Taking Action on Climate Change for the North Olympic Peninsula

A summary of the 'Preparing for Climate Change on the North Olympic Peninsula' Project. For the full report and materials: www.adaptationinternational.com





ORTH OLYMPIC PENINSULA RESOURCE CONSERVATION & DEVELOPMENT



The North Olympic Peninsula of Washington State



The North Olympic Peninsula is defined for the purposes of this project as the region whose terrestrial waters flow to the Strait of Juan de Fuca and Puget Sound.

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Climate Change on the North Olympic Peninsula	2
A Collaborative Process	4
Developing Probabilistic Local Sea Level Rise Projections	6
Overview of Prioritized Vulnerabilities:	
Ecosystems, Water Supplies, and Critical Infrastructure	8
Climate Change Adaptation	10
Prioritized Adaptation Strategies	12
Concluding Remarks	14
List of Appendices and Supplementary Information	16

Climate Change on the North Olympic Peninsula

Evidence tells an unambiguous story: the planet is warming, and over the last half century, this warming has been driven primarily by human activity.*

*National Climate Assessment, 2014

It is increasingly apparent that the global climate is rapidly changing. These changes will affect the people, ecosystems, economy, and culture of the North Olympic Peninsula.

The Pacific Northwest is already experiencing drier summers, reductions in snowpack and glacial mass, higher spring and lower summer river flows, and a more acidic ocean. These are not isolated incidents, but part of a larger regional and global trend of changing climate conditions that is driven primarily by human emission of greenhouse gases like Carbon Dioxide (CO_2), mainly from the combustion of coal, oil, and natural gas. This is due primarily to human activities such as the combustion of coal, oil, and natural gas. There is an urgent need to reduce emission of greenhouse gases at all scales of human society.

Climate change exerts its influence on human lives both directly (from extreme weather events) and indirectly (through ecosystem shifts and associated impacts to the natural and built environment). This project utilizes a regional planning perspective to better understand and prepare for Climate Change vulnerabilities of the region's Ecosystems, Water Supplies, and Critical Infrastructure.

The most noticeable climate change impacts to the North Olympic Peninsula will likely include:

A diminishing snowpack lowering the region's summer river flow and extending the summer drought season.

Shifts in the timing and type of precipitation, creating rain on snow events and unseasonably high stream flows that scour river bottoms and flood low-land areas.

Extended warm temperatures resulting in increased river water temperatures, enhanced wildfire risk, decreased soil moisture, and stressed forests through disease and insect outbreaks.

Ongoing sea level rise driving coastal flooding, saltwater inundation, and enhanced shoreline erosion. Increasingly corrosive ocean waters (i.e. ocean acidification) from the ongoing absorption of human

emissions of CO₂.

A Collaborative Process

With this project and other similar efforts, the region has a unique opportunity for collaboration on climate change adaptation between federal, state, local, and tribal governments, non-profit organizations, academic institutions, and private businesses.

Successfully planning for and adapting to the impacts of climate change requires collaboration among a broad range of stakeholders. This project synthesized the best available climate change projections with local stakeholder expertise of vulnerable sectors to ultimately develop climate change adaptation strategies for the North Olympic Peninsula. The outputs of this effort are compiled in the final Preparedness Plan and include a Vulnerability Assessment (Section 1 & II of the full report) and Adaptation Plan (Section II of the full report).

Over the course of one-year, this project brought together more than 175 partners through virtual meetings and a series of in-person workshops: to build a climate change stakeholder network, share the best available climate change science, identify and assess potential areas of concern, and select and evaluate adaptation strategies to be used across Jefferson and Clallam Counties. These partners represented cities, counties, tribes, public utility districts, ports, non-profit organizations, advocacy groups, private companies, natural resource managers, and concerned citizens of the region. In-person workshop and meetings took place across the North Olympic Peninsula, from Port Townsend to Neah Bay.

This project represents the collaboration between:

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Developing Probabilistic Local Sea Level Rise Projections

Mean sea level is rising globally due primarily to two mechanisms: ocean warming, and the melting of land-grounded ice. Global sea level rise projections and mechanisms are important, but they don't fully explain observed and projected sea level rise for the North Olympic Peninsula. This project developed an innovative approach to local sea level rise modeling.

This project developed an innovative approach for projecting future sea levels for communities on the Strait of Juan de Fuca; an approach that combines probabilistic sea level rise projections for the Strait of Juan de Fuca with high-resolution estimates of vertical land movement and observed patterns of coastal flooding. These projections are not predictions to predict a specific water level at a given date, instead these projections display a range of probabilities of potential sea level rise and storm surge elevations, allowing a reader to choose which probability of occurrence they would like to plan for. These 'probabilistic' sea level rise maps provide the probability (in percent) that mean sea level will be at or above a certain elevation (in feet) above contemporary high water levels by the decade 2030, 2050 or 2100. This includes consideration of a coastal flooding event (storm surge) occurring alongside sea level rise.



Combined Probabilistic Sea Level Rise Projections and Annual Extreme Coastal Flooding Probabilities



Overview of Prioritized Vulnerabilities

This project utilizes a regional planning perspective to better understand and prepare for Climate Change vulnerabilities of the region's Ecosystems, Water Supplies, and Critical Infrastructure.



Near-shore Environment & Watersheds

are most vulnerable to sea level rise and storm surge, changes to the amount and timing of freshwater inputs, shifting erosion patterns, altered sediment delivery and transport, and increased opportunities for invasive plants and animals.

Agriculture & Forestry are most vulnerable to increases in mean summer temperatures, increases in mean cool-season temperatures, increases in length of growing season, increases in atmospheric CO_2 levels, increases in mean evapotranspiration, decreases in summer soil moisture, decreases in mean summer precipitation, reductions in summer/fall water availability due to decreases in snowpack, and increases in mean winter precipitation.

Emerging risks for ecosystems could include low average river flow, high water temperatures, and more intense flooding events with diminished water quality, more acidic ocean waters, shifting biodiversity patterns.



Water Supplies

Surface Water Supplies are most vulnerable to seasonal changes to river flows and recharge rates, lower stream flows for extended periods especially during the summer and fall, more intense and frequent extreme precipitation events (increasing turbidity and hampering water treatment).

Groundwater Supplies are most vulnerable to altered precipitation intensity and timing along with decreases in snow pack that may decrease recharge rates, sea level rise that could drive salinization of coastal groundwater tables.

Water Quality and Availability could

be affected by changing snowpack, frequent drought periods, and lower summer precipitation may decrease seasonal water supply and increase competition for water supplies.



Downtown, Ports, & Coastlines are most vulnerable to Sea level rise, storm surge, and coastal flooding.

Floodplains and Stormwater could be affected by more intense and frequent extreme precipitation events bringing increased erosion, scouring, entrainment of more rocks and sediments, expanded flood zones, changes in side channel habitat.

Sewer and Septic Systems are most vulnerable to sea level rise, storm surge, and riverine flooding. Groundwater table alterations, shifting precipitation patterns, changes in evaporation rates (for mound septic systems).

Climate Change Adaptation

There is no "one size fits all" approach to adaptation. Climate change impacts are distinct to place and thus require targeted adaptation efforts to most benefit the people who reside there.

> Climate change preparation can take many forms, from developing educational materials to implementing policies and updating ordinances and regulations. The table of adaptation strategies on page 14 and 15 were developed collaboratively during this project and represent some of the most targeted and effective actions the region can use to prepare for the impacts of climate change. Each strategy was selected to be useful across the entire region and will likely need to be tailored to specific local community contexts.

> The strategies focus on three areas of vulnerability: Ecosystems, Water Supplies, and Critical Infrastructure. Section II of the Preparedness Plan describes each of these strategies in more detail in the context of their associated focus area. Many additional relevant strategies were discussed during this project and are included in an appendix to the complete Preparedness Plan, which also includes additional information on the strategies, such as the opportunities or concerns and Key Action Steps regarding its implementation. In addition to the 30 strategies shown on the next page, there are other strategies that ranked lower on the evaluation criteria not because they would be ineffective, but because they faced some political, social, technical, or other implementation challenge.

The outputs of this Climate Change Adaptation effort are compiled in the complete Preparedness Plan and include:

A "Vulnerability Assessment" comprised of detailed local projections of climate change impacts based on the best available science and a comprehensive participatory process. A collaborative prioritization of local resources and locations most vulnerable to climate change. An "Adaptation Plan" comprised of a collaborative prioritization of locally relevant adaptation strategies.

Prioritized Adaptation **Strategies**



Water Supplies



Critical

Infrastructure

- Enhance education on drought & water supplies issues for the peninsula
- Enhance efforts to educate home and business owners on the value of on-site water conservation, retention, and catchment
- Identify monitoring needs and enhance water supply monitoring
- Promote and incentivize smart irrigation technologies for agriculture
- Encourage forestry practices promoting water retention within the watershed

Planning Horizon for Adaptation Strategy

Near-term (0–3 years)

Long-term (>10 years)

Immediate



Perform outreach and education on climate adaptation to build community support

Awareness Strategies

planting of drought tolerant, resilient plant species

Enhance promotion of agricultural best

Enhance efforts to encourage breeding and

 Utilize low cost citizen science monitoring and analysis approaches and technologies

 Enhance efforts to incentive use of native plants landscaping in residential, commercial, industrial

climate conditions

settings

management practices to include future

Planning Strategies

- Develop graphic tool to illustrate climate impacts
- Incorporate climate change more explicitly into comprehensive plans and Shoreline Master Programs
- Increase regional capacity for water storage (preferably with natural systems)
- Encourage FEMA to incorporate climate change in rate maps and guidance
- Update municipal codes to account for enhanced fire risk at forest/residential interface where needed
- Update financing policies for development in high risk areas

- Map water retention values for ecosystems
- Continue to study ways to enhance water storage an groundwater recharge
- Improve forecasting for future water supply and demand
- Research or develop model to assess sea level rise and saltwater intrusion to groundwater
- Adopt new regulations requiring water-efficient appliances

- Create critical area flood mapping beyond FEMA's Reduce inflow and infiltration to wastewater historical flood data
- Update planning documents for sea level rise and
 Improve on-site storm water management flooding where needed
- Update Emergency management and response planning to include climate change where needed
- Develop and utilize decision making tools related to climate change risks
- Participate in FEMA's Community Rating System (CRS)

- systems
- practices
- Encourage soft defenses for shoreline infrastructure
- Enhance storm water retention in upstream areas

Policy Strategies

Concluding Remarks

Preparing for the impacts of a changing climate and building resilience is a process and not an outcome. By participating in the development of this project's preparedness plan, appendices, and supplementary information, all of the partners involved have initiated this resilience building process. This project has already borne rich cross-sectoral discussions and enhanced and strengthened professional networks and social connections around the common cause of climate change preparedness. With continued collaboration, the recommended adaptation strategies of this project have the potential to build overall climate resilience on the North Olympic Peninsula and promote the best possible future outcomes for the region's residents, ecosystems, and economy.

There is no other cause more worthy than this.

- Project Core Team Member, and Senior Planner in the Region

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List of Appendices & Supplementary Information

For more detailed information on this project please download the complete "Climate Change Preparedness Plan for the North Olympic Peninsula", available at: www.adaptationinternational.com

Additional project materials available for download:

Appendices

- A: Comprehensive List of Adaptation Strategies
- **B:** Adaptation Strategy Matrix
- C: Sea Level Rise Probability Maps
- D: Sea Level Rise Analysis Details
- E: Monitoring Plan
- F: Focus Area Overview Maps

Supplementary Information

A: List of Project Partners B: Climate Preparedness Outreach PowerPoint C: Planning Language Examples for Climate Resiliency D: Workshop 1 Results E: Workshop 2 Results F: GIS Map Development

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A diminishing snowpack in the Olympic Mountains is the expected 'new normal' under the current best available climate change projections.



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