

# Chapter 3

## Guiding Principles

The Comprehensive Plan includes a set of integrated Guiding Principles – equity, prosperity, human health, watershed health, and resilience – that bridge policy approaches throughout the Comprehensive Plan. These Guiding Principles have direct implications for the City of Portland’s infrastructure investment and management over the coming decades. The following sections address each of these principles and highlight supportive infrastructure investments and approaches intended to meet them.

### Guiding Principles

The Guiding Principles encapsulate the Portland Plan’s key priorities of equity, prosperity, health, and resiliency into the Comprehensive Plan and implementation tools. The Principles guide projects, programs, and land use decisions that are subject to the Comprehensive Plan. They are intended to be relevant to every project, program, or land use decision that updates or amends an element of the Comprehensive Plan or one of its implementation tools, including amendments to the Citywide Systems Plan. The Principles encourage balanced, integrated multi-disciplinary approaches among topics such as housing, economic development, and transportation.

**Guiding Principles.** When making and adopting legislative land use decisions, consider the impacts of:

- **Equity and environmental justice.** Encourage land use decisions that reduce existing disparities, minimize burdens, extend benefits, and improve socio-economic opportunities for under-served and under-represented populations.
- **Economic prosperity.** Encourage land use decisions that support the city’s economy and foster employment growth, competitiveness, and equitably-distributed household prosperity.
- **Human health.** Encourage land use decisions that avoid or minimize negative health impacts and improve opportunities for Portlanders to lead healthy, active lives.
- **Environmental health.** Encourage land use decisions that recognize, incorporate, and sustain valuable ecosystem services related to air, water, and land quality, and the intrinsic value of nature.
- **Resilience.** Encourage land use decisions that improve the ability of individuals, communities, economic systems, and the natural and built environment to recover from natural and human-made disasters, climate change, and economic shifts.

### Equity

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Portland is becoming an increasingly diverse city, home to people of many races, ethnicities, ages, abilities, and incomes. To serve the needs of a diverse city, the Portland Plan identifies equity as a key strategic priority and a frame for decision-making, investment, community engagement, and measurement of success.

In keeping with the federal Civil Rights Act of 1964, “It is the policy of the City of Portland, that no person shall be denied the benefits of or be subjected to discrimination in any City program, service, or activity on the grounds of race, religion, color, national origin, English proficiency, sex, age, disability, religion, sexual orientation, gender identity, or source of income.”

The Portland Plan defines equity as “when everyone has access to the opportunities necessary to satisfy their essential needs, advance their well-being and achieve their full potential.” As part of adopting the Portland Plan in 2012, City Council directed the implementation of the City’s Civic Rights Title VI Plan to remove barriers and conditions that disadvantaged groups from receiving access to, participation in, and benefits of City programs, services, and activities.

The Comprehensive Plan Update’s Vision for 2035 highlights the importance of equity, including ensuring “everyone has access to opportunity and is engaged in shaping the decisions that affect their lives.” Equity is further integrated into the plan as a guiding principle and through a variety of goals and policies that support decisions that reduce existing disparities, minimize burdens, extend benefits, and improve socio-economic opportunities for under-served and under-represented populations.

## Portland’s Demographics

Growing diversity and shifts in Portland’s population and household makeup have, and will continue to, bring corresponding changes in the values and needs of the community. These shifts result in changes in the types of transportation, water, park, and civic facilities needed to adequately serve the community.

Changing demographics may require the City to modify existing infrastructure practices or design systems that can anticipate and adapt to changing needs. For example, the City will need to continue to improve transportation infrastructure so all Portlanders, including older residents, families with children, people with disabilities, and residents with limited disposable income can walk, bike, or take transit in their neighborhoods and to destinations throughout the city. The City may also need to plan for improved or different parks and recreation facilities to accommodate diverse recreational needs and shifts in use patterns.

### Race and Ethnicity

According to the U.S. census, communities of color made up approximately 15% of Portland’s population in 1980. In 2010, these communities represented 24% of the population, lower than the national average of 33%. In 2010, the City’s population was approximately 7% Asian, 6% Black or African American, 1% American Indian and Alaskan Native, 1% Native Hawaiian and Pacific Islander, 5% two or more races, 76% white, and 4% some other race. Additionally, approximately 9% of Portlanders identify as Latino or Hispanic, an increase of over 50% from 2000.

Portland’s youth, those 25 years old and younger, are more diverse than the city as a whole. In 2010, more than 36% of Portland youth are people of color — Black or African American, Native American, Native Hawaiian, Pacific Islander, Native Alaskan, Asian, or multiracial. In addition, more than 18% of all youth identify as Latino or Hispanic.

## Age

The age of Portland's population has remained relatively constant over the past decade. In 2010, approximately 29% of Portlanders were 24 or younger, 36% were between 25 and 44 years of age, 25% were between 45 and 64, and 11% were 65 or older. In general, areas farther from the city's core, such as East Portland and St. Johns, tend to have higher youth populations.

## Disability

In 2000, approximately 19% of Portlanders over age 5 had a disability that impacted their daily activities. These disabilities included sensory, physical, and mental disabilities. Rates of disability are highest for those over 65, at 42.5%, and lowest for people between 5 and 20 years of age, at 8.9%. The Americans with Disabilities Act (ADA), enacted on July 26, 1990, provides protections to individuals with disabilities in the areas of employment, State and local government services, public accommodations, and telecommunications.

The Title II of the ADA prohibits State and local governments from discriminating on the basis of disability, but moreover, its goal is to promote equal access and full participation for all. The City of Portland works to ensure every program, service, benefit, activity, and facility operated or funded by the City of Portland is accessible to people of all abilities. The City strives to eliminate barriers that may prevent persons with disabilities from accessing facilities or participating in City programs, services, and activities. The City is currently developing a citywide transition plan to determine what physical barriers might prevent persons with disabilities from accessing facilities owned or operated by the City.<sup>4</sup>

## Income

In 2011, the median household income in Portland was \$48,831. This was \$7,023 less than the median household income in the Portland-Vancouver metropolitan region. The region's lowest median incomes can be found in North/Northeast Portland, Southeast Portland, and outer east Portland. Median household income has increased by approximately 21.6% since 2000, less than the rate of inflation. Approximately 28% of Portland households earn less than \$25,000 annually, while 31% earn more than \$100,000 annually.

Fourteen percent of Portland's families were living below the poverty level<sup>5</sup> in 2011. Poverty affects over a quarter of youth under 18 (27%) and 10% of people 65 and older. Similarly, 14% of local families access food stamp or SNAP benefits.

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<sup>4</sup> City of Portland, Americans with Disabilities Title II Program. Online, available at <http://www.portlandoregon.gov/bibs/62112>

<sup>5</sup> In 2011, the poverty threshold was \$22,350 for a family of four.

## Investing to reduce disparities

To equitably serve Portlanders, the City must work to reduce existing disparities in infrastructure service. In order to meet the Comprehensive Plan's equity principle, the City's infrastructure must be provided in equitable ways to ensure all Portlanders have access to opportunity.

Providing basic infrastructure services in currently under-served areas is a challenge – particularly for transportation, parks and recreation, and stormwater services. Resolving these deficiencies and filling gaps in existing networks will aid the City in serving existing residents and accommodating new growth. The Citywide Systems Plan presents an opportunity to reduce these disparities through policies and investments.

The Bureau of Transportation faces some significant deficiencies, based on existing levels of service and design standards. Issues include street connectivity, pedestrian and bike access and facilities, safety improvements, and substandard streets. Resolving these deficiencies would provide Portlanders with greater transportation access to employment, housing, schools, parks, commercial and community services, and other destinations throughout the city and region. The transportation investment strategy, described in Appendix A and in the Transportation System Plan, includes investments to improve multi-modal connectivity by expanding the active transportation network, maintaining transportation infrastructure, and improving safety.

Portland Parks & Recreation bases its service on sufficiency and access to park and recreation facilities. Unfortunately, many areas of Portland – especially outer east, southwest and central northeast – lack sufficient facilities such as developed parks, community centers, and trails and natural areas. In addition, many areas lack the supporting pedestrian infrastructure to allow safe pedestrian access to parks and recreation facilities. In park-deficient areas, local residents may lack opportunities to recreate, experience nature, and take advantage of the physical, mental, and community health benefits parks provide. Portland Parks & Recreation has identified a need to acquire and develop parks and recreation facilities in currently deficient areas.

Environmental Services' investments in sewer and stormwater systems and wastewater treatment are prioritized by risk due to age, condition, capacity, and regulatory mandates. Typically, high-risk areas are located in Portland's inner neighborhoods, where infrastructure is the oldest. Sewer failures or stormwater issues can result in flooding in basements and streets, sewer backups, landslides, and erosion, posing hazards to residents, businesses, and the environment. In these areas, the Bureau's Investment Strategy, described in Chapter 6 and Appendix A, includes projects to reduce risks and improve sewer capacity. In East Portland, the sewer system is relatively new. There, and in other areas of the city, the Citywide System Plan identifies investments in programs to address stormwater and natural system deficiencies and ensure the benefits of green infrastructure are equitably distributed. Examples include the Johnson Creek flood mitigation program, as well as increased tree planting in canopy-deficient areas, and community watershed stewardship grants and education programs.

## Responding to local context

Each area of Portland has its own distinctive characteristics that are valued by community members. Different places are distinguished by their communities and their unique topographies, natural features, histories, assets, patterns of development, and building types.

Instead of following a one-size-fits-all approach, growth, investment, and change can be used to enhance the strengths and assets of each area. The use of infrastructure service and design standards that reflect the unique physical and service needs of different areas of the city will ensure infrastructure is context-sensitive and provides appropriate levels of service. The public facility policies and investments in the Citywide System Plan reflect a move towards context-sensitive approaches. For example, transportation policies support a flexible approach to street design and development standards to respond to local context while ensuring multi-modal movement and access. Similarly, stormwater investments account for unique watershed conditions, including hydrology, natural resources, and level of development.

## Promoting inclusive public process

The City supports appropriate and inclusive public involvement in infrastructure investment decision-making – from project identification and prioritization to design and construction. The Community Involvement chapter of the Comprehensive Plan’s Goals and Policies, as well as guidance provided by the Community Involvement Program, support inclusive, meaningful, and transparent public involvement. Community involvement in infrastructure decision-making should be tailored to respond to the unique needs of the project and the impacted community.

## Using an equity lens

Putting equity into practice requires considering relevant data and questions and setting priorities to advance equity in decision-making. City infrastructure bureaus have been working both internally and with community members and partners to improve common understanding of infrastructure equity. Meeting the needs of a diverse and changing population requires addressing existing disparities while remaining mindful of, and adapting to, changes in community needs over time. There is, and will continue to be, a need for capacity-building, data refinement, risk assessment, community involvement, and the evolution of policies and practices to fully understand and address the equity impacts of infrastructure decisions.

The following questions can serve as an initial step to implementing an equity lens to ensure equitable outcomes in infrastructure investment decision-making. These questions can be asked at different phases of an infrastructure project, policy, or program to begin to assess potential equity impacts:

- What is the existing level-of-service in the project area? How does it compare to the existing levels-of-service across the City?
  - If the level-of-service in the area is less than other areas in the city, what are the economic, social, and environmental impacts of that reduced level of service? Does the project remedy those impacts?
  - If the level-of-service in the area is equal to or greater than other areas of the city, what are the drivers, desired results, or outcomes of the infrastructure project or program?

- What are the demographics of the area?
- Are there current or historical disparities related to infrastructure service? How does the service provided by the proposed asset maintenance, rehabilitation or renewal relate to those disparities? Could the project be improved to further reduce existing disparities?
- Who benefits most from the infrastructure project? Does the infrastructure project positively benefit racial, ethnic, or low-income communities, or people with disabilities?
- Are there potential negative consequences, impacts or burdens of the infrastructure project on racial, ethnic, or low-income communities, or people with disabilities? If so, what are the strategies to mitigate these negative impacts?
- How does the infrastructure project support inclusive, meaningful, and transparent public involvement, particularly for those most impacted?
- Does the infrastructure project support local job creation and economic development opportunities for impacted communities? Will local residents and businesses have preference for construction contracts or employment?
- Based on the information gathered and the answers to these questions, does the project or program support increased equity in the City?

## Investment, Gentrification and Displacement

Public and private investments in Portland's neighborhoods have resulted in gentrification and displacement of communities of color, low-income people, and minority-owned businesses. The Portland Plan sets an expectation that an equitable city should be proactive about the inequitable impacts that neighborhood change and gentrification can have on vulnerable households. Specifically, it called for approaches to help evaluate and better manage potential gentrification impacts of new policies, programs, and investments.

Investment in public infrastructure can cause direct displacement, through the use of eminent domain and other tools to “make way” for a new public facility. Investment can also be an indirect factor – inducing gentrification by increasing property values and housing prices, resulting in displacement due to diminished neighborhood affordability.

As part of efforts to evaluate potential gentrification impacts on local communities, the Bureau of Planning and Sustainability (BPS) commissioned a Gentrification and Displacement Study, authored by Dr. Lisa Bates. The study provides a methodology for assessing the risk of displacement, based on vulnerable population criteria (People of Color, low-income, renters, low-education attainment), changing demographics, and real estate market activity. The resulting map of neighborhood typologies, see Figure 3.1, shows where neighborhoods fall on a spectrum of gentrification risk. The study also includes a review of national best practices, including policy tools and programs that Portland could use to mitigate gentrification such as community benefit agreements. This analysis forms the foundation for the assessment of “vulnerability to displacement” used in the investment strategy for centers and corridors, described on pages 21 and 22.

When planning public investments, the City should use this map and analysis to identify critical opportunities to use the equity lens described above, involve local communities in decision-making, and link planned public investments in at-risk areas with strategic housing, economic development and other tools to address displacement risk for impacted communities.



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## Prosperity

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Infrastructure can be an important component of a successful economic development strategy, or it can be a key barrier to competitiveness and sustainability. Planning efforts for economic development should consider the opportunities of existing infrastructure capacity, challenges or deficiencies, and strategies to finance priority improvements. Economic development also offers potential opportunities to fund infrastructure improvements through public/private partnerships and other financing mechanisms.

### Economic Shifts and Employment Forecasts

Portland is the metropolitan area's regional job center and is home to 39% of the region's jobs, even though it is home to only 26% of the population. While Portland's job growth has been nearly flat (5%) since 2010, Metro expects the city will see higher rates of job growth over the next 20 years. It expects 147,000 new jobs in Portland, representing about 27% of the region's expected job growth. This level of growth is comparable to the city's historic "capture rate" of 25% of regional growth.

Manufacturing remains a key employment sector in the city. Jobs in the manufacturing sector offer opportunities for living-wage careers for residents, potentially without requiring higher education. They also have a high "employment multiplier" effect – one manufacturing job supports 3.69 total jobs in the region. Manufacturing output has been growing faster than output from service sectors. Beyond manufacturing, institutional and office are also leading employment sectors.

Over the next 20 years, Portland will see growth in all five employment geographies – in the Central City, industrial areas, commercial areas, institutions like hospitals and universities, and in residential areas. Supporting employment growth and the success of existing businesses in each of these areas may result in different infrastructure needs and investment priorities.

### Building a resilient economy

#### Competitiveness

The growth of global markets and the tightening of employment land markets in the inner portions of the Portland region mean Portland must continue to provide sufficient, high-quality employment land and necessary infrastructure to remain competitive and attract and retain businesses. To accomplish this, the City strives to provide adequate industrial and employment lands, served by associated infrastructure services, and to keep utility and infrastructure costs competitive. The Portland region's growing export activity is concentrated in manufacturing (e.g. high tech, metals, and transportation equipment), where job growth has been modest but output growth continues to outpace service sectors. The region also has growing export specializations in software, apparel, and clean-tech.

The Citywide Systems Plan includes investments in basic infrastructure services, such as transportation, water, and sewer, necessary to support economic activity. It also includes investments in parks, recreation, natural areas, trails, and other quality of life improvements, which are key to attracting and keeping a quality workforce.

## Capacity and Viability

To maintain its economic competitiveness, the City must provide adequate employment capacity and protect the viability of its industrial areas and harbor, which may require infrastructure improvements geared toward the types of industries in these areas. Infrastructure improvements will also be needed to allow economic development of new areas or more intense development of existing commercial and industrial zones.

Portland's Economic Opportunities Analysis (EOA) (2012), recommends infrastructure investment as a strategy to help meet Portland's future industrial and institutional capacity needs. It recommends prioritizing infrastructure investments that will result in greater utilization of existing industrial properties to meet capacity needs. Such infrastructure investments could include improvements to transportation and transit systems, sewer and water facilities, as well as telecommunications infrastructure. For institutional campuses, public transit infrastructure is the highest investment need.<sup>7</sup>

The Citywide Systems Plan identifies transportation, sewer, and water facilities that will be necessary to support employment designations identified in the Comprehensive Plan.

## Transportation and Freight Movement

Many local industries and businesses depend on reliable and efficient transportation systems, particularly for freight. Portland's transportation system is critical to the regional economy, as it provides connections to major markets within the city, access to major rail, marine and air cargo routes, and is a key link in the interstate highway system.

Congestion can impede freight movement, cause delays to businesses and commuters, and increase the cost of doing business in Portland. In general, as roadways reach capacity, small increases in the number of vehicles result in large increases in delays.<sup>8</sup> Conversely, small decreases can also reduce congestion significantly. Successful travel reduction strategies, such as providing affordable, reliable, and connected active transportation systems, and investments in critical infrastructure can improve freight movement, reduce commute times, and help attract and keep a quality workforce in Portland.

Portland's Economic Opportunities Analysis (EOA) recommends "strategic investments in the freight transportation systems and infrastructure needed to grow Portland's competitive position in the rapidly growing and changing international marketplace."<sup>9</sup> The EOA highlights the importance of continued investments in Portland's transportation infrastructure as outlined in the City's adopted Freight Master Plan (2006), which details policies, strategies, and desired improvements to freight management and movement in the City. Priority is given to the Freight Master Plan's program of strategic investments to encourage reinvestment and industrial expansion in Columbia Harbor as Oregon's international trade

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<sup>7</sup> City of Portland (2012). *Economic Opportunities Analysis – Section 4 Alternative Choices*. p. 26. Retrieved from <http://www.portlandonline.com/portlandplan/index.cfm?c=51427&a=392786>

<sup>8</sup> Dill, 2007.

<sup>9</sup> City of Portland (2012). *Economic Opportunities Analysis – Section 4 Alternative Choices*. p. 19. Retrieved from <http://www.portlandonline.com/portlandplan/index.cfm?c=51427&a=392786>

gateway, freight distribution hub, and international airport. The Transportation chapter of this Plan integrates recommendations and projects identified by the Freight Master Plan.

The Economic Opportunities Analysis also recommends prioritizing and better linking freight transportation improvements with other infrastructure investments in employment districts. To begin, it recommends working with regional partners to develop a regional freight rail strategy focused on enhancing rail access, travel time, and the efficiency of rail operations for competitive access to markets.

### **Funding investments**

Portland, like many cities across the nation, faces infrastructure funding challenges. Although the City is implementing best management practices and working with public and private partners to improve the efficiency and effectiveness of its infrastructure systems, new ways to fund infrastructure will be needed in the future, either to replace currently outdated funding systems or supplement inadequate funding levels. Portland's Economic Opportunities Analysis (2012) recommends that the City, and the region, pursue alternative infrastructure investment and funding strategies to maintain a competitive and innovative business environment. In particular, the EOA lists maintenance and upgrades to the transportation system, particularly for freight mobility, and broadband investments to support high tech industry as key infrastructure investment areas in need of alternative funding strategies.<sup>10</sup>

### **Maintaining Affordability**

In order to support community prosperity and affordability for households and businesses, the City aims to cost-effectively provide high-quality, reliable infrastructure services to the community. To accomplish this goal, the City is working to prioritize preventative maintenance to minimize future costs, compare the costs and benefits of proposed actions, employ risk management principles to direct public resources at the most urgent needs, and utilize diverse funding streams.

## **Education**

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Creating an educated Portland requires that all youth have the necessary support and opportunities to thrive – both as individuals and as contributors to a healthy community and a prosperous, sustainable economy.<sup>11</sup>

### **Supporting youth success**

The City's infrastructure, particularly its transportation systems, parks and recreation facilities, natural areas, and police and emergency services are critical to creating neighborhoods that support youth success. The Portland Plan sets a 2035 goal that all youth live in safe and supportive neighborhoods with safe and affordable transportation options, multiple opportunities for daily physical activity and healthy eating, public safety services, and quality schools that offer multiple community-serving functions.

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<sup>10</sup> City of Portland (2012). *Economic Opportunities Analysis – Section 4 Alternative Choices*. p. 11. Retrieved from <http://www.portlandonline.com/portlandplan/index.cfm?c=51427&a=392786>

<sup>11</sup> City of Portland (2012). *The Portland Plan*. p. 33.

The Citywide Systems Plan includes a variety of investments that help to create complete neighborhoods that support youth success. The Plan includes active transportation investments to create safe walking and biking routes throughout the city to key destinations like schools, centers, employment areas, transit, parks and natural areas. It also includes programs and investments to maintain and improve parks, recreation facilities and school grounds to increase access to recreation. The Plan supports investments, programs, and partnerships to bring nature into the city through enhanced habitat corridors, tree planting, and the use of vegetated stormwater facilities, like green streets and stormwater swales. Finally, the Citywide System Plan also supports continued collaboration between the City and local school districts around safe routes to schools, recreational programs, and neighborhood and police services.

## **Human and watershed health**

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A healthy city requires quality basic services to protect and promote human health and safety and watershed health. The City's transportation, water, sewer, stormwater, trails, green infrastructure, parks natural areas and recreation, and police and fire facilities and services are all critical to protecting and maintaining health and quality of life. The Citywide Systems Plan includes investments in projects and programs to manage and maintain these public infrastructure systems to provide these essential services.

### **Creating healthy, complete neighborhoods**

In complete neighborhoods, people have safe and convenient access to the places, goods, and services needed in daily life. These neighborhoods include housing options, employment options, grocery stores and other commercial services, quality public schools, parks, trails, natural areas and recreational facilities, affordable active transportation options, and civic amenities. A complete neighborhood must also meet the needs of people of all ages and abilities.

Complete neighborhoods can improve human and watershed health by protecting air and water quality through more trees and other green infrastructure; creating safe and convenient options to walk, bike, or take transit; and providing access to nearby parks and natural areas. These elements further promote human and environmental health by reducing auto emissions and other pollutants, and by supporting community resiliency and preparedness in an emergency or disaster. Maintaining existing built and natural infrastructure, as well as providing new infrastructure, is critical to creating complete neighborhoods.

The Citywide Systems Plan includes a variety of investments aimed at creating healthy, complete neighborhoods – including investments in active transportation networks, parks and natural areas, green infrastructure, and emergency response.

### **Connecting people and places**

Connecting Portlanders through active and low-carbon transportation options to their neighborhoods and to key destinations across the city and the region is integral to improving personal, public, and environmental health. These key destinations include places like work, school, shops, and parks and recreational opportunities. Such transportation choices reduce the need to drive, which can promote health by increasing physical activity, reducing household costs, increasing access to the outdoors, and

reducing carbon and other air and water pollutants. Making active transportation a safe and convenient option requires creating a network of safe, accessible and attractive streets, trails, and greenways that encourage active living and community interaction and that integrate nature into neighborhoods. In addition to human and environmental health benefits, shifting travel to active transportation can increase capacity on roadways for freight and automobile movement. Preserving this capacity supports economic prosperity and reduces the need for additional roadway capacity as the city and region grow. The Citywide Systems Plan includes projects and programs to improve active transportation and greenway networks and to improve the safety of the city's roadways.

## **Protecting and improving watershed health**

Healthy watersheds provide a broad array of ecosystem services. Trees, natural areas and other green infrastructure help keep the air and water cool and clean, support stream flow and stormwater management, protect and enhance biodiversity, and reduce the risks and impacts of natural hazards and climate change. These "ecosystem services" are critical for protecting public health and safety and ensuring the effectiveness of Portland's infrastructure systems. They also help the City meet environmental regulations.

The Natural Resource Inventory, adopted as part of the factual basis for the Comprehensive Plan, will inform programs to protect and restore the rivers, streams, wetlands, and vegetation that provide these ecosystem services, and that are vital components of City's stormwater infrastructure system in many Portland neighborhoods. In addition, the Portland Plan establishes objectives and actions for protecting and improving watershed health and associated benefits by 2035.

Multiple bureaus, including Portland Parks & Recreation and the Bureau of Environmental Services, play a role in protecting, restoring, and enhancing watershed health in the city. The Citywide Systems Plan identifies priority projects and program investments needed to sustain and improve key watershed functions relating to hydrology (how water interacts with the natural and built landscapes), water quality, habitat and wildlife, and to meet existing and emerging regulatory obligations.

## **Designing with nature**

The Citywide Systems Plan and the Comprehensive Plan Update's draft goals and policies encourage infrastructure design that protects and enhances watershed health and ecosystem services and avoids the costs associated with degraded natural resources. The updated goals and policies call for treating stormwater as a resource, protecting existing green infrastructure and adding tree canopy and landscaped stormwater facilities into development and street design in order to mimic the natural functions of a healthy watershed. The Citywide Systems Plan includes policies and investments intended to further integrate green infrastructure into infrastructure planning, design, and implementation, while complementing Comprehensive Plan policies that encourage environmentally-friendly development and building design.

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## Resilience

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### Preparing for climate change

Portland's climate is changing. Temperatures have increased by an average 1.3° F over the past century in the Pacific Northwest. Precipitation in the Pacific Northwest has generally increased, especially in the spring. The future impacts Portland experiences from climate change will depend largely on whether global carbon emissions decline quickly, plateau, or continue to rise.

In the Pacific Northwest, climate change projections indicate an increase in average annual temperature of 3.3° F to 9.7° F by the end of this century, with greater warming happening in the summers. These projections forecast decreases in summer precipitation (by as much as 30 percent) and increases in winter precipitation over the coming century. In the future, Portland will likely experience hotter, drier summers, and warmer, wetter winters, with more heat waves occurring during the summers.

Portland's infrastructure is vulnerable to several climate change risks including increased flooding and landslides in the winter, and high temperatures, drought, and wildfires in the summer. Portland's built infrastructure has been designed to withstand the historic climatic record. Events outside of that past experience, or an increased number of damaging events, can significantly impact important infrastructure services such as water, sewer, stormwater, flood management, and transportation. Climate change impacts can result in some infrastructure systems becoming more frequently stressed, overloaded, damaged, or at times, partially or totally unavailable. The Citywide Systems Plan includes investments to help ensure the reliability of the City's infrastructure, including improvements to water supply sources and stormwater management facilities.

Portland's green infrastructure, including trees, ecoroofs, green street facilities, natural areas, wetlands, natural waterways, and floodplains, could also be affected by climate change. For example, hotter summers can stress vegetation and make it more susceptible to diseases, pests, and invasive species. Increased flooding onto developed lands threatens homes, businesses, and roadways, and is likely to result in increased pollution and sediment entering streams, reducing water quality. However, investment in green infrastructure could mitigate stress on other assets and on Portland's residents and businesses. For example, increased tree canopy can reduce the severity of heat waves, and green streets can reduce urban flooding. The Citywide Systems Plan includes a variety of investments to protect, enhance, and restore the city's natural areas, urban canopy, and other green infrastructure.

Considering the impacts of climate change and identifying the vulnerabilities and risks of those impacts, enables the City to make more informed infrastructure investment decisions to better prepare and adapt for climate change and improve the resiliency of critical infrastructure. Climate change vulnerabilities must be incorporated into the risks of failure of the City's built and green infrastructure so assets can be appropriately maintained, designed, and replaced to improve the resiliency of systems to hotter drier summers, wetter winters, and storms of increased intensity.

## Preparing for and responding to natural hazards<sup>12</sup>

The City of Portland faces potential impacts from a wide variety of natural hazards including earthquakes, severe weather, floods, landslides, urban wildland fires, and volcanic activity. The City's infrastructure facilities and services are vulnerable to natural hazards and are also key to recovering from such events. The City's Natural Hazard Mitigation Plan identifies natural hazards, assesses the related threat and vulnerability to the city's facilities, and recommends mitigation strategies to address high risk assets. The following types of infrastructure are important to hazard preparedness, response, and recovery:

- **Essential facilities** are necessary for continuation of operations and include police and fire stations, City Hall, the 1900 Building, the City's Emergency Coordination Center, the 911 Call Center, and the Justice Center.
- **Critical facilities and infrastructure** include "systems and assets necessary to ensure continuity of security, safety, health and sanitation services, support the area's economy and/or maintain public confidence. Incapacitation or destruction of any of these systems or assets would have a debilitating impact on the area either directly, through interdependencies and/or through cascading effects."<sup>13</sup> Critical infrastructure includes public services that have a direct impact on quality of life such as communication technology (phone lines or Internet access); vital services such as public water supply, sewage treatment; and transportation facilities, such as airports, heliports, highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots and waterways, harbors, and dry docks.
- **Lifelines** include utility systems (potable water, wastewater, oil, natural gas, electric power facilities, and communication systems) and transportation systems (airways, bridges, roads, tunnels, and waterways). Communications facilities are also important lifelines.
- **High Potential Loss Facilities** include facilities that would have a high loss (environmental, economic, or human life and safety) associated with their failure, such as nuclear power plants, levees, dams, and military installations. In Portland, City-owned high potential loss facilities include Portland Water Bureau reservoirs, such as those at Mount Tabor and Washington Park.

The Citywide Systems Plan includes investments to improve the resiliency of the City's infrastructure to natural and other hazards. These include projects to reduce risks to essential and critical infrastructure; improve and restore the city's green infrastructure; enhance the seismic resilience of facilities; and provide redundant (i.e. backup) infrastructure for assets like water and sewage pump stations.

## Adapting to social and economic changes

Resilient infrastructure must be adaptable to social and economic shifts as well as natural and climactic changes. Many types of infrastructure built today – including roads, pipes, and parks – are expected to last for many decades. Planning, managing, and investing in the City's infrastructure in ways that reflect changing demographics and economic needs will be integral to meeting the needs of the community over coming decades.

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<sup>12</sup> Adapted from City of Portland, Natural Hazard Mitigation Plan, 2010.

<sup>13</sup> Portland/Vancouver Urban Area Critical Infrastructure Protection Plan, 2009.

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