Climate Change Adaptation through Local Comprehensive Planning:

Guidance for Puget Sound Communities

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Meeting the challenges of climate change

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Mitigation and Adaptation

There are essential roles for both climate mitigation and adaptation strategies in Bainbridge Island's actions relating to climate change, including in our Comprehensive Plan.

> **"Mitigation** responses aim to reduce the rate and extent of climatic change caused by greenhouse gas emissions, while **adaptation** responses address the effects of climate change by increasing resilience and/or decreasing vulnerability. Combined, these two approaches create a comprehensive, integrated strategy for addressing climate change." (Central Puget Sound Regional Open Space Strategy 2015)

Mitigation can be achieved through approaches such as higher-density development, reducing vehicle miles traveled, non-motorized transit, green building techniques, and renewable energy sourcing.

Adaptation addresses the effects of climate change (including sea level rise, altered precipitation pattern with related flood and drought, increasing temperature) through approaches such as low-impact development; climate certified zoning, permitting & procurement; and climate-savvy hazard mitigation.

Acknowledgements:

EcoAdapt would like to thank the Bullitt Foundation for their generous support and belief in the importance of this project. We are also grateful to the Bainbridge Community Foundation, Sustainable Bainbridge and the City of Bainbridge Island staff, City Council and Planning Commission for their partnership in the initial work with their community that fostered this project, as well as our two early reviewers in that process, Michael Cox and Cami Apfelbeck, and the stalwart copy editing of Julie Witz.

Finally, we dedicate this report to the past, current and future citizens of the Puget Sound Region. We hope that this product will sustain the legacy of our past, challenge the imagination of our present and foster the survival of our future.

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Why Communities should include Climate Change in their Comprehensive Plans

If you're updating a Comprehensive Plan, you should be thinking about climate change, consider these points:

- Local comprehensive planning asks every community to think about and plan for future growth and development. Part of this future involves climate change, the impacts and implications of which need to be understood and addressed. Doing so within a community's Comprehensive Plan is logical and appropriate.
- As communities come to understand climate change and the manifestations and impacts it will have in your region, it should not be difficult for local government leaders to realize that planning for climate change has a place within local land use policy and planning. Consideration the Washington Growth Management Act makes it clear that climate change impacts have the potential to affect every planning goal of the state planning act. A durable local plan will need to be climate-savvy.
- The Puget Sound Regional Open Space Strategy identifies open space preservation as a key mechanism through which to implement climate mitigation and adaptation (ROSS 2015). Through land use planning and local comprehensive planning communities have the opportunity to make climate-savvy development and conservation choices.
- "Changing climate trends and patterns will result in a *new normal* for planners to consider in planning for the long-term sustainability of their community, grow their economy, allocate their public services (e.g., public health investments), protect their population and natural resources, and prioritize their investments. **Historic trends and past events may not provide sufficient data to make informed decisions** as future climatic conditions change and affect your municipality." (APA 2015, emphasis added)
- "Land uses delineated in comprehensive plans provide the foundation for city government and private actions that have a substantial long-term effect on whether our cities move toward carbon neutrality and energy efficiency or accelerate climate change and increase energy costs. Land development decisions are infrastructural - once made, they are extremely difficult and expensive to undo. Consequently, land use plans either enable other best practices, or hinder their effectiveness." (MN GreenStep Cities, https://greenstep.pca.state.mn.us/bestPracticesDetail.cfm?bpid=6).
- Comprehensive planning is an active community engagement process that is understood and accepted as normal by Puget Sound communities today. "Planning for climate change – adaptation and mitigation – corresponds to the common steps in a typical planning process" (APA 2015). Future climate scenarios and expected impacts information should be considered just like other baseline data that is commonly used to inform long-range planning.
- Comprehensive planning that is done within the frame of climate consciousness can replace need for a separate Climate Action Plan.
- Compact development, low impact development, and alternative transportation are main land use policy decisions that can positively affect climate change mitigation and ease adaptation. "Smart growth principles can improve the bottom line for businesses, households and governments by increasing property values, cutting fuel and infrastructure costs, creating jobs, enhancing public health and strengthening communities" (Growing wealthier: smart growth, climate change and prosperity, Center for Clean Air Policy: 2011).

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Washington State Planning Mandate

Adopted in 1990, the Washington State Growth Management Act (GMA) [Revised Code of Washington (RCW)] requires the states' fastest growing counties and the cities within them to prepare comprehensive plans. The planning mandate and legislative finding are clearly stated:

> *The [Washington] legislature finds that uncoordinated and unplanned growth, together with a lack of common goals expressing the public's interest in the conservation and the wise use of our lands, pose a threat to the environment, sustainable economic development, and the health, safety, and high quality of life enjoyed by residents of this state. It is in the public interest that citizens, communities, local governments, and the private sector cooperate and coordinate with one another in comprehensive land use planning. Further, the legislature finds that it is in the public interest that economic development programs be shared with communities experiencing insufficient economic growth. (RCW 36.70A.010)*

Jurisdictions planning under the Act are required to plan for 20 years of growth and must address issues of land use, housing, capital facilities, utilities, rural issues, transportation, economic development, and parks and recreation in eight mandatory plan elements (RCW 36.70A.070). Optional plan elements are encouraged for other planning issues relating to the physical development within a jurisdiction, such as conservation, solar energy, and recreation (RCW 36.70A.080).

The GMA states that, "[e]ach county and city that is required or chooses to plan under RCW 36.70A.040 shall perform its activities and make capital budget decisions in conformity with its comprehensive plan" (RCW 36.70A.120). Therefore, while the Comprehensive Plan is only a policy statement providing direction to a community, that community is then obliged to *put its money where its mouth is*, so to speak.

As communities become aware of the manifestations and impacts that climate change will have in our region, it should not take long for local government leaders to realize that planning for climate change has a place within local land use planning. When looking through a climate lens at each of the state GMA planning goals it is clear that climate change will potentially affect each one of them. Accommodation for the impacts of climate change, or climate adaptation planning, should be dovetailed with any local comprehensive planning effort and associated regulation. Box 1 helps to explain why this is the case. It refers a reader to tables within this document that clearly discuss the impacts of climate change on each State GMA Goal. Using that climate lens, Box 1 reworks the State GMA Goals to make them climate savvy:

Box 1: Comparison of State Planning Goals and inclusion of Climate Adaptation into Planning Goals

Washington's Growth Management Planning Goals - Adopted to guide comprehensive planning and development regulations in the state of Washington (per RCW 36.70A.020)	**Discussion of the impacts of climate change on this goal:**	**Suggested Climate Savvy GMA Goal (should also be adopted by a community as a local climate-savvy goal) (additions in blue):**
Urban growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.	Table 2	Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner. All development investment should be located outside of current and future hazard zones.

Washington's Growth Management Planning Goals - Adopted to guide comprehensive planning and development regulations in the state of Washington (per RCW 36.70A.020)	Discussion of the impacts of climate change on this goal:	Suggested Climate Savvy GMA Goal (should also be adopted by a community as a local climate-savvy goal) (additions in blue):
Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.	Table 2	Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development, while encouraging location of development adjacent to mass and non-motorized transit corridors. Any allowed conversion of undeveloped land should maintain habitat connectivity such that species and ecosystem services are maintained under current and future conditions.
Transportation. Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.	Table 6	Encourage efficient multimodal transportation systems that are based on regional priorities, coordinated with county and city comprehensive plans, and site infrastructure outside of current and future hazard areas.
Housing. Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.	Table 5	Encourage the availability of affordable housing to all economic segments of the population of this state that respects affordability over time by developing energy efficient stock located outside of current and future hazard areas. Promote a variety of residential densities and housing types, and preserve existing housing stock if located outside of current and future hazard areas.
Economic Development. Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities.	Table 7	Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses with particular emphasis on investment in and encouragement of businesses and industries that utilize renewable sources of energy, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic growth, all within the current and future capacities of the state's natural resources, public services, and public facilities.
Property Rights. Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.	N/A	Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions. Begin to consider that as climate changes, private lands will become vulnerable to hazards (e.g. sea level rise, erosion, shoreline change, ecosystem migration), which may affect property rights.

Washington's Growth Management Planning Goals - Adopted to guide comprehensive planning and development regulations in the state of Washington (per RCW 36.70A.020)	Discussion of the impacts of climate change on this goal:	Suggested Climate Savvy GMA Goal (should also be adopted by a community as a local climate-savvy goal) (additions in blue):
Permits. Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.	N/A	Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability. Permitting should not be granted without full consideration of the implications of climate change over the life of the product of the permit.
Natural resource industries. Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forestlands and productive agricultural lands, and discourage incompatible uses.	Table 4	Maintain and enhance natural resource-based industries for both productivity and conservation of function under future climate scenarios, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forestlands and productive agricultural lands, discourage incompatible uses, and ensure ecosystem function under future climate scenarios. Due consideration of future conditions and the effects on natural resource-based industries must be part of management.
Open Space and Recreation. Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.	Table 2, 4 & 8	Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities, all considering current and future environmental conditions.
Environment. Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.	Table 2 & 4	Ensure the durability of our state's environment and enhance our high quality of life, through protection for air and water quality, as well as water availability even as temperature and precipitation patterns change.
Citizen Participation and Coordination. Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.	N/A	Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts. Advance the understanding by citizens of the implications of climate so they are informed stakeholders and can plan for the future accordingly.
Public Facilities and Services. Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.	Table 6 & 9	Ensure that public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards. Also, ensure that any existing or newly permitted public facilities and services are designed to consider current and future climate scenarios when calculating level of service and are required to avoid present or future hazard areas.

Washington's Growth Management Planning Goals - Adopted to guide comprehensive planning and development regulations in the state of Washington (per RCW 36.70A.020)	Discussion of the impacts of climate change on this goal:	Suggested Climate Savvy GMA Goal (should also be adopted by a community as a local climate-savvy goal) (additions in blue):
Historic Preservation. Identify and encourage the preservation of lands, sites, and structures, that have historical or archaeological significance.	Table 9	Identify and encourage the preservation of lands, sites, and structures, that have historical or archaeological significance, including planning for their vulnerability under future climatic conditions.

Puget Sound communities need climate adaptation planning in local comprehensive plans

By explicitly considering climate change in local planning and decision-making, your community will be on a path to a resilient future. These actions must start today as the decisions currently being made will set the stage for our ability to respond to changing climatic conditions in the future. The broader vision and hope for the guidance contained herein is that it will enable Puget Sound communities to effectively adapt to the implications of a changing climate in the coming decades.

Communities need to know how to begin planning for climate change. One guiding premise is that:

Communities can make good decisions when they have information and know what questions to ask.

Let's break that down.

***Communities*:** That means all community members, not just City Council members, not just City department staff, but every member of the community in whatever their capacity — teacher, retailer, physician, developer, emergency service provider, landscaper, student, you name it.

***Good decisions*:** Good decisions are the ones that get you to good outcomes now and into the future. They don't trade short-term gains for long-term problems. They demonstrate prudent use of community time and money in order to achieve community benefit and serve the public good.

***Information*:** This means not just reflecting on what you want or what you think, but doing research to learn what is the state of knowledge regarding climate change and undergoing an analysis to determine how that knowledge applies to local conditions and goals.

***Questions*:** Sometimes the best place for a community to use information is by asking the questions that will illuminate the path to a good decision.

Model Process for Incorporating Climate Change into your Comprehensive Plan

A community update of a local comprehensive plan (LCP) is a very appropriate mechanism with which to dovetail climate adaptation planning. As individuals, as a community and as a society, we need to plan for climate change, just as we plan for future growth, social needs and economic trends. Doing so within a community's LCP is logical and appropriate

The City of Bainbridge Island (COBI) did just that. Their process is presented here as an example of a successful attempt to incorporate climate change adaptation planning into an LCP update. The City process was a bit different than what other communities may have the chance to undertake, as an outside organization (EcoAdapt) obtained local funding from the Bainbridge Community Foundation and developed the Bainbridge Island Climate Impact Assessment (BICIA) in collaboration with the City simultaneous to the two-year LCP update process. During the creation of the BICIA, EcoAdapt also provided ongoing input, and drafted goals and policy language suggestions for the City to consider as it revised each element.

Local Note: In 2015-2016 Bainbridge Island, WA, undertook a comprehensive plan update during which the City made significant strides toward including climate savvy policy guidance. Tips and lessons learned from that local process are included within this document as example (marked as "Local Note:").

Figure 1 below shows the process undertaken by EcoAdapt to develop the BICIA. Major components included a community elicitation process, whereby local knowledge and community values were gathered to infuse the BICIA with innovative community-driven solutions. A community workshop (held at Bainbridge Island City Hall on November 18, 2015) enabled citizen access to informational materials and one-on-one engagement that helped to build local capacity and climate literacy. An intended outcome of that workshop was to provide information and guiding questions so the community could create a more resilient Bainbridge Island in the face of climate change. If the content that stems out of this process that was incorporated into the 2017 revision of the LCP is then implemented throughout local regulations, City actions, budgets and programs, Bainbridge Island will have policy guidance in place to help effectively manage the changing conditions in the decades to come. At the time of this publication the draft 2016 Comprehensive Plan was expected to be adopted by City Council in February 2017.

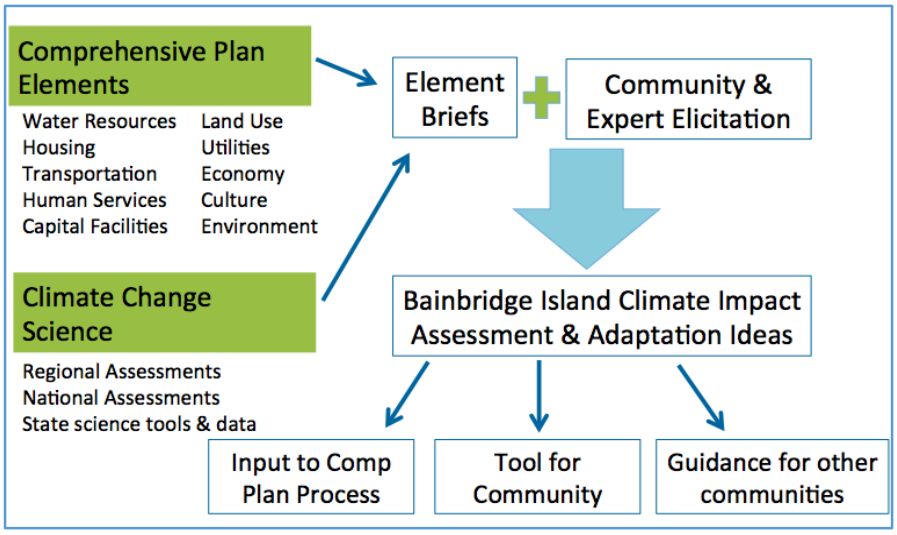

Figure 1. The BICIA process, depicted here, used existing, freely accessible information and community engagement to provide a tool for use by all Bainbridge Islanders in their own work, as well as in the update of the Comprehensive Plan. This process will also provide guidance for other communities. The Element Briefs referenced in this figure were created for Bainbridge Island and are available on the BICIA Workshop Support page (EcoAdapt.org/workshops/BICIA-workshop). Each Brief breaks down the existing Comprehensive Plan goals, presents planning questions to guide community evaluation of the climate vulnerabilities of each element, and presents the climate impacts expected on that element. These Briefs are models that can be utilized by other Puget Sound communities.

Rather than creating a stand-alone climate change plan for the City of Bainbridge Island, this process encouraged the integration of climate change information directly into existing decision-making processes such that all future decisions will be climate informed and can benefit from the latest information, because climate change is a topic of emerging information and has implications for virtually every facet of our lives.

The BICIA is intended to guide Bainbridge Island officials and citizens to incorporate climate change considerations into all activities. COBI can use the BICIA to do the following:

- Serve as a foundation for the City and its citizens to create a more resilient Bainbridge Island in the face of climate change, by giving a framework for **regular integration of climate impacts and implications into all local activities;**
- Inform their Comprehensive Plan update and implementation processes;
- Assist with planning and decision making, such as siting, improvements, finance and project design undertaken by local government agencies including City of Bainbridge Island, Bainbridge Island Police Department, Bainbridge Island School District, and Bainbridge Island Metropolitan Park and Recreation District; and,
- Assist with public/private partnerships, such as business improvement, transportation, and housing.

Local government decisions can help improve local community outcomes, but the decisions each citizen makes have implications for their own lives as well as for our collective community resilience. The BICIA was intended to inform the Comprehensive Plan, but it also served a different function, which was to help all Island residents mainstream climate savvy decision-making into their lives and actions. These ideas are valid for any Puget Sound community. Public participation and citizen engagement in a GMA update is valuable for creating a better plan. It is also an opportunity to raise climate change awareness generally.

See Box 2: *What Can Community Members Do*, for ideas of what we can all be doing to make more informed and effective decisions considering climate change.

Box 2: WHAT CAN COMMUNITY MEMBERS DO?

1) **Inform yourself of the regional context.** Resources to get you started include:

- Puget Sound regional climate change impacts reports (Mauger et al. 2015), available at cses.washington.edu/picea/mauger/ps-sok/PS-SoK_2015.pdf;
- Washington Chapter of the American Planning Association's website, including their "Ten Big Ideas," the first of which is to address climate change: www.washington-apa.org/address-climate-change;
- Inform yourself using a local example. These resources will introduce you to the concepts and can be considered as framework to then insert their own community specific issues.
- An interview with Dr. Lara Hansen, EcoAdapt, by Bainbridge Community Broadcasting, providing information on climate change and Bainbridge Island (bestofbcb.org/cafe-031-ecoadapt-helps-cobi-comp-plan-to-adapt-to-climate-change/);
- Guides to evaluating the climate vulnerability of a Comprehensive Plan element. See Bainbridge Island Element Briefs available at EcoAdapt.org/workshops/BICIA-workshop.

2) **Help your community incorporate climate change into all activities:**

- Encourage the **Planning Commission** to add all climate-savvy recommendations into the next update of your Comprehensive Plan update.
- Ensure that the **Comprehensive Plan recommendations** become part of local code and practice.
- **Be the voice** that asks about climate change when decisions are being made.

3) **Make your own climate-savvy decisions at home, school and work**

- Consider how you can make a personal contribution to mitigation and adaptation. There are goals, policies and actions that you can take in your business or home. Modify what you see here for your own needs. Make your personal ecosystem climate savvy and durable.
- Take every opportunity you have to plan for climate change in building, maintenance and transportation choices, including:
    - energy efficiency,
    - landscape and lawn care choices,
    - facilities siting and design,

What is within this Climate Adaptation Guidance?

Using the framework of local comprehensive planning and the Washington State Comprehensive Plan requirements under the Growth Management Act, this guidance was developed to enable understanding and inclusion of anticipated climate change impacts into the local long-range planning by Puget Sound government officials and citizens.

This resource intends to enable your community to incorporate climate-informed decisions into your local comprehensive planning. Users should be able to find relevant local climate change information (including projections), formulate questions to help evaluate the implications of climate change on any element of community planning, and make climate-savvy goals, policies, and implementation decisions that will generate the best long-term outcomes for your community — its businesses, schools, services, recreation, ecosystems and individuals.

This climate adaptation planning handbook is presented in three main sections:

Section One: General Impacts of Climate Change anticipated for the Puget Sound region. This section summarizes the climate change impacts expected to affect the region for six impact areas: temperature, precipitation/storminess, sea level rise, vegetation change, ocean acidification and slope stability. Table 1, Climate Change Implications for Comprehensive Plan Elements, identifies the impacts of each of these six areas on the element areas within a typical local comprehensive plan.

There will always be uncertainty in climate information, however this should not stop or delay action. Climate change will alter the circumstances upon which everyone makes decisions; to continue making durable and resilient choices one needs to overlay the expected impacts onto an issue area, determine what the implications of climate change will be, and then to act in a way that will allow for durable and resilient choices, development and investment.

Section Two: Climate Change Implications for Comprehensive Plan Elements. Climate adaptation planning requires one to understand how climate change will impact the baseline information used to make decisions within any area of expertise. Then, to understand how that baseline information will change over time. Lastly, to adapt to climate change local government officials and others need to accommodate that change in their planning, permitting, and fiscal decision-making.

This section is organized by local planning elements and:

a. Provides details about each climate impact and how it will have implications on an elements' concerns (including Tables 2 through 9—Element Implications from Climate Change), and;
b. Provides questions for each element that should be asked and discussed by the community at large and local decision-makers. Doing so will imbed climate change into your thinking and enable your community to adapt to likely implications.

c. Identifies priority Goals and Policies that should be incorporated into each Local Comprehensive Plan element to make the community climate-savvy and to lay a policy foundation for climate adaptation actions.

Section Three: Implementation Actions. This comprehensive plan guidance leads up to what is perhaps the most important section – implementation actions for any climate savvy community. Table 10, Adaptation Planning Implementation, lays out climate adaptation implementation measures that are called for to address both climate mitigation and adaptation. After developing and adopting a Local Comprehensive Plan that frames local planning policy, action is needed to implement measures intended to effect either climate mitigation or adaptation. The recommended actions are:

1. **Adopt a Local Comprehensive Plan that clearly links climate change implications to the interests of all local planning and policy goals.**
2. **Create a Climate Change Task Force**.
3. **Develop and require a Climate Assessment Certification**.
4. **Integrate climate information into all decision-making processes.**

Section One: General Impacts of Climate Change Anticipated for the Puget Sound Region

The effects of climate change relevant to the Puget Sound region can be categorized in terms of six impact areas: temperature, precipitation/storminess, sea level rise, vegetation change, ocean acidification and slope stability. Understanding the implications of each, their interactions with each other and their interactions with other factors can improve our ability to make good long-term decisions.

Temperature

Regional climate has warmed over the past century, with increasing warming in the past thirty years (Mauger et al. 2015)[1]. This pattern is expected to continue in the 21st century with an increase of double to ten time as great. In degree terms, the historic average temperature for the Puget Sound lowland region was 50.3° F between 1950 and 1999, with 1.3° F of warming by 2014. This trend is consistent throughout the region. Along with this warming, the frost-free season has grown longer by 30 days.

Between now and mid-century, average air temperatures have a +4-5.5° F projected increase, with even greater warming possible in the years after. This warming, unlike warming observed to date which has not substantially affected spring temperatures, will affect all seasons, with the greatest increase in summers.

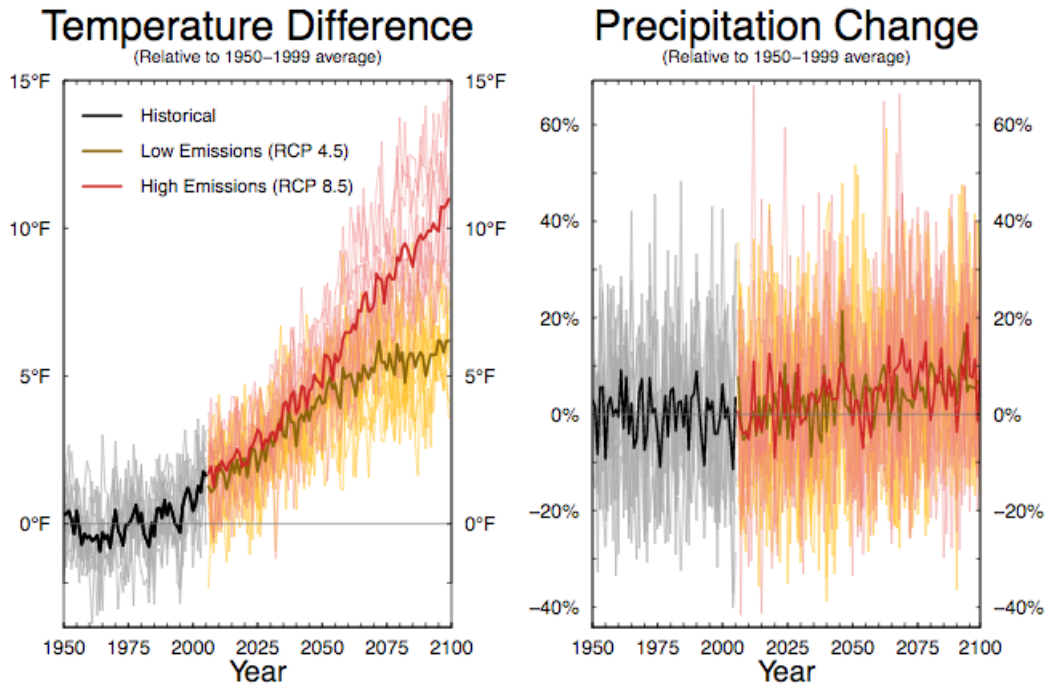

Figure 2. Regional projects for changes in temperature and precipitation. Note current emissions trajectory matches the RCP 8.5 curve on this graph. From Mauger et al. 2015.

[1] State of Knowledge: Climate Change in the Puget Sound, Mauger et al. 2015 is a report prepared by the University of Washington's Climate Impacts Group with a focus on the Puget Sound region.

Increasing temperature has implications for the Puget Sound in many aspects of regional planning. Increasing temperature may affect demand for water, and it will certainly increase the need for water by vegetation (natural systems, agriculture and landscaping). Increasing temperature will also affect terrestrial, freshwater and marine ecosystems. It will also increase local incidence of heat-related illness, increase likelihood of diminished air quality, and add thermal stress to the list of things degrading local infrastructure, such as road and bridges. (Table 1)

Precipitation/Storminess

To date there has not been a long-term change in regional precipitation. However, there has been a "modest increase" in rainfall events that are considered heavy. Going forward, year-to-year variation is expected to be the dominant factor in precipitation for all seasons except summer, which is expected to see declining precipitation (Mauger et al. 2015) (Figure 3). Additionally, there is an expectation for more intense (+22%) and more frequent extreme winter precipitation events (seven events per year, up from two event per year historically).

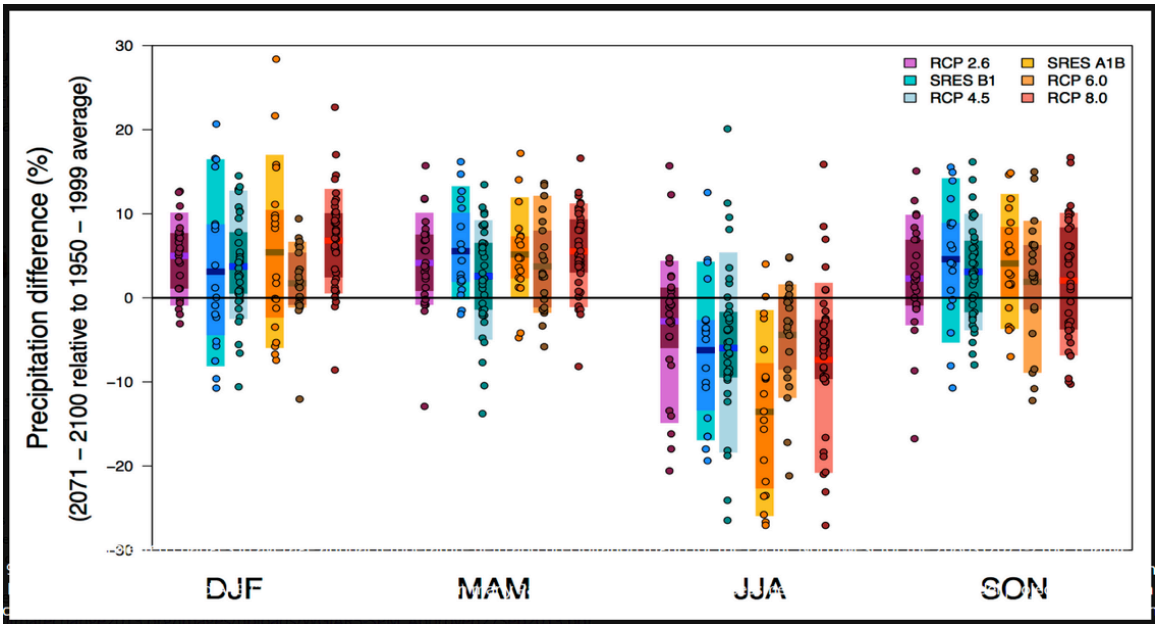

Figure 3. Projected percentage difference in precipitation by season for the Pacific Northwest based on six climate scenarios (RCP 2.6, 4.5, 6.0 and 8.0; SRES B1 and A1B). From the Climate Impacts Group, University of Washington.

Increasingly intense winter precipitation events have significant implications for all things affected by episodic flooding. This includes homes, businesses and critical infrastructure. For example, increasing "storminess" has the ability to overwhelm stormwater infrastructure that was designed to handle lower flows. Intensity of precipitation also negatively affects groundwater recharge rates (faster moving water has less time to infiltrate) and surface water quality (heavier, faster rains pick up contaminants, nutrients and sediments, enabling them to travel).

In addition to changes in the timing and intensity of precipitation events, we are also projected to have a shift in the type of precipitation as snow gives way to more rain (Mauger

et al. 2015). Driven in large part by regional warming this will result in reduced spring snowpack, estimated to be 25% less at mid-century than in 2006, as well as continued glacier loss. In the North Cascades a 56% decrease has already been observed from 1900 to 2009 (Dick 2013), and a 34% decrease in the Olympic Mountains from 1980 to 2009 (Riedel et al. 2015). These trends are expected to continue with projections for regional snowpack decline of roughly 50% by the 2080s (Mauger et al. 2015), in significant part due to a shift from snow to rain as the dominant form of precipitation for most watersheds (Hamlet et al. 2013). The result of this will be greater winter streamflow and reduced summer streamflow, both scenarios having implications for communities and ecosystems in the region.

Declining precipitation during the summer, already this region's dry season, may result in decreased groundwater recharge rates as well. These decreased rates may not be offset by more intense winter precipitation, because periods of high flow often result in a greater percentage of water running off in to the Sound. Summer drought can also increase the risk of vegetation or wildfires (which already occur in the region; Figure 4 for an example from Bainbridge Island), and a change in the types of vegetation that can thrive in this region.

Another concern with respect to changing precipitation patterns is the very large number of septic systems in the Puget Sound region, whose function will be affected by climate change because of either too much or too little water, which adversely affects their ability to function properly. Additionally "increased precipitation or sea level rise may certainly affect septic system performance due to their impacts on shallow groundwater levels and soil saturation" (J. Kiess, Assistant Environmental Health Director, Kitsap Public Health District, Pers. Comm., June 17, 2016).

Additional aspects of the implications of changing precipitation and storminess patterns for the Puget Sound region are outlined in Table 1.

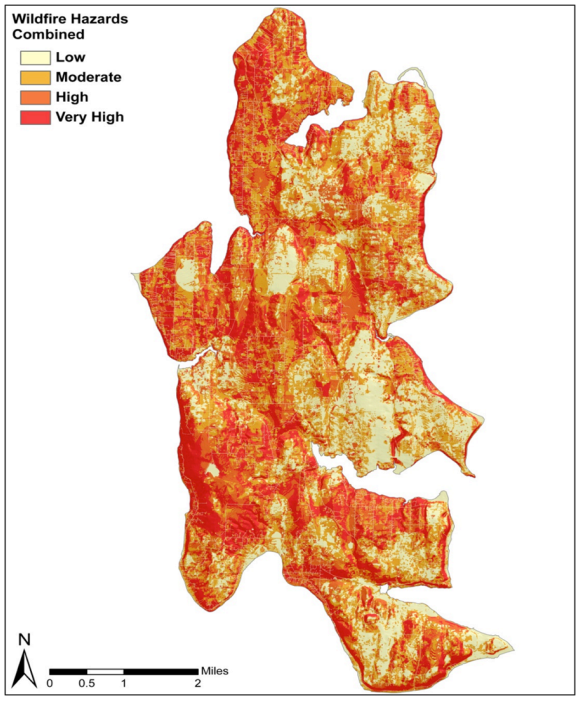

Figure 4. Wildfire hazards as identified in the Bainbridge Island Hazard Identification and Vulnerability Assessment. This map was created in 2010 based on an assessment and ranking of spatial hazards, proximity to hydrant, and past occurrence of vegetation fires, which in part is related to annual precipitation and weather. The hazard shown here is based on past conditions—climate change my result in increased occurrence or intensity of wildfires in some areas. From BIFD 2012.

Sea Level Rise

Global sea level rise and local factors are influencing sea level rise around the Puget Sound. Over the next century, conservative estimates show sea level rising 14 to 54 inches in our region (Mauger et al. 2015). Variability is largely due to local geological forces (uplift and subsidence) and our understanding of ice melt in Greenland and Antarctica, as global sea level rise is due to thermal expansion as ocean waters warm and increased volume as terrestrial ice sources (especially Greenland and Antarctica) melt into the world's oceans. Increases at even the lower end of this range could seriously affect Puget Sound ecosystems and infrastructure, inundating coastal habitat, flooding roads and structures, and compromising the functions of stormwater, septic and sewer systems (Figure 5).

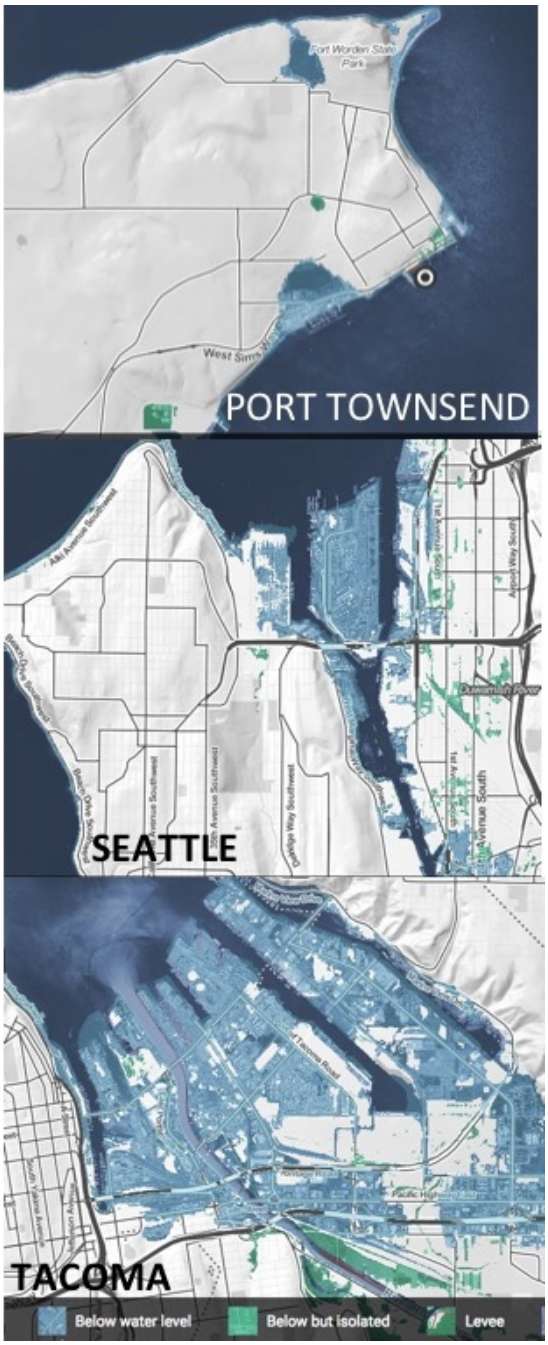

Figure 5. Several sites around the Puget Sound region with a projected 2 meters of sea level rise. From Surging Seas (sealevel.climatecentral.org).

It should be noted that shoreline planning will be directly affected by sea level rise. Shoreline Master Programs (SMP) are local land use policies and regulations designed to manage shoreline use in Washington State. They are prepared collaboratively by the Washington Department of Ecology (DOE) and each shoreline community, and must comply with the Shoreline Management Act (SMA) and Program Guidelines (Washington Administrative Code 2011). SMP are intended to "protect natural resources for future generations, provide for public access to public waters and shores, and plan for water-dependent uses" (WA Department of Ecology n.d.a. website).

Currently, the SMA *does not* require consideration of or planning for sea level rise. At the time of this report, the DOE was considering updating the rules that implement the SMA. Part of the scope under consideration is to include a new section on planning for sea level rise (WA Department of Ecology 2016). Guidelines could be amended to provide technical or procedural recommendations for jurisdictions that elect to voluntarily address future conditions resulting from sea level rise.

Another effect of sea level rise is the potential for seawater/saltwater intrusion into aquifers and nearshore surface waters. The combination of sea level rise, increased extraction of water (due to increased demand from population growth, increasing temperatures or other causes) and decreasing input/recharge (due to declines in summer precipitation, intensity of storm events and reduced permeable surfaces) can increase the

risk of saltwater intrusion into our aquifers. Saltwater compromising an aquifer reduces or precludes that waterbody's utility as a source of drinking, agricultural or habitat water, while possibly increasing local conflict and cost for water resources.

Local Note: In order to better understand groundwater resources, as well as future potential for salt water intrusion, the City of Bainbridge Island conducted a groundwater assessment and modeling project which included assessing climate change by considering three concurrent stressors (decreased recharge, 4-foot increase in mean sea level rise by 2100, and increased groundwater withdrawal rates based on population increases (Bannister et al. 2016).

It should be noted that the Puget Sound region is home to coastal Superfund sites, as well as other sites that host soil and groundwater contamination. The Wyckoff site, located at the mouth of Eagle Harbor on Bainbridge Island, was evaluated for vulnerability from climate change, especially sea level rise (EPA 2016a). Site managers are working with the knowledge that local sea level has risen approximately "8.6 inches from 1900 to 2008" and is projected to rise up to 9.5 inches by 2030, up to 19.7 inches by 2050 and up to 60.7 inches by 2100. Over the past several decades, projections of sea level rise have steadily increased. Therefore, prudence suggests planning for the higher end projections while preparing for even higher eventual increases. This is especially relevant since the U.S. Army Corps of Engineers has made estimates of water level impacts from the combination of sea level rise and 100-year extreme water levels, which have inundation at between 8 and 13 feet. To date there has not be any use of hydrological models to assess the implications of sea level rise and storm events on aquifers in the vicinity of the Wyckoff site in the evaluation of treatment options. However, considerations around flooding and rainwater runoff have been evaluated and are anticipated to be addressed with possible changes in outfall pipe diameter. (H. Bottcher, USEPA, Pers. Comm., June 1, 2016).

Additional aspects of the implications of sea level rise for the Puget Sound region are outlined in Table 1.

Vegetation Changes

Changes in local climate (e.g., increasing temperatures, decreasing summer precipitation) will affect local vegetation—forests, horticulture and agriculture. Forest distribution is projected to reduce Douglas fir in the Puget Sound region by mid-century, with possible expansions of western hemlock, whitebark pine and western red cedar across the Pacific Northwest (Mauger et al. 2015). With climate change, much of the Puget Sound region's current maritime evergreen needle leaf forest is projected to change (Figure 6). Summer water stress may decrease tree growth and increase fire risk. These changing conditions (e.g., climatological, heat and water stressed plants) are also likely to cause changes in pests. Therefore, while length of our growing season may increase, more extreme stressful conditions (heat, drought, flooding), coupled with pest pressure by new species and at different times may adversely affect agriculture and landscaping species.

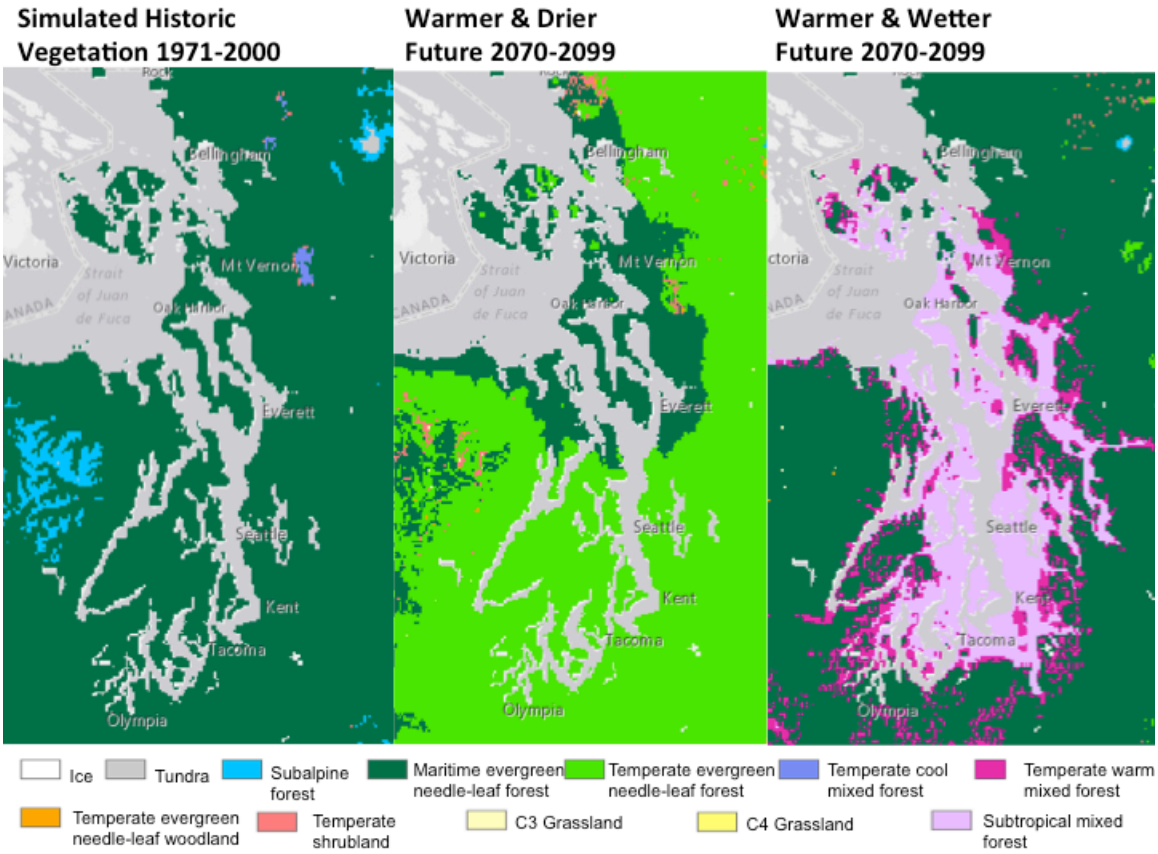

Figure 6. Projected vegetation changes for the Puget Sound region with two different possible futures (warmer and wetter, or warmer and drier). Based on MC1 dynamic model simulated potential vegetation using historic, MIROC 3.2 medres, and Hadley CM3 model ensembles, A2 SRES emission scenario. From DataBasin.org.

Local marine habitats will also see changes in flora and fauna. One area of particular concern is increasing magnitude and frequency of Harmful Algal Blooms, which can adversely affect shellfish, marine food webs and air quality. This is expected due to increasing temperature and altered pH (Mauger et al. 2015).

Additional aspects of the implications of vegetation change for the Puget Sound Region are outlined in Table 1.

Ocean Acidification

As carbon dioxide levels increase in the atmosphere, more carbon dioxide is absorbed by the world's oceans, resulting in acidification of the Puget Sound. Measurable declines in pH have already occurred and are expected to continue (Mauger et al. 2015).

The impacts of ocean acidification on Puget Sound may be further compounded by changes in circulation and salinity due to changing runoff (heavy precipitation, declining snowpack), water temperature and hypoxia (diminished dissolved oxygen). All of this has implication for water quality compliance and activities that affect or rely on water quality, including aquaculture and municipal sewage discharge compliance. Our understanding of the

ramification of ocean acidification is just beginning, with new revelations being made regularly. Puget Sound communities will need to monitor this issue in order to plan and respond effectively. In addition to staying up to date on the emerging science and management practices in relation to ocean acidification, we can also find out what is happening locally by using the closest ocean acidification monitoring buoy for the region, located in Dabob Bay (Dabob NANOOS ORCA buoy, www.pmel.noaa.gov/co2/story/Dabob). This site provides a local picture of how ocean conditions are changing and may help advise local decisions, such as marine resource management, aquaculture planning and permitting, and run-off and discharge issues.

Additional aspects of the implications of ocean acidification for the Puget Sound region are outlined in Table 1.

Slope Stability (confounded by climate change)

Climate change has the potential to affect slope stability by increasing saturation (due to altered precipitation intensity and timing), altering the vegetation that holds slopes together (due to altered precipitation and increasing temperatures), increasing erosion (due to sea level rise and altered precipitation) and undermining hillsides (due to sea level rise and flooding). As a result, it is necessary to consider how planning, conservation and development may need to be modified due to changing slope stability. According to the most recent building exposure risk analysis this can be significant. For the relatively small community of Bainbridge Island there were 177 buildings (valued at $55 million) located within landslide zones (FEMA 2015). Clearly this is not an insignificant concern for local planners.

Since slope instability can threaten public and private infrastructure and natural resources, and endanger lives, stability should be understood prior to any local permitting. Currently there are tools provided by the Washington Department of Ecology intended to guide regional land use decisions, although in most cases these do not incorporate climate change concerns. However localities can apply their own knowledge of changing precipitation and sea level rise to shoreline slope stability mapping products (Figure 7)(Coastal Zone Atlas of Washington 1979).

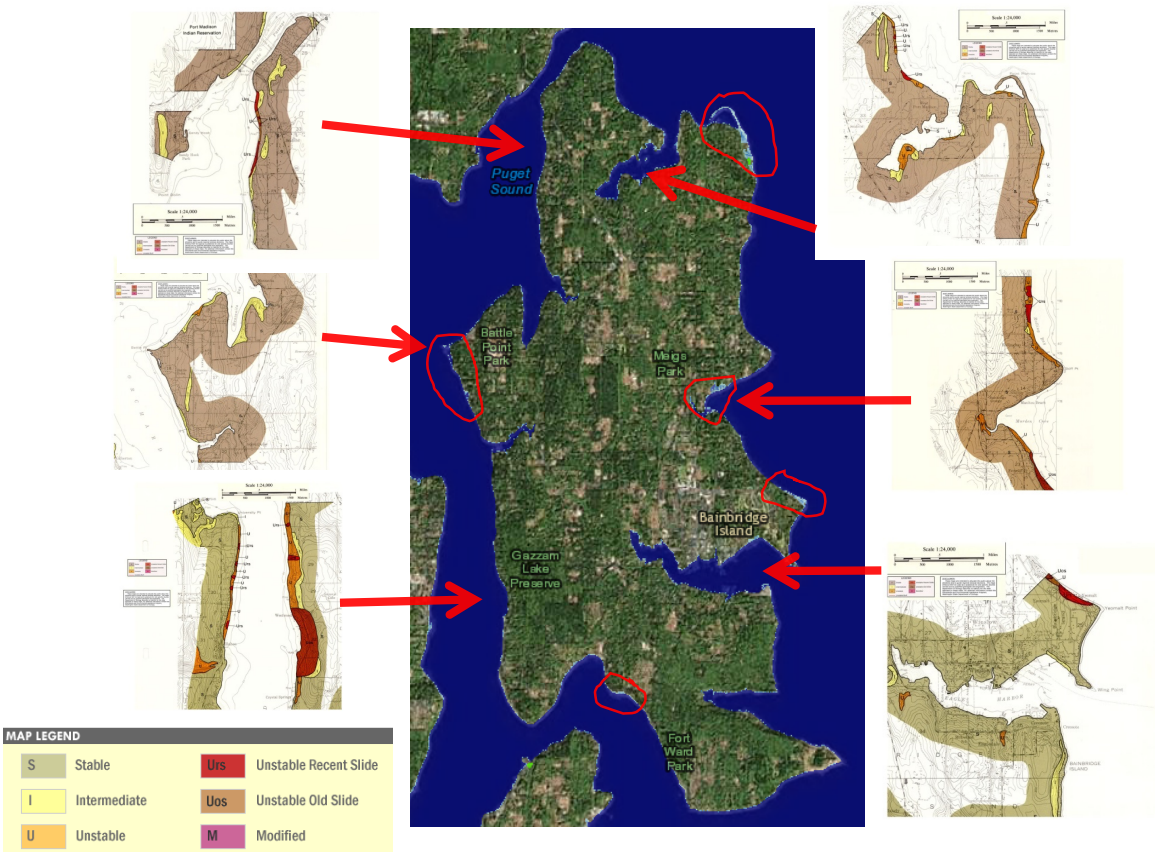

Figure 7. Shoreline stability and future sea level rise, shown with some sample Bainbridge Island sites. Some of the areas potentially impacted by a simulated two-foot sea level rise (light blue, circled in red; center). Sample areas showing slope stability concerns (outer). Sea level rise and associated coastal erosion are likely to exacerbate shoreline stability. From the Washington Department of Ecology (ecy.wa.gov/programs/sea/femaweb/kitsap.htm) and NOAA (coast.noaa.gov/slr).

Additional aspects of the implications of slope stability due to climate change for the Puget Sound region are outlined in Table 1.

The following Climate Change Implications for Comprehensive Plan Elements Table (Table 1) identifies the climatic implication that Puget Sound communities can expect to affect the interests considered in each local comprehensive plan element. This table, however, is not just useful for community planning; anyone can use it to understand which climate impacts will affect their personal, organizational or business choices, development decisions, capital expansions, future markets, landscaping, conservation actions, etc.

Table 1. Climate Change Implications for Comprehensive Plan Elements

Table 1	IMPACTS					
ELEMENT	Temperature	Precipitation/ Storminess	Sea Level Rise	Vegetation Changes	Ocean Acidification	Slope stability
Water Resources	• Increased temperature results in increased water use/extraction rates • Increased evaporation rates • Diminished water quality	• Changes in groundwater recharge rates • Alters storm water retention & infrastructure needs and effects on stormwater discharge compliance • Flooding effects on water quality • Effects on proper function of septic & sewage systems	• Risk of saltwater inundation of some aquifers and surface waters • Risk of salt/seawater intrusion into aquifers • Risk of inundating shoreline aquatic resources and habitat	• Changing vegetation may require more water, alter hydrograph or limit groundwater recharge • Loss of riparian buffer function or composition	• May affect sewage and stormwater discharge compliance • May negatively affect aquaculture • Potential negative impacts to and loss of flora/fauna, particularly shellfish	• Loss of flora or new species may alter slope stability
Land Use and Housing	• Greater need for water due to higher temperatures • Increased agricultural stress • Increased temperature in buildings • Regional population growth due to impacts in other regions	• Groundwater recharge may be diminished and further limited by impermeable surfaces • Potential risk to housing stock (flooding, leaks) • Stormwater retention and infrastructure needs may change • Effects on proper function of septic & sewage systems	• Risk of saltwater inundation of septic systems and wells • Loss of some land and property • Affects Shoreline Master Plan efficacy	• Change in buffer and green space condition		• Limit suitability of lands for some uses
Economy	• Increased costs associated with cooling, water and some resources • Possible changing needs of heating & cooling • Changes in tourism patterns • Change in fisheries	• Increased costs associated with water and some resources (food) due to less water • Risk of flooding events • Tourism disruption • Service disruptions • Increases in insurance costs • Increased costs for energy	• Issues for boating and ferries • Cost of infrastructure repair/retrofit • Insurance costs • May affect cost of water if supply diminished	• Changing agriculture costs, output and composition • Altered energy needs due to changes in plant cover	• Change in fisheries • May affect cost of sewage and stormwater treatment	• Loss/damage to facilities and infrastructure

Table 1	IMPACTS					
ELEMENT	Temperature	Precipitation/ Storminess	Sea Level Rise	Vegetation Changes	Ocean Acidification	Slope stability
Environment	• Thermal stress on local habitat • Diminished water quality (including nearshore marine, including hypoxia and harmful algal blooms) • Change in fisheries	• Decreased seasonal stream flow, affects native fish • Stormwater systems overwhelmed • Recharge surface may become insufficient • Floodplain protection may need to increase • Altered fire risk	• Altered hydrograph of estuaries and streams • Diminished water quality due to septic and sewage inundation	• Possible loss of some protected or iconic flora (forest, agriculture)	• Change in fisheries • Potential negative impacts to and loss of flora/fauna, particularly shellfish	• Erosion • Critical habitat loss
Transport	• Roads and bridges adversely affected by thermal stress • Smog-related air quality hazards increase • Heat may reduce non-motorized transport	• Increased risk of flooding • More drought may increase non-motorized transport, while strong rain events may increase auto dependence	• Inundation of coastal roads • Dock/harbor infrastructure affected	• Altered canopy cover may reduce protection for non-motorized transport • Loss or change of vegetation near roads may affect road condition (water flow, erosion)		• Loss or change of vegetation may affect slope stability near roads
Utilities and Capital Facilities	• Changing energy demand • Changing energy availability • Capital facilities not designed for higher temperatures	• Increased risk of flooding and fire • More wind storms increases risk of power outage • Septic & sewage systems affected by heavy precipitation & low-flow events	• Inundation of coastal infrastructure	• Energy demand increases with different % canopy cover	• May affect sewage and stormwater discharge compliance	• Infrastructure placed in unstable locations
Cultural Resources and Human Services	• Increased incidence of heat-related illness (including respiratory due to adverse air quality) • Introduction of new disease-bearing pests	• Potential risk to housing stock (flooding, leaks) • Drought and changes in water supply leading to rising costs • Heightened risk of waterborne pathogens and bacteria from flooding	• Loss of coastal art and artifacts	• Changing agriculture costs, output and composition		• Loss of art and artifacts

Section Two: Climate Change Implications for Comprehensive Plan Elements

The preceding section provided an overview of the climatic changes forecast to impact your local environment. This section intends to help planners, local officials, and community members begin adaptation planning by enabling you to ask and answer one initial appropriate question:

> ***What are the climate issues of concern for each Comprehensive Plan Element and how will those issues affect what we are planning to do?***

Climate change will alter the circumstances upon which everyone makes decisions. To continue making informed decisions one needs to overlay the expected impacts onto an issue area and determine what the implications of climate change will be. For example, if you are an infrastructure planner, you need to know about site conditions such as slope stability. If you are planning for a capital investment near the shoreline, you would want to know about future flooding and sea level rise impacts. If you are permitting or constructing housing you should know about changes in average seasonal temperatures and the impact on energy consumption. Transportation systems generate stormwater and their function depends on its management; therefore, transportation engineers and planners need to know projected precipitation to properly design durable facilities. If you are a local first responder, you need to know the hazards to which your community is vulnerable. This list goes on.

Climate adaptation planning asks you to think about what baseline information you depend on to make decisions within your area of expertise. Next, you are asked to understand how that baseline information will change over time due to climate change. And lastly, you are asked to accommodate that change in your planning.

A Framework for Adaptation: Considering Impacts and Implications

Arguably the most important goal of climate adaptation planning is to integrate climate-informed thinking and apply the implications of climate projections into everyday decision-making. Effective planning in the face of climate change seeks to reduce a community's contribution to climate change by reducing greenhouse gas emissions (mitigation) and increasing community resilience to the manifestations of climate change (adaptation) as central organizing principles of local policymaking.

Per the APA Washington Chapter, there are three valid methods for fitting climate change into the planning process: 1) integrating future climate considerations into all long-term projects, 2) integrating climate change adaptation and resilience into existing planning practices, and 3) developing a climate adaptation/resilience plan (American Planning Association-Washington Chapter. 2015). It is also reasonable to use a combination of these methods, thereby tackling adaptation from many angles at once.

As any Puget Sound community undertakes a Comprehensive Plan update cycle, they have a logical and appropriate opportunity to use that active planning process to integrate climate

change into the plan and its implementation, achieving methods 1 and 2, and thereby eliminating the need for a separate climate action planning process (method 3).

This document shows you why and where to include climate change in a local Comprehensive Plan.

Importance of Overarching Climate Change Policy to Frame your Plan

Climate change and its impacts have the potential to affect every element of a Comprehensive Plan. Don't be tempted to relegate the discussion, goals and policies needed for adequately adapting to climate change to an environmentally-focused section of your plan. By including climate change in a more "umbrella" fashion, your Plan will provide an overarching framework for appropriately addressing climate change impacts and implications throughout the plan that follows. For example, drafting a Climate Change Guiding Principle at the front of all elements is appropriate, as it would provide a framework under which your municipality could make climate-savvy decisions in every issue area contemplated by your local Comprehensive Plan.

In the case of the 2016 Bainbridge Island Comprehensive Plan there are Guiding Principles up front that act as umbrella goals for the rest of the Comprehensive Plan. This is an effective structure in which climate change and the need for adaptation and mitigation are introduced and a clear, over-riding link to every element that follow is established. Then, within each mandatory and optional element to follow Bainbridge went on to include goal and policy language that intends to address the climate impacts and implication on each element.

> *Key Point: Burying reference to climate change within only an environmentally focused element does not give climate change the attention it warrants; climate change can impact all community decisions and priorities in every element area.*

Prior to creating this Climate Change Guiding Principle, the Bainbridge Island Comprehensive Plan relegated climate discussion to its environment element. During their recent update process, the case was made and accepted that climate change would affect all elements, as well as the other Guiding Principles already adopted, which related to respecting special character, water resource protection, costs and benefits related to private property rights, meeting human needs, not compromising future generations, and operating budget decision. Climate change could negatively affect each of these community concerns. Therefore, by having climate change prioritized as a Guiding Policy it was clear that Bainbridge recognized that climate change will affect all interests of its Plan.

If your community's Comprehensive Plan is not structured in a way that can accommodate Guiding Policies per se, it is reasonable and appropriate to incorporate this into your Land Use Element, which does also serve to set an over-riding development theme for a community. It is possible to use the suggested language below as a Land Use Goal and then still work climate change into the remaining elements of your plan.

An effective Guiding Principle to address Climate Change should have 4 components:

1. A **Goal** that lays out a clear vision, clarifying the full scope of the issue, including the call for action on both climate mitigation and climate change adaptation.

> Suggested Goal - Reduce greenhouse gas emissions (mitigation) and ameliorate the effects of climate change (adaptation) in order to foster the community's environmental, economic and social resilience in the face of shifting conditions, such as sea level rise, more extreme weather events, and human responses to climate change.

"Human response" is important to flag in the Goal for two reasons: 1) climate change is not just an environmental issue, rather it has social ramifications as well; and 2) in addition to the direct impacts of climate change, unintentional social actions as a result of climate change will also require planning and response.

2. A **policy that addresses mitigation** (reduction of greenhouse gas emissions) through all avenues that are relevant to the Comprehensive Plan.

> Suggested Guiding Policy 1 - Mitigation: Participate with state, regional and local partners to reduce greenhouse gas emissions consistent with the 1990 benchmark and future year targets set forth in state law, educate the public about climate change, and incentivize activities that reduce greenhouse gas emissions.

This policy would encourage, for example:

- increased energy efficiency standards;
- decreased fossil fuel consumption (e.g., by investing in and increasing non-motorized transportation options);
- increased renewable energy use;
- requiring compact transit-oriented development and sustainable land use designs;
- See actions listed in Table 10, column 2, Main actions in this sector that will affect Mitigation

3. A **policy that addresses adaptation** (climate resilience) throughout every element of a Comprehensive Plan, since all elements are vulnerable to the effects of climate change:

> Suggested Guiding Policy 2 - Adaptation: Minimize or ameliorate the impacts of climate change on our community and its ecosystems through climate-informed policies, programs and regulations.

This policy would encourage, for example:

- planning development that will allow for associated conservation, including protection of current habitat, and enabling future species and habitat migration (e.g., encourage land use tools such as conservation subdivision design, cluster, or opens space residential subdivision design codes, and Transfer of Development Rights programs);

- ensuring sustainable water use management, even as water availability and use patterns change with climate change (e.g. employ Low Impact Development regulations to the greatest extent possible; require balanced community water withdrawal budgets);
- preparing for rising sea levels in zoning, critical infrastructure siting and management of natural systems;
- enabling hazard mitigation planning to drive other local land use decisions (e.g. locate all new growth outside of known and future hazard prone areas);
- See actions listed in Table 10, column 3, Main actions in this sector that will support Adaption.

4. A policy that provides a **framework** for **why** and an approach to **how** this can all happen:

   Suggested Guiding Policy 3 – Implementation: Create goals and policies that increase community resilience to climate change by evaluating the implications of climate change on all element areas and developing actions that incorporate those realities in order to achieve robust long-term outcomes. Goals and Policies shall result in regulations and work-plans for application in all areas of local government oversight, by requiring the evaluation of the implications of climate change in all local decisions.

This policy would encourage, for example:

- Community consideration of FUTURE conditions. For example, by requiring consideration of sea level rise in coastal infrastructure permitting, changing precipitation patterns in development of water resources and water budgets, and future temperature patterns in determining long-term affordability of housing design, etc.
- Analysis of future function and fiscal impact of a permit based on today's versus future climatic conditions;
- See actions listed in Table 10, column 4, Implementation/Tool Kit Actions.

Local Note: It is possible to make your plan comprehensive and strategic at the same time. According to Joseph Tovar, FAICP, Planning Consultant, Bainbridge Island "has issued a draft plan that is not only truly comprehensive but more strategic than most. It meets the 20-year population and employment targets but also recognizes that a multi-decade time horizon is needed to evolve a durable and energy efficient built environment. Likewise, it addresses climate change from a multi-generational perspective. The Plan's vision and priorities guide the capital budget, as GMA mandates, but also guide the operating budget." (www.tovarplanning.com/blog/files/joe-report-fall-2016.pdf)

Bainbridge Island has proposed the following Guiding Principle in its 2016 Comprehensive Plan update:

Guiding Principle #7. Reduce greenhouse gas emissions and increase the Island's climate resilience.

Guiding Policy 7.1

Mitigation: Participate with state, regional and local partners to reduce greenhouse gas emissions consistent with the 1990 benchmark and future year targets set forth in state law, educate the public about climate change and incentivize Island activities including land use patterns and building practices that reduce greenhouse gas emissions.

Guiding Policy 7.2

Adaptation: Minimize or ameliorate the impacts of climate change on our community and our Island's ecosystems through climate-informed policies, programs and development regulations.

Guiding Policy 7.3

Evaluate the climate vulnerabilities and implications of City actions and identify policies that alleviate those vulnerabilities. Consider the effects of shifting conditions (sea level rise, changing rainfall patterns, increasing temperatures and more extreme weather events) and the effects they cause (altered vegetation, changing water demands, economic shifts).

Mandatory versus Optional Comprehensive Plan Elements in Washington State Code

The Revised Code of Washington requires certain cities and counties to adopt a Comprehensive Plan. There are eight required elements -- Land Use, Housing, Capital Facilities, Utilities, Rural, Transportation, Economic Development, and Park and Recreation. Optional elements can be included if they relate to the physical development within your jurisdiction, and a community can elect to develop an element that speaks to a particular issue or value of importance to itself. Suggestions in the Code include Conservation, Solar Energy, and Recreation (**RCW 36.70A.080).**

Local Note: The City of Bainbridge Island included optional Human Services and Cultural Elements to support non-profit and City programs critical to their community's quality of life.

This Guidebook asks that your community elect to incorporate climate change and address its impacts and implications throughout your Local Comprehensive Plan. It is possible to have a stand-alone Climate Change Element. However, by incorporating or mainstreaming climate change adaptation planning within and throughout your plan, you acknowledge your community's understanding that climate change impacts and implications will be pervasive. They will affect every facet of our lives and should be addressed within each issue area/Element of a local planning document.

The GMA also states that "Each county and city that is required or chooses to plan under RCW 36.70A.040 shall perform its activities and make capital budget decisions in conformity with its comprehensive plan" (RCW 36.70A.120). Therefore, while the LCP is a policy statement intended to guide growth and development there is a burden on each community to support its LCP, mandatory and optional elements alike, through its fiscal choices.

Climate adaptation planning is not only about dealing with negative circumstances, though it is often framed in terms of avoiding loss and safeguarding people, places, and things. There is *opportunity* to increase resilience and to construct a more sustainable, durable and fiscally-sound community and economy.

This section explores **eight** community planning elements and provides questions to steer a community toward climate-savvy decision making. Comprehensive Plan element areas include: **Land Use** (with associated areas of **Water Resources** and **Environment**), **Housing**, **Infrastructure** (including the mandatory elements of Transportation, Capital Facilities and Utilities), **Economic Development**, and **Park and Recreation**. Also included is a guidance discussion of **Social Services** for communities wishing to add optional elements such as Cultural Resources and Human Services.

The Land Use Element

Most if not all the implications of climate change come into play in work related to land use and land use planning. For example, sea level rise, changing precipitation patterns, increasing temperatures, vegetation changes and our responses to those changes will all affect the suitability and success of all land use decisions, and changes in these conditions alter the foundation upon which most decisions are made today.

Local development patterns provide opportunities to either benefit or compromise both climate **mitigation** and **adaptation** for the long term. Your community should use its Comprehensive Plan and the Land Use goals to give a clear directive to enact mitigation and adaptation strategies:

- *Mitigation* measures include reducing vehicle miles traveled, encouraging non-motorized transportation, taking other actions that will reduce consumption of fossil fuels, establishing green building incentives or regulations, and preserving vegetated/forested areas and ecological functions of existing landscapes.
- *Adaptation* measures include shifting development and infrastructure from flood-prone and other hazard areas, improving and integrating hazards planning, requiring drought-tolerant plantings in drought-prone areas and other efficient uses of climate-sensitive resources, Low-Impact Development, implementing economic development strategies that are sustainable in future climates, and encouraging energy-saving buildings, multimodal transportation, and redevelopment/retrofitting.

Land use decisions and local planning are in large part about protecting public health, safety and welfare; therefore, overarching most local government functions. Similarly, dealing with the impacts of climate change spans all disciplines and elements of any comprehensive plan. Several things should be acknowledged about climate change any time your community makes a land use decision, including:

- Municipal officials will be called upon to address both the causes and consequences of climate change;
- These same officials can be responsible for development of climate-aware goals and actions within each element of the local Comprehensive Plan and its implementation;
- The groundwork for a climate-savvy local plan needs to be laid down within the goals and policies of the Land Use – or overriding – element;
- Regulations should acknowledge that climate change will impact future conditions and should be factored into all decision-making today;
- Proactive climate-aware strategies and responses should be developed by all local actors, not just the local government; and that,
- Your community is bound by distinct borders and its landscapes and ecosystems have a finite carrying capacity.

To make land use decisions and investments today that will prove lasting in the future, we must understand and acknowledge what our future may look like (e.g., what resources and conditions will be present). Studies to determine components of this future should be undertaken. When they are, it will be critical that climate change and future climatic scenarios be incorporated into any analysis. For example, if a municipality (or homeowner developing a supply well) undertakes a water study, parameters should be given for scenarios of supply and demand that consider altered precipitation patterns over time based

on best available climate predictions (e.g. through longer study time horizons). Efforts should be made to evaluate potential future conditions to the degree possible.

The Federal Emergency Management Agency (FEMA), through the Disaster Mitigation Act of 2000 and their subsequent implementing actions, encourages communities to integrate hazard mitigation planning into local comprehensive planning in order to establish "resilience as an overarching value of a community and provid[e] opportunity to continuously manage development in a way that does not lead to increased hazard vulnerability" (FEMA, n.d.b). Climate adaptation planning follows this same reasoning and asks the same of communities. Resilience can be built through land use policies and regulations that take into consideration "information of the location, frequency, and severity of hazards ... and setting forth recommendations that influence development in a way that does not increase risks to life and property" (FEMA, n.d.b. Web).

Basic questions about future climate must be asked when considering any development proposal, investment, maintenance, or new project. See Table 2, Land Use Implications from Climate Change, to determine what future climate related changes will affect land use.

Table 2. Land Use Implications from Climate Change

CLIMATE IMPACT	LAND USE IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to affect the proper functioning of local infrastructure. ○ stormwater inundation and localized flooding, chronic flooding, non-infiltrated run off, erosion and landslides ○ increased maintenance needed • Changing patterns and extremes will cause shifts in overall vegetation types and habitats. • Groundwater recharge may be diminished and further limited by impermeable surfaces. • Changes in snowpack volume, melt time and melt rates will affect downstream ecosystem function and infrastructure built to accommodate runoff, infiltration, and capture.
Temperature → *more extremes and prolonged summer highs*	• Increases and seasonal changes will increase the frequency and duration of droughts: ○ changes in growing seasons affects commercial agriculture and recreational gardening ○ increased demand for water ○ increased risk of wildfire (conflicts at the wildland-urban interface) • Long-term temperature trend changes will cause shifts in vegetation and habitats. • Changes in snowpack volume and rate of meltdown will affect infrastructures capacity to handle meltwater, stream flows and water temperature (as suitable habitat).
Vegetation changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Changes can occur in buffer and green space conditions due to vegetation shifts. • There is the potential for deadwood and detritus as die-off occurs, which will increase the fuel load and risk for wildfires. • Changes can be seen in flora and fauna habitat suitability.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas. ○ Roadways could be undermined by shoreline instability and land loss. Mapping should be done to identify vulnerable local infrastructure and critical community facilities. Consider linkages with Hazard Mitigation Planning. ○ Outright loss by inundation of land • There is a risk of saltwater intrusion and its effect on the groundwater, drinking water supply, and septic and sewer systems. • The efficacy of a Shoreline Management Plan will be affected if it too doesn't adapt to sea level rise.
Slope Stability → *Sea level & precipitation pattern changes will compromise once stable slopes*	• There is the potential for limited suitability of lands for some uses (both coastal and inland) due to changing slope stability and associated conditions (temperature, precipitation, sea level rise).
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THE ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• Population projections are an important piece of data in long-range planning. Regional population may grow due to negative impacts in other regions. Consider how population may change due to climate migration to or from your community.
Transportation plans → *Vehicle miles traveled is a major contributors to greenhouse gas emissions*	• Sprawling versus compact development is fueled by transportation infrastructure, which will have a direct role in a community's ability to address local greenhouse gas emissions and the long-term costs of infrastructure maintenance.

Questions to Consider for Land Use Adaptation

The implications identified above in Table 2 should make it obvious that responsible planning and development requires decisions be considered through a climate change lens. Prior to any land use decision, we should ask:

1. Are our community and all stakeholders aware of effects on land uses from today's precipitation, temperatures, and sea levels?
   - If these climate factors were to be altered, how would that affect our land use?
   - How would alterations affect land use investments?
   - Are we physically developing a durable, climate resilient community?

2. Will future climatic conditions prevent or hinder a proposed system/infrastructure/use/parcel from working as expected? Will they remain durable in the face of future climate?

3. Are our land use regulations sufficiently requiring compact, low-impact development patterns?
   - Does our community employ a host of land use tools that result in sustainable development?
   - Are we working to lower our local carbon footprint by reducing vehicle miles traveled?
   - Does our plan sufficiently acknowledge the link between development patterns and climate mitigation?

4. Are there particular land uses that are likely to be impacted more directly or to a greater extent by climate changes? What special planning considerations can and should be made for these?
   - If we seek to preserve working waterfronts, will climate change alter conditions so that they can't function?
   - If wetland was set aside, will it be wetland in the future?
   - Are we allowing space for migrating species and habitats?

5. Do our community's hazard mitigation needs factor into our land use decisions?
   - Does the permitting process explicitly require considering present and future vulnerable site conditions?
   - What hazard planning is required to be undertaken and how are vulnerability or risk assessments used in every-day decision-making?
     - Are we as a community asking, "If development is allowed in a coastal zone that is subject to future sea level rise, and therefore becomes vulnerable to shoreline instability and localized flooding, is our community liable for any resulting harm?" (After all, we allowed the development in a known/projected hazard area.) Questions like this are beginning to be asked nationally (even by insurers), and it is important for planners and community leaders to get out in front.
   - If we do allow development in high-hazard areas, should we require bonding of the property by the developer to avoid future cost to the community that may be incurred by the risky development?

Climate Savvy Priority Land Use Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Conserve natural resource lands and ecosystem functions by preventing land conversion to sprawling or incremental development. • Focus all new growth as infill or compact development. • Reduce consumption of fossil fuels.	• Locate all new growth outside of future hazard prone area. • Assess any proposed project for its ability to function in the long term under climate change. • Minimize or avoid potential for future threats to the people, property, environment and economy of your community. • Utilize all hazard mitigation planning, shoreline and floodplain management processes, and capital facilities planning to identify and address local climate change concerns.	• Avoid present and anticipated future Hazard Zones. • Preserve lands that provide functionality in the future. • Allow only compact, transit-oriented development.

The Water Resources Element

Water is an essential part of life around the Puget Sound— for both natural and built environments — and its health is linked to the sustainability of both people and ecosystems. Typically in Washington, community water supply resources are discussed in Comprehensive Plan Land Use elements where state statute requires that they "shall provide for protection of the quality and quantity of groundwater used for public water supplies" (RCW 36.70A.070(1)).

Local Note: An alternative model is Bainbridge Island, which has chosen to add a Water Resources Element to their Comprehensive Plan in order to elevate its importance and provide space to focus on it appropriately. This element includes consideration of surface water (including marine and freshwater aquatic resources), stormwater, and groundwater. Whether your community has a stand-alone Water Element or addresses it as a subset of the Land Use Element (as the GMA seems to suggest) there are many climate implications to consider.

It doesn't take much thought to realize that there is a direct link between climate and the health and abundance of our water resources. Per the 2015 Central Puget Sound Regional Open Space Strategy, "natural and built systems are at risk from the effects of a changing climate, including increased average temperatures, altered precipitation patterns, altered hydrology (e.g., decreased snowpack, flow patterns), altered oceanic and atmospheric circulation, sea level rise, and changes in water chemistry and quality," and these changes will stress water supplies and quality (ROSS 2015).

A local Comprehensive Plan has a 20-year time horizon for planning. However, like many decisions a comprehensive plan informs, water resource decisions made in the past, present, and near future will affect the resource well beyond 20 years from now. How is this reconciled so that a community can ensure sustainable water resources? One part of the answer needs to be the factoring of future climate conditions (changing precipitation, temperatures, and sea level rise) into today's decision-making.

The Washington Department of Ecology Shoreline Master Program (SMP) deals with water resources in the nearshore and requires a local program Plan that drives policy and regulations affecting coastal development. Unfortunately, climate change impacts, including sea level rise, are not required to be addressed or planned for by the SMP. Each community has an opportunity within its Comprehensive Plan to address this omission by requiring holistic shoreline management under present and future conditions.

See Table 3, Water Resource Implications from Climate Change, to determine how climate change has the potential to affect both the health and supply of surface and groundwater resources.

Table 3. Water Resource Implications from Climate Change

CLIMATE IMPACT	WATER RESOURCE IMPLICIATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• More intense and frequent storms, heavier rainfall events, or snowpack melting can cause stormwater inundation and localized flooding, chronic flooding, non-infiltrated runoff (degrading water quality), erosion, landslides, sediment loading and siltation downstream and in embayments and other nearshore habitat/areas. • Stormwater systems may be undersized and development may have to accommodate greater flows and retrofit. • Undersized stormwater systems and flood events lead to runoff that may degrade water quality. • Changes in precipitation patterns will lead to changes in groundwater recharge rates or transition from snow to rain dominated systems reducing storage of water in snowpack. • Discharge compliance of sanitary and stormwater discharge may be affected. ○ Flow flashiness can cause erosion degrading instream habitat, negatively affecting macroinvertebrate diversity & health. • Lower summer streamflows can result in decreased water for irrigation and summertime hydropower production, decreased fish habitat, and increased conflicts over water and urban demand for water.
Temperature → *more extremes and prolonged summer highs*	• Increases in temperature results in: ○ increased water use/extraction rates ○ rising surface water temperature that may affect aquatic species (e.g. salmon, macroinvertebrates, plankton) ○ increased evaporation rates that will affect surface habitat and groundwater recharge rates ○ diminished water quality ○ snowpack melt patterns that leave surface waters depleted
Vegetation Changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Species composition in natural areas will change as precipitation and temperature changes. • Changes in water retention/recharge will affect wetland ecosystem functions, and result in the loss of riparian buffer function or composition. • Changing vegetation may require more water, alter the hydrograph or limit groundwater recharge.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Changes to coastal zone resources and shoreline stability ○ Shoreline instability and potential land loss can affect water pumping stations, sewer/septic and stormwater infrastructure as well as water supply wells. • Inundation risk to aquifers (intrusion), surface waters (overwash and increased tidal ranges), shoreline ecosystems and habitat.
Slope Stability → *Sea level and precipitation pattern changes will compromise once stable slopes*	• As vegetation changes and shifts there could be a loss of flora or addition of new species that alter slope stability. Slope failure may impact water infrastructure and negatively affect wetland ecosystem function. • Die-back and loss of root systems supporting slopes could lead to instability in highly vulnerable areas. • Snowpack melting that increases runoff can lead to an increase in landslides.
Ocean Acidification → *decreasing pH of the waters of Puget Sound*	• This has the potential to affect stormwater discharge compliance as toxicity is affected by pH. • Aquatic species may be affected by acidification due to climate change.
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THIS ELEMENT	
Population changes → *account for anticipated change due to climate refugees*	• Climate change may increase population in the Puget Sound region (climate migrants). ○ An increase in population will increase water use/extraction rates and require more sanitary disposal, as well as causing additional pressure on local aquatic habitat integrity.

Questions to Consider for Water Resources Adaptation

The implications identified above in Table 3 should make it obvious that responsible use and preservation of surface and groundwater resources should be considered through a lens of climatic changes. As your community plans it should ask:

1. Are current precipitation patterns fully understood as to how they impact water resources, wastewater systems, and stormwater management in our community today?
   - If precipitation were to increase, decrease or change in intensity and duration, would it affect local water resources?
   - If precipitation were to fall as rain instead of snow in your watershed, would it affect local water resources?
   - What in-stream flow impacts will result during both during wet and dry season base flow levels? Does our community need to care about this?

2. How will the many facets of climate change and our responses to it affect our drinking water supply and water budget?
   - If we use groundwater sourced supply, will our recharge pathways be affected by altered precipitation patterns? Will existing or proposed development and impermeable surfaces further confound this?
   - Will our surface water supply be impacted by changes in annual snowpack?

3. If sea level were to rise, would it affect our water resources? Do current tidal ranges have an impact on coastal lands, shoreline stability, and infrastructure in the coastal zone?
   - Do we know where vulnerable systems are located?
   - How would sea level rise affect our groundwater/drinking water supply? Is saltwater intrusion a risk under future conditions and, if so, what needs to be done to avoid the risk?

4. If average seasonal temperatures were to shift would it affect our water source (aquifers or surface waters)?
   - Are there currently any seasonal/temperature related impacts that cause problems?
   - Do isolated high-heat or cold days have an effect? Does consumption change with increasing temperatures?
   - Does the efficiency or reliability of our water system change?

5. What is the appropriate planning horizon that should be applied to decisions to protect and sustain any groundwater resources? If that timeframe is longer than a decision's effective time horizon, should we conduct appropriate analysis and modeling so that we understand, as best we can, what state the resource is likely to be in 50 years? 100 years?

6. Are water resource conservation measures being fully implemented?

7. Can our community use the Comprehensive Planning process and the Water Resources element to address precipitation change, sea level rise and other climate-related impacts, including altered patterns of use, which the Shoreline Master Program does not?

8. Has our Critical Areas Ordinance, which has a role to play in water resources protection, been reviewed under the climate lens? Are there protections that can be strengthened or employed in this ordinance that will help reduce the impacts of anticipated climate change?

9. Under current climate conditions, are there any locations that are currently nearing or exceeding allowed discharge per sanitary or stormwater permits? What are the current concerns and will they be exacerbated by expected future climate?

10. Is our community dependent in whole or in part on annual snowpack levels? Does the rate of melt affect any water resources in our community (e.g., surface water levels, rate of run-off that our stormwater systems must accommodate)?

Climate Savvy Priority Water Resources and Environment Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Retain vegetation and tree canopy that serves to enhance the local air and water quality. • Maintain ecosystem function and ability of systems and habitats to migrate and function over time.	• Plan for improvements, source development, and stormwater infrastructure that are based on future precipitation scenarios. • Implement supply and demand-side water conservation. • Protect ecosystems and their buffers. • Retain vegetation and tree canopy that serves to reduce stormwater runoff, promote ground water recharge and stabilize local climate. • Accommodate for shifting species in revegetation, restoration and other projects. • Utilize all compact and Low Impact Development techniques (which reduce impervious and engineered area).	• Plan for changing water availability and use. • Maintain environmental integrity and function while supporting transitions.

The Environment Element

Changing climatic conditions are anticipated to alter the long-term function of our natural systems; systems that are vital to our economy, environment and quality of life. Washington is expected to experience rising seas, warmer temperatures, decreasing snow pack, and more extreme weather events -- manifestations of which bring significant risks to our forests, agriculture, freshwater supplies, coastlines, and ecosytems (WA Department of Ecology, n.d.b website). Communities should be starting today to plan how they will adapt to and accommodate these changes. If your community local Comprehensive Plan does not have a stand-alone Environment element, locate the sections of your plan that address your local environment and apply these environment implications and questions there.

Various landscapes and ecosystems of your community should be considered holistically as "environmental resources", including water resources, critical areas, wellhead and aquifer recharge areas, agricultural lands, open spaces (forests, fields), as well as the built environment and areas within it that form ecosystem corridor connections.

One part of any local environment (and likely a noted priority for Puget Sound communities) is open space and natural lands. There is opportunity to value and prioritize these natural areas beyond their aesthetic or community character value if we think about them as the climate adaptation tools that they are. The Central Puget Sound Regional Open Space Strategy (ROSS 2015) argues for the thoughtful preservation of open space as one strategy to both mitigate and adapt to climate changes. ROSS (ROSS 2015) defines open space as:

> *A diverse spectrum of lands across a rural and urban continuum on large and small scales. Traditionally open space may be imagined as wilderness lands or public parks, but it also encompasses resource lands for agricultural and timber production, wetlands and water bodies, local and regional recreational trail systems, as well as urban green spaces like parkways, rain gardens, and green roofs.*

Careful planning and acknowledgement of the importance of these open space resources in your community should be a main goal of any local community planning. Natural resource design standards will make natural systems and ecosystems more resilient to changing local conditions. Any existing open space plans or studies should be revisited and updated to include climate savvy goals and policies.

> *Local Note: In 2006, Bainbridge Island Mayor Darlene Kordonowy appointed the 2025 Growth Advisory Committee and asked them to develop recommendations on how to accommodate the City's projected growth in a way that satisfied the mandates of the Growth Management Act, the spirit of the City's Comprehensive Plan, and the community's values and vision. The Committee produced the 2008 Bainbridge Island Open Space Study that presents an assessment of high-priority open space areas for conservation and gives a multi-pronged approach for preservation that includes both regulatory strategies and landowner incentives (Bainbridge Island Open Space Study 2008). The Open Space Study should be revisited and updated so that it can serve as a guidance document to the Comprehensive Plan and be made climate savvy itself.*

See Table 4, Environmental Implications from Climate Change, to determine what future climate related changes will have local effects on your environment.

Table 4. Environmental Implications from Climate Change

CLIMATE IMPACT	ENVIRONMENTAL IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to cause stormwater inundation and localized flooding, chronic flooding, non-infiltrated runoff, erosion and landslides, which have the potential to affect the proper functioning of local infrastructure and to degrade water quality and local environments. • Changing patterns and extremes will cause shifts in overall vegetation types and habitats. • Groundwater recharge may be diminished by flow rates and increased speed of runoff (e.g. rapid snowmelt), and further limited by insufficient recharge surface area. • Drought and flood will cause alterations to the wildfire hazard risk. • Floodplain protection may need to increase and current floodplain delineations may become inaccurate. • Changes in seasonal streamflow will affect native fish.
Temperature → *more extremes and prolonged summer highs*	• Increases and seasonal changes will increase the frequency and duration of droughts. • Changes in growing seasons will affect commercial agriculture and recreational gardening. • Increased demand for water will result from drought, lower flows, higher temperatures, etc. • Longer drought periods result in increasing wildfire risk (conflicts at the wildland-urban interface, or WUI). • Thermal stress will affect local habitats, and also local fisheries. • Inland and nearshore water quality will diminish as temperatures change, causing hypoxia and harmful algal blooms.
Vegetation changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Long-term temperature and precipitation trend changes will cause shifts in vegetation and habitats. • Changes can occur in buffer and green space conditions due to vegetation shifts. • There is the potential for deadwood and detritus as die-off occurs, which will increase the fuel load and risk for wildfires. • Changes can be seen in flora and fauna habitat suitability, leading to possible loss of some protected or iconic flora. • Agricultural operations and recreational gardeners will need to adapt to changes in crop suitability and species tolerance.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas. Outright loss of floodplain and other critical habitat area will result from inundation of today's shoreline. • Saltwater intrusion can affect groundwater and drinking water supply. • Water quality can be affected by saltwater inundation/flooding of sanitary sewer and septic systems. • The efficacy of the Shoreline Management Program will be affected if it too doesn't adapt to sea level rise. • Alterations to a local hydrograph will affect estuaries and streams.
Slope Stability → *sea level & precipitation pattern changes will compromise once stable slopes*	• Erosion of slopes can cause loss and damage to critical habitat.
Ocean Acidification → *decreasing pH of the waters of Puget Sound*	• Changes will occur in local fisheries.
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THIS ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• Increases in local population (should climate immigration occur) will place increased demands and stress upon all environmental resources.
Transportation plans → *Vehicle miles traveled is one of the greatest contributors to greenhouse gas emissions*	• Transportation projects and associated development patterns will have a direct role in the ability to address local greenhouse gas emissions. Vehicle miles traveled will directly impact air quality and ground level ozone.

Questions to Consider for Environmental Adaptation

In order to better understand the climate vulnerability of the environment explored in Table 4 and apply those implications to decision-making, we should ask:

1. How do current precipitation patterns affect our environment? How will alterations in precipitation patterns affect our local environment? (E.g., if water recharge set-asides or permeability standards are devised, they would need to be sufficient under changing precipitation patterns.)

2. If average seasonal temperatures and patterns were altered, would it affect your local environment? What are the current seasonal/temperature-related impacts?
   - Do isolated high-heat or cold days have an effect on your environment)?
   - What effects will occur locally as the growing season changes? Will there be impacts for crop suitability, including species tolerance, water needs and pest management?
   - What effects will occur locally as snowpack amount and longevity changes (e.g. less overall melt water, earlier melting, rapid melting)?

3. How do sea level and associated conditions (high tides, inundation and frequency) affect your community today?
   - How does sea level affect your coastal zone and nearshore environmental resources?
   - Does this have an impact on sanitary sewers, septic systems, and stormwater drainage? How does the proper functioning of these systems affect the local environment?

4. Do changing patterns have the potential to affect critical area and habitat location and function? Will natural resource lands and open space areas be affected?
   - Should we prioritize areas likely to serve as climate refuges for local and migrating flora and fauna (areas likely to maintain more stable conditions over time)?
   - Do we need to look to yet-unprotected or unidentified lands in order to avoid future flooding? To accommodate vegetation and habitat (e.g. wetlands) migration?
   - Are local regulations sufficient to prevent or promote development that is desirable, low impact, and resource protective?

5. What effects would your community experience if there are shifts in vegetation composition (die-off, migration, new species) in natural areas?
   - How can we ensure future ecosystem function under changed conditions?
   - What effects will be seen on the type and quality of open space and the function of our natural resource lands? Will it matter if these areas change?
   - If a wetland, or other area, is protected or restored will it serve that function into the future? Will areas we protect today hold the same resource value under changed conditions?

6. As temperature and precipitation patterns change (more frequent and prolonged drought) the risk of wildfire may increase.
   - At what frequency does your community experience wildfires/vegetation fires now?
   - Does your community have a Hazard Vulnerability Assessment, Hazard Mitigation Plan, or other plan that should be considered and linked to your Comprehensive Plan?
   - Is it important to identify vulnerable forests or landscapes and their interface with developed areas? What part of your wildland-urban interface is at risk?

- What are the consequences of fires and firefighting efforts (e.g., physical breaks, chemical use, water needed) for our local environment and community?

7. How is local air quality today? Will your community exceed air quality standards in the future, either due to warmer summers resulting in more ground level ozone, or colder winters resulting in greater local fuel use?

Climate Savvy Priority Water Resources and Environment Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Retain vegetation and tree canopy that serves to enhance the local air and water quality. • Maintain ecosystem function and ability of systems and habitats to migrate and function over time.	• Plan for improvements, source development, and stormwater infrastructure that are based on future precipitation scenarios. • Implement supply and demand-side water conservation. • Protect ecosystems and their buffers. • Retain vegetation and tree canopy that serves to reduce stormwater runoff, promote ground water recharge and stabilize local climate. • Accommodate for shifting species in revegetation, restoration and other projects. • Utilize all compact and Low Impact Development techniques (which reduce impervious and engineered area).	• Plan for changing water availability and use. • Maintain environmental integrity and function while supporting transitions.

The Housing Element

Housing is a basic human need that must be affordable and accessible to everyone. The Washington GMA requires a housing element that ensures the vitality and character of established residential neighborhoods, while inventorying existing and project housing needs; provides for the preservation, improvement, and development of housing; identifies sufficient land for housing; and makes adequate provisions for needs of all economic segments of the community.

Changing climatic conditions have the potential to greatly affect existing housing stock, particularly in terms of location within vulnerable areas and energy efficiency of its basic design. The Housing Element requirements give communities an opportunity to address both adaptation and mitigation in housing decisions. Climate mitigation (reducing greenhouse gas emissions) will be affected by increases in sustainable and green building design that improve efficiency and lower consumption (less water and energy use, less need for heating and cooling through improved insulation, energy efficient appliances, alternative energy access, drought-tolerant plantings), as well as transportation patterns associated with location of housing (locations closer to non-motorized and public transit corridors could decrease emissions). In the future, sustainable design and access to non-motorized and public transit will help homeowners adapt to rising costs of resources because they will need to consume less.

Planning for an adaptive housing stock would also require development of affordable housing that remains affordable over time. If homes are not energy efficient under future climate scenarios, affordability may not be lasting, or costs may be passed onto future inhabitants. Similarly, adaptive housing should be located in areas associated with non-motorized and public transportation, providing residents with climate-savvy choices.

Location of housing within a known or projected hazard area is a true indicator of vulnerability. Just as we should consider the location of a home within a known or potential future floodplain or tidal inundation zone, we should understand its susceptibility to other climate related hazards as well. For example, wildfire is a hazard of rising concern in the region, has the potential to affect housing stock, and may increase over time as temperature and precipitation patterns change. Identifying the vulnerability of existing housing stock to wildfire involves mapping wildfire risk areas and locating the Wildland-Urban Interface (WUI). This is something that community planning departments and fire departments should be collaborating on, if not already being done through other local hazard mitigation planning actions.

> *Local Note: Bainbridge Island experiences vegetation fires every year; from 1989-2009 there were 454 reported vegetation fires (BIFD 2012). WUI is something that Bainbridge Island homeowners should be aware of, and homeowners should know their risk (Luke Carpenter, BIFD, Pers. Comm., April 29, 2016).*

See Table 5, Housing Implications from Climate Change, to determine what future climate related changes will affect housing.

Table 5. Housing Implications from Climate Change

CLIMATE IMPACT	HOUSING IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to cause stormwater inundation and localized flooding, chronic flooding, non-infiltrated runoff, erosion and landslides, which have the potential to affect the proper functioning of local infrastructure and to lead to degrading water quality and local environments. Development and design standards should accommodate future conditions to avoid failure, as well as increased maintenance, repair and other associated costs to homeowners and the community. • Drought and flood will cause alterations to the wildfire hazard risk and affect housing stock at the wildland-urban interface. • Floodplain protection may need to increase, and current floodplain delineations may become inaccurate. Be sure to locate new housing outside of future hazard zones. • Localized flooding and heavy rains can affect low quality, older, or poorly located housing stock.
Temperature → *more extremes and prolonged summer highs*	• Increases and seasonal changes will increase the frequency and duration of droughts. • As temperatures increase and there are longer drought periods, there is an increased risk of wildfire (conflicts at the wildland-urban interface). • Local temperature fluctuations and new seasonal averages will affect energy use and a home's ability to maintain a stable, habitable climate in an affordable way. • Local and regional greenhouse gas emissions may increase due to rates and types of home heating/cooling energy consumption.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas. Outright loss of land can occur. Housing stock may be vulnerable.
Slope Stability → *Sea level and precipitation pattern changes will compromise once stable slopes*	• Housing stock located on coastal and inland slopes may be in danger if instability develops or increase.
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THIS ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• Increases in regional population will place increased demands and stress upon all types of housing stock.

Questions to Consider for Housing Adaptation

The implications identified in Table 5 above make it clear that the provision of durable and/or affordable housing can be adversely affected by changing climatic conditions. As community housing decision are being made, the following questions should be asked:

1. If precipitation were to increase or decrease, how would it affect our housing stock? How do current precipitation patterns affect housing?
   - How does precipitation and "storminess" affect infrastructure related to housing? Will changes in precipitation have an impact on sanitary sewers, septic systems, and stormwater drainage? How does the proper functioning of all these systems affect local housing stock and affordability?

2. If average seasonal temperatures are altered, would it affect our housing? Are there currently any seasonal/temperature related impacts on housing?
   - Do isolated high-heat or cold days have an effect on housing? What will happen if patterns change?
   - Does the community support and employ energy efficiency measures? (Future conditions may necessitate them even more – retrofits and upgrades are expensive.)
   - Is affordability affected by temperature extremes?

3. If sea level were to rise, would it affect our housing stock? How do sea level and associated conditions (high tides, inundation, etc.) affect homes today?
   - Should we continue the permitting of housing in high-hazard areas without requiring a climate assessment and analysis of the resilience of the house and its systems into the future?
   - If we do allow building in high-hazard areas, should we require the developer/owner to bond the property in order to avoid future cost to the community that may be incurred by the risky development?

4. Do we understand the connections between climate impacts and housing affordability?
   - Are there some climate-vulnerable locations that should be recognized as unsuitable for affordable housing?
   - Should the community acknowledge that climate vulnerability could cancel out the intended affordability (i.e., avoid locations susceptible to systems failure due to changing climate or show a preference for locations where alternative energy is more easily accessed)?
   - Should affordable housing be co-located with access to non-motorized and public transit corridors (thereby also making transit affordable, and reducing further greenhouse gas emissions)?

5. Are lands vulnerable to wildfire known, and what is the area of interface with developed areas/housing stock? Where is your community's Wildland-Urban Interface (WUI)?

6. Are we supporting and enabling low-impact development techniques and residential green infrastructure sufficiently and without unnecessary barriers? Are we incentivizing it?

7. Are there state or local "green" residential building requirements that are being used by our community to reduce energy demand and water consumption? Are there any that should be added?

8. Does our community have any regulations and incentives to ensure the long-term durability and efficiency of our local housing stock?

9. Should priority and incentives be given to housing development near non-motorized and public transit corridors?

Climate Savvy Priority Housing Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Increase sustainable and green building design (which reduce energy consumption). • Prioritize siting in locations that are not motorized-vehicle dependent for access to jobs, education and commerce.	• Development of affordable housing should require affordability over time (if not energy-efficient under future climate scenarios, will affordability remain?)	• Ensure that housing stock, (affordable and market-rate alike) avoid present and anticipated future Hazard Zones. • Require aggressive energy efficiency standards to lower carbon emissions as well as to maintain affordability over time. • Incentivize the location of affordable housing within compact, transit-oriented centers.

The Infrastructure Planning Elements

Inclusive of Mandatory Elements Transportation, Capital Facilities and Utilities

Infrastructure is a category that includes myriad capital facilities and services that a government typically provides to its citizens, including utilities, roads, transportation systems, public buildings, schools, parks, water, sewer and stormwater systems, and first responder services. Climate change may significantly alter the proper functioning, longevity, and fiscal responsibility of local infrastructure. Climate-savvy planning for infrastructure would ensure that climate vulnerabilities/variabilities inform infrastructure improvements, siting and design.

The Washington GMA mandates communities to have an element for capital facilities, utilities, and transportation. Together these services are considered infrastructure, and are addressed by this adaptation guidance as such.

Transportation

Land use and transportation are clearly linked: good outcomes in one can allow good outcomes in the other. If land use development patterns result in compact development, then multi-modal transportation systems that generate lower numbers of vehicle miles traveled can flourish. Low-impact modes such as walking and biking become more practical. Transportation infrastructure and use patterns are directly linked to production of greenhouse gas emissions and local air quality. Therefore, when they are managed to reduce motorized transit they foster climate change mitigation.

In many places across our region, homes and businesses are indeed spread out across large areas, and as a result getting from place to place can become dependent on car trips. Improvements and expansions in the non-motorized transportation pathways and trail systems (if done well, such that they provide routes to where people need to go) could reduce car dependence while increasing safety, decreasing traffic, improving environmental quality and improving public health. Every opportunity should be taken by your community to invest in non-motorized transportation infrastructure (e.g., pedestrian and bicycle trail expansions, improvements, and linkages). Additionally, great effort should be taken to improve public transportation, which reduces traffic, improves environmental quality (think hybrid and electric buses), and reduces greenhouse gas emissions. Additionally, public transit and non-motorized transit corridors can be designed to be more resilient to climate change, being built out of harm's way from expected risks and vulnerabilities.

Capital Facilities

Hazard mitigation and climate adaptation strategies overlap perhaps nowhere else as obviously as they do when thinking about capital facilities. Providing public facilities or services and making capital expenditures in areas that are vulnerable to hazards is simply not good public policy. FEMA recognizes that “a community’s facilities and infrastructure policies are directly linked to land use patterns and community development” (FEMA n.d.a). Resilience will be improved when policies limit or exclude facilities, services and capital expenditures in present or future hazard areas. It is critical to ensure long-term durability and continued function by not investing in climate vulnerable locations. Additionally, it is

important to ensure that any ongoing hazard identification and risk assessment on which planning is based fully incorporates climate change impacts and implications.

For example, plans relevant to Bainbridge Island included the 2012 Bainbridge Island Hazard Identification and Vulnerability Assessment by Bainbridge Island Fire Department & Western Washington University, the 2015 Risk Report prepared by FEMA for Kitsap County, and the 2012 Kitsap County Multi-Hazard Mitigation Plan by the Kitsap County Department of Emergency Management. Every community should identify such plans pertinent to them, utilize them during comprehensive and climate adaptation planning, and update them to be informed by climate change implications.

Communities make major investment in stormwater infrastructure, which is quite vulnerable to climate change due to its ability to function during low and high flow periods. The Washington Department of Ecology will soon begin to require Low Impact Development (LID) Municipal Stormwater Permitting (also known as Green Stormwater Infrastructure). Puget Sound communities will be required to incorporate LID best management practices into local codes, ordinances, and standards. LID is "a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices ... that are integrated into a project design" (WA DOE, n.d.c website). LID best management practices include infiltration, filtration, storage, evaporation and transpiration through the use of bioretention, rain gardens, permeable pavements, minimal excavation foundations, vegetated roofs, and rainwater harvesting. Communities should utilize this opportunity and require the use of LID to the greatest extent possible and design LID standards such that they are responsive to the climatic changes we will experience in the coming decades.

Utilities

Conversion and conservation are key words when it comes to developing climate resilient and durable utilities. The reliance on and continued use of fossil fuels in the production of energy is the largest contributor to greenhouse gas emissions. A community can work to reduce its overall reliance on fossil fuels by increasing requirements on utility providers for conservation of fossil fuels and conversion to renewable sources of energy. Communities with an opportunity to switch to a utility provider that relies on renewable energy should take every available opportunity to do so, as it is the most efficient and rapid path to reduced carbonization. Additionally, an overall reduction in energy use and water use is a climate adaptation strategy; if we need less, we can thrive when there is less. Other opportunities in the utility sector for resilience include improved energy efficiency, grid redundancy and "smart" control design coupled with renewable energy.

Forward-thinking communities are undertaking measures to change their energy footprint. For example, the Metropolitan Council of Minnesota, the regional planning agency for the Twin Cities area, is encouraging inclusion of climate change in local plans, and has developed a regional plan, Thrive MSP 2040, that encourages resilience. The Resilience Plan provides suggested implementation measures, such as "natural resource design standards to make natural systems and ecosystems more resilient to development" (Metropolitan Council 2016). Community forests, for example, will help to mitigate urban heat island effects. Local Twin Cities' governments are required by state law to include an element in their

Comprehensive Plan for protection and development of access to direct sunlight for solar energy systems (a mitigation measure). Other communities have also prioritized maximizing their local generation and renewable potential. Lancaster, Calif., for example, has created a locally run, not-for-profit power program to promote local generation and use of sustainable energy, and aims to be the first net-zero city in the United States (City of Lancaster n.d.). The city has also set in place high energy efficiency requirements and incentives for all local development (residential and commercial), as well as incentives for local generation (Center for Sustainable Energy n.d.).

Future climatic conditions and impacts on infrastructure must be considered in order to effectively plan any long-term investment, maintenance of, or new infrastructure project. See Table 6, Infrastructure Implications from Climate Change, to determine what climate related changes will have an impact on your community's infrastructure.

Table 6. Infrastructure Implications from Climate Change	
CLIMATE IMPACT	INFRASTRUCTURE: TRANSPORTATION, CAPITAL FACILITIES AND UTILITIES IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to cause inundation and localized flooding, chronic flooding, non-infiltrated runoff, erosion and landslides, which will affect the proper functioning of local infrastructure and the provision of utilities (including stormwater inundation and localized flooding, more frequent power outages as transmission lines are compromised, and structural damage to critical facilities from erosion and landslides). • Predicted "storminess" includes the potential for more wind storms, which increases the risk of power outages and disruption to the provision of other utilities. • Drought and flood will cause alterations to the wildfire hazard risk, necessitating increases in fire department services and infrastructure and potential costs associated with land management to prevent wildfire. • Sanitary sewers and community/private septic systems will be impacted by both heavy precipitation and low-flow drought events. • New infrastructure (capital projects) may be needed to remedy system failure or capacity. • More rain or extreme storms may lead fewer people to use non-motorized transportation; the desirability of the bike/walker culture may be affected. This shift would increase greenhouse gas emissions, degrade local air quality and increase ground-level ozone. It may also impact demand patterns for other modes.
Temperature → *more extremes and prolonged summer highs*	• Increases and seasonal changes will increase the frequency and duration of droughts, leading to increased demand for water. New infrastructure may be needed to remedy system failure or increase capacity (capital projects). • As temperatures increase and there are longer drought periods, there is an increased risk of wildfire, necessitating increases in fire department services and infrastructure and potential costs associated with land management to prevent wildfire. • Longer seasons, hotter hots and colder colds will change energy demand from what it is today and may change the availability of certain types of energy. Additional and differentiated energy sources may be needed and will result in capital projects and costs, as well as new or expanded infrastructure. • Excessive or prolonged heat degrades infrastructure more quickly, necessitating increased maintenance budgets for repairs and replacements (thermal stress). • Smog-related air quality hazards may increase. • The desirability of the bike/walker culture may be affected and more extreme temperatures (colder colds, hotter hots) may lead fewer to use non-motorized transportation (thus increasing greenhouse gas emissions, degrading local air quality and increasing ground level ozone). This may also impact demand patterns for other modes.
Sea Level Rise → *Projected Mean:* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas. ○ Outright loss of floodplain and other critical habitat area will result from inundation of today's shoreline and low-lying areas. ○ Roadways can be undermined by shoreline instability, land loss, and inundation. ○ Dock and harbor infrastructure will be compromised by rising seas, necessitating increased maintenance, retrofitting or replacement. • Saltwater intrusion can affect groundwater and drinking water supply. • Water quality can be affected by saltwater inundation of sanitary sewer and septic systems or untreated stormwater runoff. • The efficacy of the Shoreline Management Plan will be affected if it too doesn't adapt to sea level rise.
Vegetation changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Long-term temperature and precipitation trend changes will cause shifts in vegetation and habitats. (If these changes occur in transportation corridor buffers, they could impact roadways (brush fires, deadfall, water flow, etc.) • There is the potential for deadwood and detritus as die-off occurs, which will increase the fuel load and risk for wildfires. • Energy demand for heating and cooling will increase if the percentage of tree-cover/canopy changes over time.

Table 6. Infrastructure Implications from Climate Change	
CLIMATE IMPACT	INFRASTRUCTURE: TRANSPORTATION, CAPITAL FACILITIES AND UTILITIES IMPLICATIONS
Slope Stability → *Sea level and precipitation pattern changes will compromise once stable slopes*	• Loss or change of vegetation, precipitation patterns, and rising sea level may affect slope stability near and under roadways or other infrastructure, causing structural failure and necessitating repairs.
Ocean Acidification → *decreasing pH of the waters of Puget Sound*	• Ocean acidification may compromise stormwater and sewage discharge compliance, making capital projects necessary.
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THIS ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• It is uncertain whether climate changes will lead to increased or decreased local population: • Increases in population will place increased demands and stress upon all capital facilities and utilities in a community, including requiring additional transportation infrastructure; and • Reductions in population may affect abilities to provide cost-effective public modes.
Transportation projections, TIP projects, other proposals → *vehicle miles traveled contributes to greenhouse gas emission*	• All future transportation projects will have impacts related to air quality and local greenhouse gas emissions. Know what new contributing sources may arise, and what to do about them. Projects including those that take cars off the road, decrease idling, improve and increase non-motorized use and access, or use and develop alternative/green fuels use will help mitigate future climate change by decreasing emissions.

Questions to Consider for Infrastructure Adaptation

The implications identified in Table 6 should make it obvious that responsible infrastructure development or commitment of resources should be considered through a lens of these changes. In order to responsibly provide durable infrastructure, climate vulnerability should be fully understood. Your community should ask:

1. Will future climatic conditions prevent existing or proposed infrastructure from working as expected?

2. How do current **precipitation** patterns affect our existing infrastructure? As precipitation patterns are altered, how will things change?
   - What effect would an increase in intensity of rainfall/storminess have on our infrastructure?
   - What effect would periods of drought have on our infrastructure?
   - Are we prepared to respond and recover from infrastructure failures that may result from "storminess"? (E.g., too wet and too dry are both conditions under which septic systems fail.)
   - Does precipitation cause any transportation impacts, including delays or changes in levels of service, street flooding, changes in commuting/mobility patterns? (e.g., if it's rainier do fewer commuters bike and more drive instead?)
   - Are Low Impact Development stormwater management techniques sufficiently addressing concerns? Are they being used? Are they sufficient as designed? Do they need to be updated?

3. Are there currently any seasonal/temperature related impacts to our infrastructure? If average seasonal **temperatures** were to shift, how might it impact our infrastructure?
   - Do isolated high-heat or cold days affect our infrastructure?
   - Are our capital facilities designed to function efficiently under altered temperature scenarios?
   - Can the community absorb increased costs of heating and cooling?
   - Can we provide adequate energy to meet those needs?
   - Do temperatures affect transportation patterns, e.g. fewer bikers and walkers?
   - Will changes in snowpack melting rates and timing affect our infrastructure?

4. How do sea level and associated conditions (high tides, inundation and frequency) impact us today? Would **sea level** changes impact infrastructure?
   - Which community facilities and infrastructure are in places that may experience inundation or storm surge?
   - Which community facilities and infrastructure may experience functional impairment due to sea level rise or storm surge?
   - Are there transportation systems, locations, levels of service, or patterns that are affected by coastal conditions? Do current tide heights and tidal ranges have an impact?

5. How does existing vegetation affect infrastructure and utilities today? Will shifts in **vegetation** composition (die-off, migration, new species) impact infrastructure and utilities?

- As temperature and precipitation patterns change (more frequent and prolonged drought), the risk of wildfire may increase. What actions should be taken now to prepare for this future risk? Does this involve capital projects and/or increases in public safety infrastructure?
- Is it important to identify infrastructure and utilities that are located in or near wildfire risk areas?
- What are our fire abatement techniques and what are the possible implications of these actions given climate change (e.g., use of chemicals, need for water, vegetative management)?

6. Does our community know where its vulnerable infrastructure is located? Is it likely that today's problems will be exacerbated by climate changes? Will now-stable infrastructure become vulnerable?
    - Do we know where our high hazard/vulnerable areas are and what critical facilities and infrastructure lie within those areas? What infrastructure may be located in a future hazard area?
    - Can we create a "watch list" for infrastructure that already exhibits climate vulnerability? Which facilities or systems are likely to become more vulnerable under future conditions (some may even become less problematic)?
    - Does our community participate fully in ongoing regional or state-level hazard mitigation planning processes and utilize those findings in our land use, capital facilities, and economic development planning?
    - Are we ensuring that any active hazard identification and vulnerability assessment work includes climate change and its implications as hazards?
    - If we do allow infrastructure development in high-hazard areas, should we require bonding of the property by the developer (even if the "developer" is us) to avoid future cost to the community that may be incurred by the risky development?

7. Are there local mechanisms that our community should employ now to diversify the provision of energy in the future?
    - Can we do anything to act in advance of the fact that climate change may dictate significant cost structure changes and supply issues that are yet unknown and necessitate the need to abandon fossil fuel use and turn to renewables?

8. What mechanisms exist to address any climate vulnerability identified in our infrastructure? How can we require infrastructure investments that are designed to function in future climate scenarios?
    - Can any changes be made to the local building code and design requirements?
    - Can we create a "climate-secure certification process" whereby infrastructure must demonstrate consideration of present and future conditions and increased climate vulnerability in any capacity calculations, studies, siting, and permit approvals? Such a process could require inclusion of future projected conditions/climate scenarios to understand future resource conditions, including groundwater recharge rates, stormwater runoff calculations, supply conditions, location within a vulnerable area, and sustainable power supply.

9. Does our community prioritize alternatives to fossil fuel based systems, thereby acknowledging and demonstrating through action that our transportation and utility infrastructure can play a role in climate change mitigation?
    - Is our community doing all it can to support and plan for non-greenhouse gas emitting transit?
    - Is our community developing infrastructure for low carbon, alternative green energy based fuel systems?
    - Are we supporting and enabling Low Impact Development techniques and green transportation infrastructure sufficiently and without unnecessary barriers?

10. Does our community prioritize and have actions within a Non-Motorized Transportation Plan to help address climate change?
    - Are there potential climate impacts to non-motorized infrastructure that will diminish its durability?

Climate Savvy Priority Infrastructure Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Reduce consumption of fossil fuels. • Link to land use and reduce sprawling development. • Prioritize walkability, non-motorized transit and mass transit, and discourage single occupancy vehicle use. • Require utilities to use renewable energy sources. • Reduce energy use and water use.	• Promote compact development. • Place transportation infrastructure in locations that will not be negatively affected by climate impacts. • Ensure that climate vulnerabilities/variabilities inform infrastructure improvements, or siting and design. • Ensure long-term return on investments and continues functions by not investing in climate vulnerable locations. • Increase requirements on utility providers for conservation of conventional and conversion to renewable sources of energy.	• Incentivize fuel efficiency and require reliance on renewable energy sources (work toward reduction carbon emissions). • Incentivize the location of any infrastructure within compact, transit-oriented centers. • Do not allow the location of any infrastructure to be within present or anticipated future hazard zones.

The Economic Development Element

Not all consequences of climate change are environmental, and impacts to the environment are not without ramification to local economies. "Potential costs to Washington families, businesses and communities are projected to reach nearly $10 billion per year by 2020 if Washington state and other states and nations fail to drive reductions in climate-changing greenhouse gas pollution" (WA Department of Ecology, n.d.d website). Potential costs to Washington economies include lost natural water storage from snowpack decline, increased public health costs, reduced salmon populations, increased energy costs, increased wildfire costs, lost recreation opportunities, coastal and storm damage, reduced food production and increased infestation of pests in forests. Additionally, one close to home example of economic impact is to Washington's shellfish industry, which leads the nation in the production of farmed oysters, clams and mussels. Even by 2011, shellfish producers in Washington had already experienced declines in oyster production, due at least in part to the increasing acidity of our marine waters due to increased carbon dioxide in our atmosphere from the combustion of fossil fuels (WA Department of Ecology, n.d.d website). Conditions are not getting any better.

The Comprehensive Planning process affords communities an opportunity to address future economic challenges from climate change and to plan for economic strength and diversity. Climate adaptation strategies and policies can bring about economic benefit – some communities are beginning to recognize this and act. This is not a new idea, and is being done around the country by forward-thinking, climate-savvy communities. The Metropolitan Council of Minnesota (mentioned above as an energy leader) is encouraging planning for climate change in local plans, and states within their Local Planning Handbook that "[a] diverse local economy that strategically uses local resources is less vulnerable to economic volatility and regional or global recession. Minimizing exposure of city budgets to the risk of property value fluctuations or development cycles will help cities be better prepared for circumstances beyond normal operations…" (Metropolitan Council 2016). Consider actions taken by the City of Lancaster, CA, to create economic incentives by decreasing local power costs with renewable power generation (City of Lancaster website). Puget Sound communities can position themselves for a sustainable economic future by working toward energy efficiency and renewable energy programs.

There is a clear link to be understood between climate and economy. See Table 7, Economic Implications from Climate Change, to determine what future climate related changes will affect our local economy.

Table 7. Economic Implications from Climate Change

CLIMATE IMPACT	ECONOMIC IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to cause stormwater inundation and localized flooding, chronic flooding, non-infiltrated runoff, erosion and landslides. This will affect the proper functioning of local infrastructure and lead to degraded water quality and local environments. Residents, businesses and governments depend on the proper functioning of these systems. • Water supply may be reduced, which will likely increase the cost of water for all users. • Floodplain protection may need to increase and current floodplain delineations may become inaccurate, leading to additional insurance costs for businesses, residents, and local government. • Changes in seasonal streamflow will affect native fish and fisheries. • If tourism is weather-dependent, changes in precipitation patterns may result in changes in tourism numbers and patterns. (E.g., consider less reliable snow for skiing and drought increasing threat of wildfire affecting summer recreation.)
Temperature → *more extremes and prolonged summer highs*	• Increases and seasonal changes will increase the frequency and duration of droughts. • Increases and seasonal changes will affect the costs associated with indoor climate control, leading to higher costs for heating or cooling. • Changes in growing seasons will affect commercial agriculture and recreational gardening, as well as associated businesses. • Increased demand and rising costs for water will result from drought, lower flows, etc. • Thermal stress will affect local habitats, and also local fisheries. • If tourism is weather-dependent, changes in temperature patterns may result in changes in tourism numbers and patterns.
Vegetation changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Long-term temperature and precipitation trend changes will cause shifts in vegetation and habitats. • Agricultural operations and recreational gardeners will need to adapt to changes in crop suitability and species tolerance. ○ Changes in production costs, output and composition may result in higher food prices. ○ Changes in recreational gardening needs may boost related business, but may also increase resources required. • If canopy and/or ground cover change, it could lead to altered energy needs for indoor climate control.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas. Outright loss of floodplain and other critical habitat area will result from inundation of today's shoreline. Water dependent uses will be adversely affected. • Saltwater intrusion can affect the groundwater and drinking water supply– affecting costs and availability for consumers. • Water quality can be affected by saltwater inundation/flooding of sanitary sewer and septic systems. • Shoreline infrastructure (docks, piers, drainage systems, roads) will be negatively affected, resulting in costs for repair, maintenance, retrofitting, and loss of use. • Changes in the coastal zone translates to changes in costs for coastal property owners (insurance, maintenance, loss of use).
Slope Stability → *sea level & precipitation pattern changes may compromise once stable slopes*	• Erosion of slopes and landslides can cause loss and damage to facilities and infrastructure, and in the worst-case result in loss of life.
Ocean Acidification → *Decreasing pH of the waters of Puget Sound*	• Changes will occur in local fisheries (recreational and commercially viable). • Ocean acidification may affect the cost of sewage and stormwater treatment due to changes required to maintain compliance with discharge permits).
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THIS ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• Increases in regional population could place increased demands and stress upon local economic and environmental resources.

Questions to Consider for Economic Development Adaptation

The implications identified in Table 7 should make it obvious that economic sustainability depends on creating a flexible and durable economy in the face of climate change. In order to comprehend the climate vulnerability of the economy and to plan future resilience, your community should ask:

1. Do current precipitation patterns affect our economy, and what will happen if precipitation patterns change? Consider the economic impact of:
   - increasing costs associated with water, food, transportation and energy;
   - precipitation on tourism;
   - increased risk of flooding, storm damage, wildfire (other impacts); and
   - changes in precipitation (more flood-prone areas, more frequent flooding events) and that effect on business costs (maintenance, insurance, continuity of service).

2. Do current average seasonal temperatures affect our local economy and what will happen if temperature patterns change? Consider the economic impact of high-heat or cold days and longer seasons:
   - will they have an effect on our economy and the resources that drive it;
   - will they affect personal and business operations and expenses (changes in energy needs, increased cost of water); and
   - does the weather affect tourism? Should we care?

3. Do sea level and associated conditions (high tides, inundation, etc.) affect our community today?
   - If sea level rise affects our coastal zone and nearshore environmental resources, will this affect our local economy (consider shellfish production, boating infrastructure, homes, businesses, transportation, etc.)
   - Does sea level affect proper functioning of drinking water wells, sanitary sewers, septic systems, and stormwater drainage? And how would failures compromise our local economy (unanticipated expenses to business, government and taxpayers)?

4. Are there sectors of our local economy that are based on today's climatic conditions? Consider:
   - economic implications of losing/lessening value of working waterfronts/shorelines;
   - effects that will occur locally as the growing season changes;
   - agriculture/aquaculture (crop suitability, including species tolerance, water, pests);
   - water dependence (use of in processing, proximity to); and
   - tourism (if an important local economic factor).

5. Do we understand our climate-economy link (at the global, regional, and then local scale)?
   - Is our economy vulnerable to changes elsewhere (e.g., supply locations for food and other products, transportation corridors)? Can we take action locally to reduce these vulnerabilities?
   - Is there local support and active planning for the long-term sustainability of local businesses, including extreme weather event recovery?

6. Does local economic policy support business that will help reduce community vulnerability to climate change (e.g., those that prioritize increased efficiency of resource use such as water and energy, promotion of sustainability elements, adaptable businesses as conditions change)?

7. Do we discourage a local economy that is vulnerable to climate change by avoiding businesses that will exacerbate community vulnerability (e.g., excessive water dependence, harmful land use change, transportation dependence, high greenhouse gas emissions, and high energy use)?

8. Are we encouraging use of durable assets (natural elements, renewable resources) in development of economy and community?

Climate Savvy Priority Economic Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Support renewable energy development and those that utilize it in their business practices. • Do not permit location of industry/business that are dependent on or high-volume users of fossil fuel. • Investment in a food system based on local production and one that is not industrialized and extractive.	• Understand the vulnerability of local systems[2] to climate change and take measures to reduce the potential for exposure, damage and loss. • Encourage a local economy that is not based on vulnerable resources or sectors that will be compromised by climate change. • Encourage diversity and independence of the local economy. • Investment in a food system based on local production that is adaptive to Washington's anticipated climate changes. • Education about the importance of early awareness and action to create resilience.	• Support emerging and sustainable sectors of the economy.

[2] Local systems include businesses, tourism, infrastructure, housing stock, transportation – disruption and losses in any of these sectors will negatively affect the local and regional economy.

The Park and Recreation Element

The GMA mandates the development of a Park and Recreation element that "implements, and is consistent with, the capital facilities plan element as it relates to park and recreation facilities." Included within shall be three things: estimates of demand for at least a ten-year period; an evaluation of facilities and service needs; and an evaluation of intergovernmental coordination opportunities to provide regional approaches for meeting park and recreational demand" (RCW 36.70A.070(8) Comprehensive plans – Mandatory elements).

If thought about creatively, park and recreation infrastructure should not be standalone resources, but rather part of the fabric that connects a community to its sense of place. Per the ROSS (2015), "open space is a key mechanism through which to implement climate mitigation and adaptation, and achieve other environmental, social, and economic benefits." Most if not all the implications of climate change will affect planning for park and recreation facilities. For example, sea level rise, changing precipitation patterns, increasing temperatures, and vegetation changes all will have impacts on the accessibility, value, and function and demand of park and recreation infrastructure.

Consider one example related to changes in average seasonal temperatures, which indicates winter precipitation will include more rain and less snow in some areas, resulting in a clear and direct impact on recreation in the Puget Sound area. Per the Washington DOE, "Over 40% of the winter recreation in Washington over the last 10 years occurred at low elevation ski areas" (such as Snoqualmie Summit, Mt. Baker, Mt. Spokane). The Summit at Snoqualmie experienced "warm winters" in 27% of the years from 1971 to 2000, and may experience over 50% of "warm winters" by 2040. Total visits to Washington's ski areas over the last decade averaged 1.65 million visits per year. Annual revenue from Washington's ski areas fall within a range of $50–$150 million for ski passes, tickets, lessons, rentals. This does not include secondary revenues from skier's food, retail sales, accommodations, etc." (WA Department of Ecology, n.d.b website).

The Park and Recreation element addresses recreation perhaps more local than regional ski areas, however the problems faced by each municipality are clear and similar. For example, planning for park lands and other open space that is at risk of flooding will require forethought regarding potential siting, maintenance, protection and shifting use opportunities. All of these actions will require approaches that allow for needed changes in funding, staff time and community expectations.

See Table 8, Park and Recreation Implications from Climate Change, to determine what future climate related changes will have local effects on park and recreation infrastructure.

Table 8. Park and Recreation Implications from Climate Change

CLIMATE IMPACT	PARK and RECREATION IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to affect the functioning of park and recreation lands & infrastructure: ○ stormwater inundation and localized flooding, chronic flooding, non-infiltrated run off, erosion and landslides ○ increased maintenance needed at parks and recreation facilities ○ inundation and increased loss of use of ball and playing fields ○ lower or unpredictable water levels in lakes and streams (impacts to swim- and fish-ability) • Water quantity and quality impacts affecting recreational access and public health. • Increased costs may result when natural "watering" patterns change. Drought tolerant plantings may be necessary. • Changes in snowpack volume and melting rates will affect downstream ecosystem function and infrastructure built to accommodate runoff, infiltration, and capture.
Temperature → *more extremes and prolonged summer highs*	• Seasonal changes may impact the demand for park and recreation facilities (e.g., increased length of summer season). • Increases and seasonal changes will increase the frequency and duration of droughts: ○ changes in growing seasons affects playing field conditions and natural amenities on site ○ increased demand for water consumption ○ increased risk of wildfire (conflicts at the wildland-urban interface) • Long-term temperature trend changes will cause shifts in vegetation and habitats. ○ Re-planting and landscaping needs will be altered ○ Habitat degradation and species survivability • Changes in snowpack volume and rate of meltdown will affect infrastructure's capacity to handle meltwater, stream flows, water temperature, water quality, groundwater recharge
Vegetation changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Changes can occur in buffer and green space conditions due to vegetation shifts. • There is the potential for deadwood and detritus as die-off occurs, which will increase the fuel load and risk for wildfires. • Changes can be seen in flora and fauna habitat suitability. Changing precipitation and temperature patterns and extremes will cause shifts in overall vegetation types and habitats.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas: ○ shoreline instability and land loss could undermine roadways ○ outright loss of parkland and impeded recreation access by inundation of land ○ limiting of allowed uses in vulnerable coastal areas • There is a risk of saltwater inundation of septic systems (often serving parks and recreation facilities).
Slope Stability → *Sea level and precipitation pattern changes will compromise once stable slopes*	• There is the potential for limited suitability of lands for some uses (both coastal and inland) due to changing slope stability and associated conditions (temperature, precipitation, sea level rise). • Instability can cause impediments or limits to access of certain park and recreation lands and infrastructure.
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THE ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• Regional population may grow due to negative impacts in other regions, leading to an influx of climate refugees: demand estimates for parks and recreation may change for the required GMA 10-year planning period

Questions to Consider for Park and Recreation Adaptation

The implications identified in Table 8 should make it obvious that responsible planning for park and recreation lands and infrastructure should be considered through a lens of climate change. To provide durable park and recreation systems, climate vulnerability should be fully understood. Your community should ask:

2. Will future climatic conditions prevent existing or proposed park and recreation facilities and infrastructure from working as expected? Will they remain durable in the face of future climate?

3. How do people access our park and recreation facilities today? Can we anticipate if those access patterns with change under future climate scenarios?

4. How do current **precipitation** patterns affect existing facilities? As precipitation patterns are altered, how will things change?
   - Will demand for parks and recreation change as precipitation patterns change? How?
   - What effect would an increase in intensity of rainfall/storminess have on parks and recreation?
   - What effect would prolonged or more frequent droughts have?
   - Are we prepared to respond and recover from facility failures that may result from "storminess"? (e.g., too wet and too dry are both conditions under which septic systems fail; fields are inundated and rendered "unplayable")
   - Does precipitation cause any transportation impacts, including changes in levels of service that the park/recreation facilities can offer (e.g. if it's rainier are there fewer park users, or more if it's hotter and drier for longer?)

5. If average seasonal **temperatures** were to shift, how might it impact park and recreation infrastructure? Are there currently any seasonal/temperature related impacts?
   - Will demand for parks and recreation change as temperatures changes? How?
   - Do isolated high-heat or cold days affect parks and recreation?
   - Are facilities designed to function efficiently under altered temperature scenarios?
   - Can the community absorb increased costs of heating and cooling?
   - Do temperatures affect recreation patterns (e.g. perhaps fewer bikers, runners, and walkers and more swimmers seeking escape from higher seasonal temperatures)?
   - Will changes in snowpack melting rates and volume affect parks and recreation infrastructure (e.g. decreased instream flows reduce fishing and swimming access)?

5. How do sea level and associated conditions (high tides, inundation) impact park facilities and recreation today? Would **sea level** changes impact infrastructure?
   - What park and recreation lands or facilities are in places that may experience inundation or storm surge (consider boat ramps, beach access, dock and pier infrastructure, etc.)?
   - Which facilities and infrastructure may experience functional impairment due to sea level rise or storm surge?
   - Are vulnerable locations known and mapped?

6. How does existing vegetation affect parks and recreation today? Will shifts in **vegetation** composition (die-off, migration, new species, changes in foliage, invasive species) impact provision and use of parks and ability to recreate?
    - As temperature and precipitation patterns change (more frequent and prolonged drought), the risk of wildfire may increase. What actions should be taken now to prepare for this future risk? Are there park facilities at increased risk?
    - How are the existing vegetation, tree cover, and growing seasons linked to today's recreation patterns?

Priority Park and Recreation Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Require on-site facilities to use renewable energy sources. • Reduce energy use and water use. • Maintain ecosystem function and ability of systems and habitats to migrate and function over time. • Retain vegetation and tree canopy that serves to enhance the local air and water quality. Mitigate the urban heat island effect. • Prioritize siting of park and recreation infrastructure to maximize access by mass and non-motorized transit and to reduce overall auto-dependence by providing greenways for walking and cycling.	• Locate outside of future hazard prone area. • Ensure that climate vulnerabilities/variabilities inform park and recreation infrastructure improvements, siting and design, and have the ability to function in the long-term as designed. • Anticipate and plan now to accommodate the change in demand for the provision of park and recreation infrastructure.	• Ensure that park and recreation infrastructure also: o conserves habitat o facilitates connectivity and establishes corridors for species and range migrations/shifts o manages surface water and riverine/coastal flooding • Require demand calculations to account for climate changes.

The Social Services Element

Inclusive of cultural and human services issues

The health, safety, welfare and quality of life in your community should be priorities for your local government.

> *Local Note: By electing to include the optional elements of Human Services and Cultural resources in the Bainbridge Island Comprehensive Plan, the City had an opportunity to raise awareness about the connection between land use planning and long-term community resilience. They also have the opportunity to address the connection between climate change and long-term community resilience.*

Fostering a healthy community (both physically and mentally) will serve to increase local adaptive capacity as systems change and become strained. For example:

- planning for a sustainable local food system can insulate us locally from fluctuations in global food or fuel prices or long periods of drought in other areas;
- increasing conservation measures in housing stock and increasing walkability can strengthen our population and reduce local dependence on fossil fuel;
- education about climate change and its impacts on health, safety and welfare should be undertaken now so that our future citizenry is prepared for the climate-changed future; and,
- preparing for potential climate change-induced migration into our area such that social service providers can support changing or growing needs.

As regional and international systems are stressed by climate change, your local systems will be better positioned to provide basic human needs if the community makes climate-savvy choices now.

According to the 2004 Bainbridge Island Cultural Resources element, the general purpose of the element is to link community cultural planning to large community issues — all shape the quality of life on Bainbridge. Also, within the element, arts and humanities are used as tools for accomplishing larger community goals such as economic vitality, quality education, and community planning and design. Climate change is certainly a large community issue; therefore, the cultural resources element can be applied to matters of education and awareness of its impacts and implications. Additionally, existing cultural resources can be vulnerable to changes on the ground. For example, sea level rise and slope stability may threaten art and artifacts in the coastal zone. It may be necessary for your community to assess and locate art/artifacts and determine their climate vulnerability.

See Table 9, Social Services Implications from Climate Change, to determine what future climate related changes may affect these planning areas.

Table 9. Social Services Implications from Climate Change

CLIMATE IMPACT	SOCIAL SERVICES IMPLICATIONS
Precipitation → *changing patterns and extremes, longer duration, and greater intensity*	• Changing patterns have the potential to cause inundation and localized flooding, chronic flooding, non-infiltrated runoff, erosion and landslides, which have the potential to affect the proper functioning of local infrastructure and lead to environmental degradation. Localized flooding and heavy rains can disproportionately affect low quality, older, or poorly located housing stock and increase costs for maintenance and repair. • Predicted "storminess" includes the potential for more wind storms, which increases the risk of power outages and disruption to the provision of other utilities. This can impact the provision of fair and equitable distribution of basic human services. • Sanitary sewers and community septic systems will be impacted by both heavy precipitation and low-flow drought events. New infrastructure may be needed to remedy system failure or capacity (capital projects). Rising costs may impact the equitable distribution of basic human services.
Temperature → *more extremes and prolonged summer highs*	• Higher temperatures and seasonal changes will increase the frequency and duration of droughts leading to increased demand for water. Water shortages and/or increased costs for supply may result. Water as "an essential life need," should be a concern of the human services element. • As temperatures increase and there are longer drought periods, there is an increased risk of wildfire. Cultural resources and human service providers may be affected. • Stress and changes to agriculture and food production systems may result from changes in the growing season caused by increasing temperatures.
Sea Level Rise → *Projected Mean* *2030: +2.6 in. (+/- 2.2 in)* *2050: +6.5 in. (+/- 4.1 in)* *2100: +24.3 in. (+/- 11.5 in)*	• Coastal zone resources and shoreline stability are likely to be compromised by rising seas. Outright loss of shoreline lands may result from inundation. Coastal art and artifacts may be vulnerable. Human service facilities may be vulnerable. • Saltwater intrusion can affect groundwater and drinking water supply and result in water shortages. Water quality can be affected by saltwater inundation/flooding of sanitary sewer and septic systems. Water as "an essential life need," should be a concern of the human services element.
Vegetation changes → *shifts will occur in habitat suitability as a factor of changing temperature and precipitation*	• Long-term temperature and precipitation trend changes will cause shifts in vegetation and habitats, which will impact agricultural operations and recreational gardeners alike, both of which will need to adapt to changes in crop suitability and species tolerance. • Changes in agriculture production costs, output and composition may result in higher food prices.
RELEVANT NON-CLIMATE DATA THAT MAY AFFECT THE GOALS OF THIS ELEMENT	
Population changes → *account for anticipated increase or decrease due to climate refugees*	• Increases in local population will place increased demands and stress upon all human services.

Questions to Consider for Social Services Adaptation

The implications identified in Table 9 should raise awareness of the fact that the provision of human services and our links to cultural resources that help define us are at risk. In order to understand potential climate vulnerability of cultural resources and human services in your community you should ask:

1. If precipitation patterns were to increase or decrease, how might they impact cultural resources or human services? How does current precipitation (patterns and amounts) affect them?
   - What would be the effect of an increase in intensity of rainfall/storminess?
   - What would be the effect of increased periods of drought on these community resources?

2. If average seasonal temperatures were to shift, how might they impact our cultural resources or human services?
   - Are there currently any seasonal/temperature related impacts?
   - Do isolated high-heat or cold days impact cultural resources or human services?
   - Can the community absorb increased costs of heating and cooling? Is this a human services issue to consider?

3. How do sea level and associated conditions (high tides, inundation, etc.) impact our community today? If sea level were to rise how might it impact our cultural resources or human services?
   - Are there stationary cultural resources located within the high-hazard coastal zone?
   - Are there human services or cultural facilities located in places that may be subjected to inundation or storm surge?

4. Population growth places more demands on human services, as does a more stressed, displaced, underprivileged, or under-employed population. Climate refugees or migrations may affect our community, thus increasing the demand for human services. Is there any pre-planning or capacity building that should be undertaken?

5. If food systems become stressed by climate factors, prices will increase, placing stress on lower-income families who are less financially resilient, triggering a need for more services. Is there any pre-planning or capacity building that should be undertaken?

6. As temperature and precipitation patterns change (more frequent and prolonged drought) the risk of wildfire will increase. Are cultural or human service resources and facilities located in or near wildfire risk areas?

7. Can we create a "watch list" of cultural resources and human services that exhibit climate vulnerability? What facilities and systems will be affected as conditions change over time?

8. Is our educational system preparing students for citizenship and employment in a climate-changed future?

Climate Savvy Priority Social Services Goals and Policies		
Goals in this element that will effect climate mitigation:	Goals in this element that will support climate adaptation:	Planning Policies should be drafted to:
• Ensure that services are located and provided such that transportation and energy use are minimized.	• Anticipate and be ready to accommodate the rise in demand for the provision of human services if things "get bad" due to climatic changes. • Education about climate change and the impacts and implications on the health, safety, welfare and future of all to create a ready and adaptive citizenry.	• Plan for increasing needs the provision of all social services. • Plan for manners in which climate change may affect cultural resources in their design and protection.

Section Three: Implementation

There are several action steps that should be paramount and undertaken by every community regarding climate adaptation. While they are not simple steps, they are all easily achievable and the process of completing them will enhance local capacity to address the challenges of climate change that you will face in perpetuity.

Arguably, Actions One and Two below are the primary two structural changes that a climate savvy community should do first to allow for future climate adaptation. Actions Three and Four are perhaps the most important daily activities for your community to undertake that will begin to enable you to adapt to climate change and to begin to tackle other implementation measures presented in Table 10.

Action One: Adopt a Local Comprehensive Plan that clearly links climate change implications to the interests of all local planning and policy goals. In other words, adopt climate-aware goals and policies throughout each element of your Comprehensive Plan.

Action Two: Create a Climate Change Task Force. This involves designation of the leaders, managers and staff that should incorporate climate change and community resilience into their duties. This will enable climate change considerations to be mainstreamed into the actions and decisions of your community into the future.

Action Three: Develop and require a Climate Assessment Certification (CAC). This requires evidence that any project proponent (including the local government) has assessed future site/operating conditions and determined climate readiness, including the avoidance of projected vulnerabilities. Such certification should be applied to and required prior to any fiscal or permitting decision.

Action Four: Integrate climate information into all decision-making processes. Continuously update access and understanding of the latest climate-relevant information and apply your understanding of how climate change will affect your community in all local decisions. Use Table 10 to support these efforts. This can also include activities to map future hazards and monitoring to assess the efficacy of your actions.

By explicitly considering climate change in your local planning and decision-making, your community will be on a path to a resilient future. However, these actions must start today as the decisions we are currently making will set the stage for your ability to respond in the future. An initial suite of implementation recommendations for your community can be found in the following table, Table 10: Adaptation Planning Implementation. We invite you to waste no time in bringing these actions to life and making your community climate savvy.

Table 10. Adaptation Planning Implementation

Planning Element	Main actions in this element that will support Mitigation	Main actions in this element that will support Adaptation	Implementation / Tool Kit Actions *(necessary implementing authorities in addition to your local government are listed in blue italics)*
Government Operations			• Create a **Climate Change Task Force** to oversee and organize community-wide climate change preparation and response strategies. *(Fire, Police, Parks & Rec., Schools)* • Develop and require a **Climate Assessment Certification (CAC)**. Such CAC should be required before any fiscal or permitting decision could be final. A CAC would be evidence that any government action, project proponent, fiscal decision, etc. has assessed future climate conditions and determined durability of a choice, including the avoidance of projected vulnerabilities. Criteria for determination are suggested in the planning sector rows that follow here.
Land Use	Conserve natural resource lands and ecosystem functions by preventing land conversion to sprawling or incremental development. Focus all new growth as infill or compact development. Reduce consumption of fossil fuels.	Locate all new growth outside of future hazard prone area. Assess any proposed project for its ability to function in the long term under climate change. Minimize or avoid potential for future threats to the people, property, environment and economy of your community. Utilize all hazard mitigation planning, shoreline and floodplain management processes, and capital facilities planning to identify and address local climate change concerns.	• Develop and require a **Climate Assessment Certification**. Include criteria for Land Use: Require use of any existing local or regional hazard mitigation plans or create a local hazard identification processes that will help determine suitability of a site for development or investment. *(Fire, Schools, Parks & Rec.)* • Analyze Floodplain Management Plans and Hazard Mitigation Plans to be sure climatic scenarios are adequate and considered in analysis. • Promote compact development through tax incentives and other tools. • Promote walkability and prioritize multimodal, non-fossil fuel dependent transportation. • Require the use of well-designed ecosystem based Cluster, Open Space Residential Design, or Conservation Subdivision regulations for any residential subdivision. • Create specific climate-informed Low Impact Development regulations and require use in all new or re-development. • Identify your community's FEMA multi-hazard mitigation planning requirements and existing plans (such as a Pre-disaster or Multi-Hazard Mitigation Plan or a Hazard Identification and Vulnerability Assessment). ○ Climate Change Task Force members, Planning Department staff, and local officials should participate in any process and fully incorporate climate change hazards into these plans. *(Fire, emergency management offices, FEMA)* • Utilize available land use tools to increase the preservation of land for future agriculture, resource migration, open space, and population changes (including preservation and working landscape zoning classifications, transfer of development rights, and conservation subdivision design standards where appropriate).

Planning Element	Main actions in this element that will support Mitigation	Main actions in this element that will support Adaptation	Implementation / Tool Kit Actions *(necessary implementing authorities in addition to your local government are listed in blue italics)*
			• Update and implement the recommendations of your local Open Space Plan or Study to include climate adaptation and climate change adaptation. *(Local or regional Land Trusts, Parks & Rec.)*
Transportation	Reduce consumption of fossil fuels. Link to land use and reduce sprawling development. Prioritize walkability, non-motorized transit and mass transit, and discourage single occupancy vehicle use.	Promote compact development. Place transportation infrastructure in locations that will not be affected by climate impacts	• Develop and require a **Climate Assessment Certification**. Include criteria for Transportation: ○ Require any new transportation infrastructure to be located outside of vulnerable areas (ensure long-term function). ○ Projects must include non-motorized transportation components such as trailway linkages and walkability, or include impact fees. • Create a structure of impact fees for all development permits. • Create, fund and implement a Non-motorized Transportation Plan. • Adopt a Transportation Improvement Plan that prioritizes mass transit or, pedestrian, bicycle and other non-motorized modes over single occupancy vehicle use. • Utilize land use regulations and incentives that promote compact, non-single occupancy vehicle-dependent development. • Inventory and create a "Watch List" of vulnerable transportation infrastructure (combine with the list for other community infrastructure). ○ Create a prioritized plan to relocate or retrofit vulnerable infrastructure.
Housing	Increase sustainable and green building design (which reduce energy consumption). Prioritize siting in locations that are not motorized-vehicle dependent for access to jobs, education and commerce.	Development of affordable housing should require affordability over time (if not energy-efficient under future climate scenarios, will affordability remain?)	• Develop and require a **Climate Assessment Certification**. Include criteria for Housing: ○ Location of structures out of vulnerable areas ○ Use of sustainable building practices ○ Use of renewable energy and conservation measures/features ○ Creation of non-motorized transportation corridor connections • Adopt Green Building Codes such as energy- and water-efficient fixtures and appliances, increased insulation requirements, including windows, etc. • Enable use of green roofs, greywater and Low Impact Development methods on site. • Utilize bonds in residential permitting within known hazard areas to cover potential future remediation.
Water Resources and Environment	Retain vegetation and tree canopy that serves to enhance the local air and water quality.	Plan for improvements, source development, and stormwater infrastructure	• Develop and require a **Climate Assessment Certification** Include criteria for Water Resources and Environment: ○ Mandate demonstrated consideration of present and future conditions in any water resource calculations, studies, and permit approvals.

Planning Element	Main actions in this element that will support Mitigation	Main actions in this element that will support Adaptation	Implementation / Tool Kit Actions *(necessary implementing authorities in addition to your local government are listed in blue italics)*
	Maintain ecosystem function and ability of systems and habitats to migrate and function over time.	that are based on future precipitation scenarios. Implement supply and demand-side water conservation. Protect ecosystems and their buffers. Retain vegetation and tree canopy that serves to reduce stormwater runoff, promote ground water recharge and stabilize local climate. Pay attention to shifting species in revegetation, restoration and other projects. Utilize all compact and Low Impact Development techniques (which reduce impervious and engineered area).	(Require inclusion of future projected conditions/climate scenarios to understand future resource conditions, including groundwater recharge rates, stormwater runoff calculations, etc.) • Require any water resource data gathering and analysis to include metrics that are sensitive to and identifiable as markers of climate changes. • Continue or develop a Groundwater Monitoring Program and periodically review its program parameters for climate-savviness. • Set no-net groundwater extraction rates to ensure maximized aquifer recharge and to stay below early warning levels (balance the aquifer stressors of increased population and rising demand, decreased recharge from climate change, and rising sea levels). • Require a Hydrologic Assessment Report that includes future climate scenarios for any proposed development projects. • Ensure full protections under the Critical Areas Ordinance, review and revise as necessary. • Adopt Critical Aquifer Recharge Area and Wellhead Protection Regulations. • Adopt Low Impact Development standards and remove regulatory barriers to encourage green infrastructure, which can lessen stress on our natural systems (e.g., to promote on-site water retention/infiltration and slow stormwater runoff rates). • Adopt Lot Coverage Maximums (adjusted to lesser values in aquifer recharge and other sensitive areas). • Develop tree canopy and vegetation retention requirements (balanced with FireWise vegetation-free envelopes). *(Fire)* • Place importance on ground cover and understory for their water retention capacity. • Enable systems and techniques that reduce energy and conserve resources (e.g., greywater systems, green roofs, use of green energy technology). • Conduct a wildfire vulnerability survey of public lands/interfaces and create a plan for wildfire management. *(Fire)* • Require drought-tolerant plantings. • City tree planting efforts should require use of species that will persist for expected lifetime.

Planning Element	Main actions in this element that will support Mitigation	Main actions in this element that will support Adaptation	Implementation / Tool Kit Actions *(necessary implementing authorities in addition to your local government are listed in blue italics)*
Infrastructure[3]	Require utilities to use renewable energy sources. Reduce energy use and water use.	Ensure that climate vulnerabilities/variabilities inform infrastructure improvements, or siting and design. Ensure long-term return on investments and continued function by not investing in climate vulnerable locations. Increase requirements on utility providers for conservation of conventional and conversion to renewable sources of energy.	• Develop and require a **Climate Assessment Certification**. Include criteria for infrastructure: ○ Demonstrated consideration of present and future climate-vulnerable site conditions in any infrastructure capacity calculations, siting and permit approvals. ○ Require inclusion of future projected conditions/climate scenarios to understand future resource conditions, including groundwater recharge rates, stormwater runoff calculations, supply conditions, and location within a vulnerable area. • Enable conversion to a utility dependent on renewable energy sources. • Prioritize and develop expedited permitting and funding for infrastructure that will decrease fossil fuel emissions and support adaptation. ○ Priority given to infrastructure that increases walkability, is located in village, compact or other neighborhood service centers, and allows access by multi-modes. ○ Provide incentives through permitting for use of renewable energy providers and systems. • Identify and map infrastructure that is located within hazard areas and create a "Watch List" of vulnerable infrastructure (combine with the list for transportation infrastructure). ○ Create a prioritized plan to relocate or retrofit vulnerable infrastructure. • Adopt Low Impact Development techniques and remove regulatory barriers to encourage green infrastructure, which can lessen stress on natural systems.

[3] Infrastructure is a category that includes myriad capital facilities and services that a government typically provides to its citizens, including utilities, roads, public buildings, schools, parks, water, sewer & stormwater systems, and first responder services.

Planning Element	Main actions in this element that will support Mitigation	Main actions in this element that will support Adaptation	Implementation / Tool Kit Actions *(necessary implementing authorities in addition to your local government are listed in blue italics)*
Economy	Support renewable energy development and those that utilize it in their business practices. Do not permit location of industry/business that are dependent on or high-volume users of fossil fuel. Investment in a food system based on local production and one that is not industrialized and extractive.	Understand the vulnerability of local systems[4] to climate change and take measures to reduce the potential for exposure, damage and loss. Encourage a local economy that is not based on vulnerable resources or sectors that will be compromised by climate change. Encourage diversity and independence of the local economy. Investment in a food system based on local production that is adaptive to Washington's anticipated climate changes. Education about the importance of early awareness and action to create resilience.	• Study and identify economic and financial vulnerabilities of the community and how they are likely to be worsened by climate change impacts. • Enable incentives for actions that decrease vulnerability of the local economy. • Employ creative funding mechanisms that support and coordinate community-wide action to address climate and hazard mitigation. Develop a steady-state funding mechanism. • Invest in the development of a local food system: ○ Create an Agricultural Zoning classification, or similar as appropriate. ○ Use land use tools such as PDR, TDR and tax incentives to preserve farmland. ○ Incentivize farm practices that employ resource (fuel, water) conservation methods and are not extractive or chemically dependent. ○ Support markets for local farmers to sell goods locally. • Form partnerships with local organizations and action groups to develop a coordinated public outreach campaign intended to increase community awareness of the issue of climate change in their own lives and on your community's long-term resilience. ○ Create materials (including online and signage) promoting sustainable features of your community that make you more resilient to climate change, and encourage businesses, patrons and visitors to take their own actions to reduce the effects of climate change. ○ Engage the local media to ask questions about climate implications in coverage of local planning issues. *(Chamber of Commerce, Business Associations)*
Park and Recreation	Require on-site facilities to use renewable energy sources. Reduce energy use and water use.	Locate outside of future hazard prone area. Ensure that climate vulnerabilities/variabilities inform park and recreation infrastructure improvements or siting	• Develop and require a **Climate Assessment Certification**. Include criteria for park and recreation infrastructure: ○ Demonstrated consideration of present and future climate-vulnerable site conditions in any capacity or demand calculations, siting and permit approvals. ○ Demonstrated understanding that park and recreation facilities may need to be in vulnerable locations but that if accounted for in planning can

[4] Local systems include businesses, tourism, infrastructure, housing stock, transportation – disruption and losses in any of these sectors will negatively affect the local and regional economy.

Planning Element	Main actions in this element that will support Mitigation	Main actions in this element that will support Adaptation	Implementation / Tool Kit Actions *(necessary implementing authorities in addition to your local government are listed in blue italics)*
	Maintain ecosystem function and ability of systems and habitats to migrate and function over time. Retain vegetation and tree canopy that serves to enhance the local air and water quality. Prioritize siting of parks and recreation infrastructure to maximize access by mass and non-motorized transit.	and design, and have the ability to function in the long-term as designed. Anticipate and plan now to accommodate the change in demand for the provision of park and recreation infrastructure.	become an asset to site design (e.g. wetland areas, fields, retention areas designed for temporary flooding/runoff or inundation while factoring in temporary loss of use to demand models). ○ Require inclusion of future projected conditions/climate scenarios to understand future resource conditions. • Design for walkability to and within facilities and prioritize multimodal, non-fossil fuel dependent transportation. • Create specific climate-informed Low Impact Development regulations and require use in all new or re-developed park and recreation facilities. • Identify and map park and recreation infrastructure that is located within hazard areas and create a "Watch List" of vulnerable infrastructure (combine with the list for infrastructure and transportation infrastructure). • Create a prioritized plan to repurpose, relocate, or retrofit vulnerable infrastructure.
Social Services (Cultural and Human Services[5])	Ensure that services are located and provided such that transportation and energy use are minimized.	Anticipate and be ready to accommodate the rise in demand for the provision of human services if things "get bad" due to climatic changes. Education about climate change and the impacts and implications on the health, safety, welfare and future of all to create a ready and adaptive citizenry.	• Develop and require a **Climate Assessment Certification**. Include criteria for cultural and human services: ○ Create criteria for public cultural and human service projects that ensure they are not vulnerable to climate change. • Create incentives for local agriculture and disincentives for the conversion of agricultural landscapes to other uses. Recognize the importance of a robust local food production system as a human service. • Incorporate climate change into school curricula to help prepare your students for their careers and citizenship in a climate-changed world. *(Schools)*

[5] Human services are those that assist people in meeting the essential life needs of food, clothing, shelter and access to health care.

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