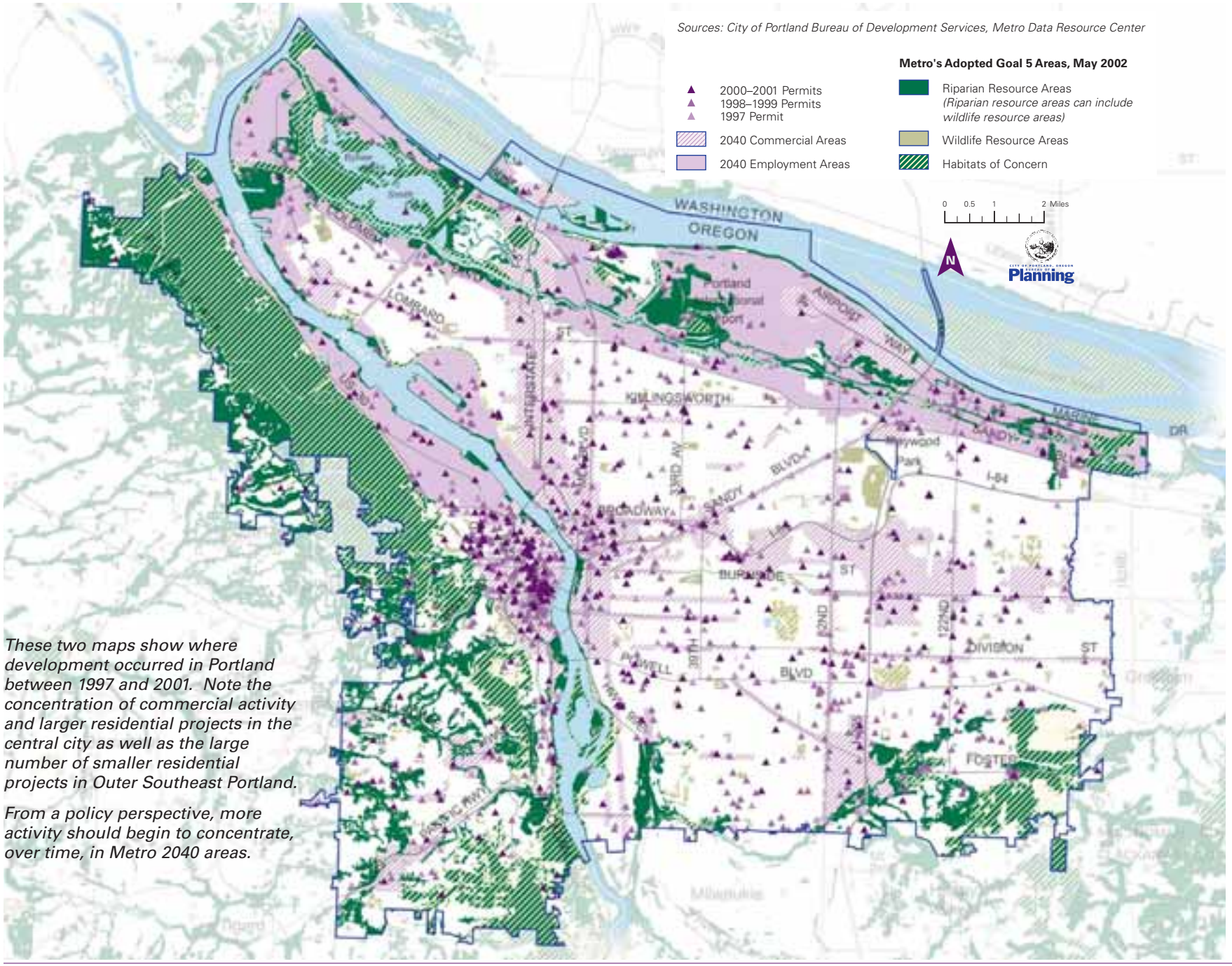
RESIDENTIAL PERMIT ACTIVITY



New Housing Units by Type 1997–2002

Source: City of Portland Bureau of Development Services

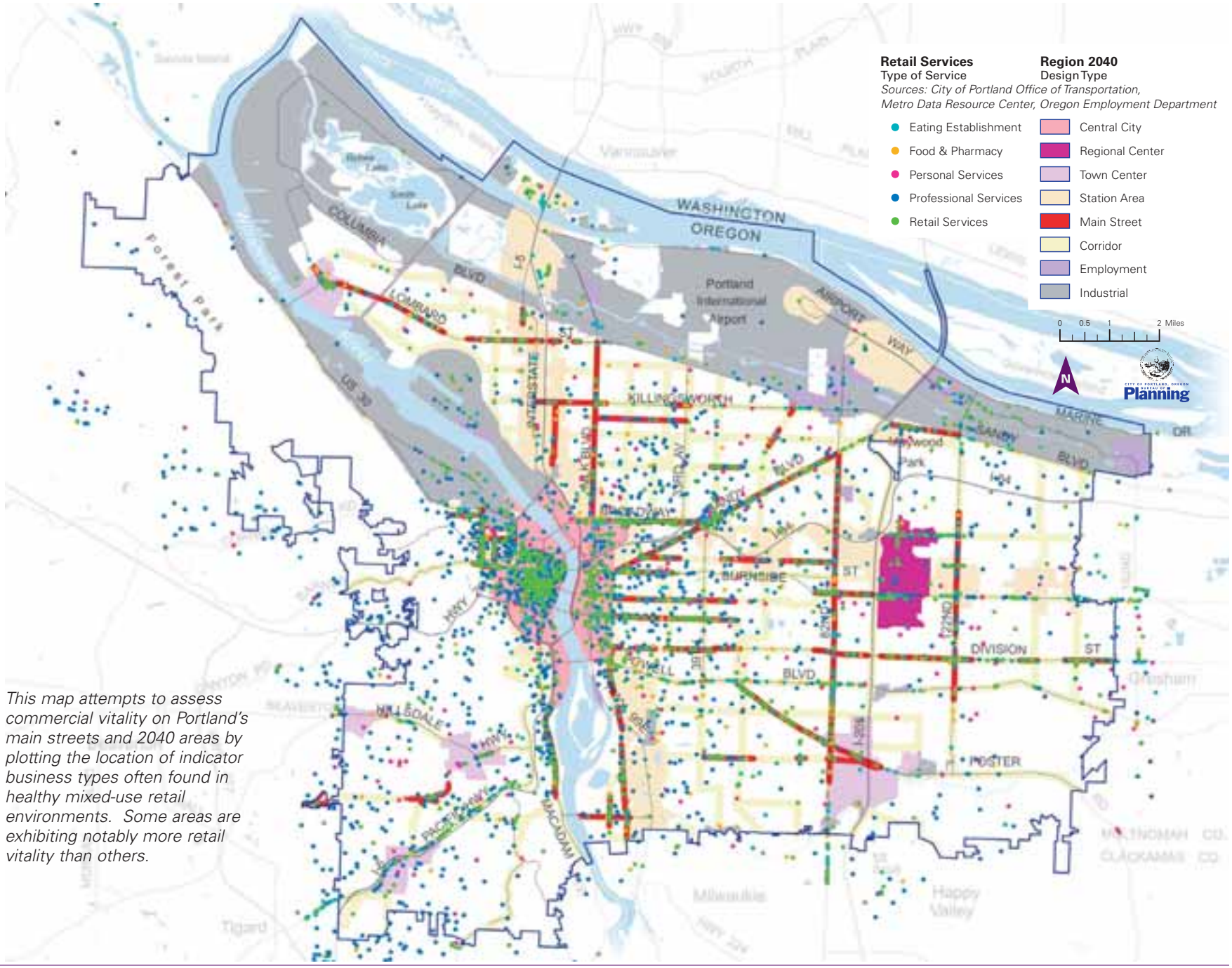
NON-RESIDENTIAL PERMIT ACTIVITY



These two maps show where development occurred in Portland between 1997 and 2001. Note the concentration of commercial activity and larger residential projects in the central city as well as the large number of smaller residential projects in Outer Southeast Portland.

From a policy perspective, more activity should begin to concentrate, over time, in Metro 2040 areas.

RETAIL SERVICES

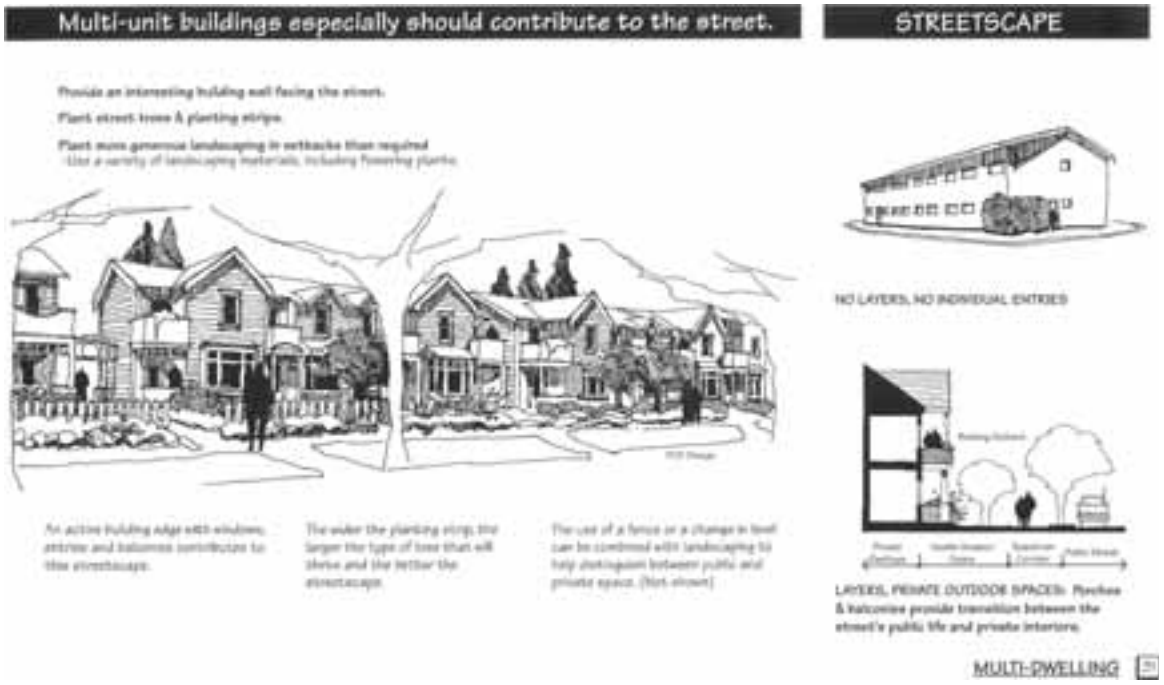


This map attempts to assess commercial vitality on Portland's main streets and 2040 areas by plotting the location of indicator business types often found in healthy mixed-use retail environments. Some areas are exhibiting notably more retail vitality than others.

Infill Design

While City design goals calling for higher-density residential development to be concentrated near transit areas are being realized, the design of individual development is often not fulfilling community expectations. Planning projects have identified a community desire for infill development to contribute to a pedestrian-oriented streetscape and to respect desired neighborhood character. The diagram in *Building Blocks for Outer Southeast Neighborhoods* (1996) is one example.

Frequently, however, infill development falls short of these expectations, with building facades dominated by driveways and garages. New base zone design standards address this issue for single-family residential development, but few such design controls apply to most multifamily development outside the central city (60 percent of new multifamily development in Outer East Portland, for example, feature street frontages devoted primarily to parking).



Additional Policy and Planning Resources

Peaking of World Oil Production: Impacts, Mitigation, & Risk Management; by Robert Hirsch, SAIC
http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf
Also known as the Hirsch Report, what is often consider the foremost document on peak oil, was prepared for the US Department of Energy and published in February 2005. It discussed the likelihood of peak oil occurring and how soon we need to take mitigating action. His executive summary states that "the peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking."

Energy Bulletin
http://www.energybulletin.net
EnergyBulletin.net is designed to be a clearinghouse for current information regarding the peak in global energy supply. The website is edited and maintained by a small number of individuals unaffiliated with any private, government, or institutional body. They publish news and research concerning the current peak oil situation and trajectory, relevant institutional pronouncements, innovations or partial solutions to the crisis, alternative financial systems, or post-carbon urban agriculture. The editors also include any other issues which assist in understanding of the broader implications of the peak

Regional Framework Plan, Metro 2040 Growth Concept
http://www.metro-region.org/article.cfm?ArticleID=432
The Metro 2040 Growth Concept defines regional growth and development in the Portland metropolitan region. The growth concept was adopted in the Region 2040 planning and public involvement process in December 1995. It includes land-use and transportation policies that will allow the Portland metropolitan area cities and counties to manage growth, protect natural resources and make improvements to facilities and infrastructure while maintaining the region's quality of life.

Regional Transportation Plan (RTP)
http://www.metro-region.org
One of Metro's major responsibilities under federal and state law is development of the Regional Transportation Plan (RTP). Updated and adopted by the Metro Council every four years, this plan sets the direction for regional investments in a mix of transportation options, including roadways, light rail, freight, transit, pedestrian access and bicycles.

Transportation System Plan (TSP)
http://www.portlandonline.com/transportation/index.cfm?c=38838
Portland has worked with Metro and other agencies, citizens, and community and business groups to develop the City's first Transportation System Plan. The TSP elaborates on the

transportation element of the Comprehensive Plan and helps implement the region's 2040 Growth Concept by supporting a transportation system that makes it more convenient for people to walk, bicycle, use transit, and drive less to meet their daily needs.

The Oregon Strategy on Greenhouse Gas Reductions
http://oregon.gov/ENERGY/GBLWRM/Strategy.shtml
The Oregon Department of Energy (ODOE) has developed 15 transportation actions as part of the Governor's Initiative on Global Warming. While the plan highlights many state level initiatives for transportation efficiency that parallel local policies, it also includes tax credits for purchasing high efficiency vehicles, standards for high efficiency/low rolling resistance tires, I-5 corridor safety stops to reduce truck idling and freight/rail efficiency including multi-modal freight transportation options and intelligent transportation systems.

Renewable Energy Action Plan
http://oregon.gov/ENERGY/RENEW/RenewPlan.shtml
The plan specifically targets transportation fuels in both long and shot term goals. In the long term, the plan requires all diesel sold in Oregon to contain 5 percent biodiesel by 2010, growing to 20 percent by 2025 and that all gasoline will contain 10 percent ethanol by 2010, growing to 15 percent by 2025. The short term transportation goals include 25 biodiesel and ethanol in diesel and gasoline respectively and annual production of 15 million gallons of biodiesel and 100 million gallons of ethanol by the end of 2006.

White Paper: Future Oil Supply Uncertainty and Metro
http://www.metro-region.org/article.cfm?articleid=18951
Metro prepared this White Paper to explore how they may approach the possibility of future uncertainty in the supply and price of oil. It identifies future oil supply uncertainty as a timely risk management issue, and establishes a basis for the Metro Council to consider possible policy and program responses.

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