Sea Grant
Washington

Community-Based Coastal Resilience Planning Guidebook

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The Washington Coastal Resilience Project (WCRP) is a three-year effort to rapidly increase the state's capacity to prepare for coastal hazards, such as flooding and erosion, that are related to sea level rise. The project will improve risk projections, provide better guidance for land use planners and strengthen capital investment programs for coastal restoration and infrastructure. Partners include:

Washington Sea Grant
Washington Department of Ecology
Island County
King County
NOAA Office of Coastal Management
Padilla Bay National Estuary Research Reserve
The City of Tacoma
The Nature Conservancy
U.S. Geological Survey
University of Oregon
University of Washington Climate Impacts Group
University of Washington Department of Earth and Space Sciences
University of Washington School of Marine and Environmental Affairs
Washington Department of Fish and Wildlife
Pacific Northwest National Laboratory

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Table of Contents

Guidebook Overview

This guidebook is provided as a resource for shoreline communities to assist in planning and implementing coastal resilience strategies and projects at the local level. The guidebook provides background information on the concept of community-based planning and the importance of coastal resilience, followed by a stepwise guide to conducting community-level planning complete with planning templates and links to additional information and resources. Through applying the process outlined in this guidebook, shoreline residents will have access to the information and resources necessary to develop community-specific coastal resilience plans and improve preparedness for the future.

What is community-based planning?

Community-based planning is, generally, a voluntary local planning process which brings together people and groups from various backgrounds within a community to develop and implement a coordinated plan of action to address a particular issue or set of issues. In the context of this guidebook, community-based planning presents the opportunity for shoreline community members to identify and work to resolve issues surrounding projected sea level rise through local, non-governmental action.

Why is coastal resilience planning important?

As our climate changes, so will many factors which may affect both the shoreline ecosystems and existing properties. These factors include potential sea level rise and increased frequency and intensity of extreme weather events. Current projections indicate Washington State shoreline communities may experience between 1-3 feet of sea level rise by 2100 which may, in many cases, result in issues such as increased frequency and extent of coastal flooding, increased coastal erosion, impacts to coastal groundwater quality, and habitat loss. Planning for coastal resilience is something that can take place within communities recognizing the importance to take action to address these issues with or without government policy or direction.

Who should participate in coastal resilience planning?

All shoreline properties may benefit from coastal resilience planning, particularly those most likely to be affected by projected sea level rise. These include beach communities situated near the ordinary high water mark with limited elevation difference between the shoreline and building foundations; communities built on engineered canals and natural spits with limited natural protection; and communities built atop or at the toe of steep, unstable slopes.

How does the planning process work?

This guidebook details a stepwise planning process intended to achieve community sea level rise adaptation objectives and ultimately develop community-specific coastal resilience plans. The planning steps introduced in this guidebook incorporate adapted elements of existing planning processes and tools developed by the U.S. Federal Emergency Management Agency (FEMA), National Oceanic and Atmospheric Administration (NOAA), and the U.S. Coral Triangle Initiative Support Program; and connect users to additional resources.

Community-Based Coastal Resilience Planning Process

The following section of this guidebook details objectives, community actions, and resources related to each step in the planning process. Worksheets associated with each step of the process provide templates that communities may use to document their decisions and actions. Through completing the process steps and worksheets, communities will develop a baseline coastal resilience plan which may be used as a basis for implementing sea level rise adaptation projects. The process is intended to be iterative, and regular review of planning assumptions and process outcomes is necessary to ensure plans consider current information related to sea level rise projections and adaptation best practices.

Steps to Community-Based Coastal Resilience Planning

Step 1: Define Planning Issues and Establish a Planning Team

In order to effectively plan, community members must first identify specific issues which need to be addressed through community action and establish a planning team representative of community interests comprised of members who are willing and able to commit to the planning process from beginning to end.

Define Planning Issues

Objective

This initial step is intended to raise awareness of potential issues related to projected sea level rise. In this step, shoreline residents concerned with current or future issues related to coastal flooding identify the extent to which sea level rise may affect their community,

Process

1. *Develop a community profile* – Document basic community characteristics (population, community designation, etc.) as well as current and future general coastal resilience concerns. Include physical issues such as property damage and habitat loss, and non-physical issues such as quality of life impacts, and economic impacts. The profile should also identify existing community generated plans that address coastal issues.
2. *Identify local sea level rise projections* - The Washington Coastal Hazards Resilience Network published *Projected Sea Level Rise for Washington State: a 2018 Assessment* which provides a range of sea level rise projections reflecting various probabilities of exceedance and timelines. Using this resource, communities may identify the different amounts of sea level rise associated with multiple scenarios. For communities in other states, refer to sea level rise projections prepared for your area.

The tables below use Island County Sea Level Rise Average Projections to demonstrate how to read sea level rise projections for Washington State. Local projections can be found for 171 different locations at: https://wacoastalnetwork.com/chrn/research/sea-level-rise/

Example of Sea Level Rise Projections in Washington State

Island County Sea Level Rise Average Projections

RCP 4.5 Sea level rise projections averaged for Island County in feet based on Miller, et al. 2018 projections. Probabilities indicate the likelihood sea level will meet or exceed elevations.

	Very Likely 95% Probability to exceed	Likely 50% Probability to exceed	Unlikely 1% Probability to exceed	Mid-Range 17 -83% Probability to exceed
2050	0.3	0.7	1.4	0.5 -1.0
2070	0.5	1.1	2.4	0.7 -1.5
2100	0.7	1.8	4.4	1.1-2.5

RCP 8.5 Sea level rise projections averaged for Island County in feet based on Miller, et al. 2018 projections. Probabilities indicate the likelihood sea level will meet or exceed elevations.

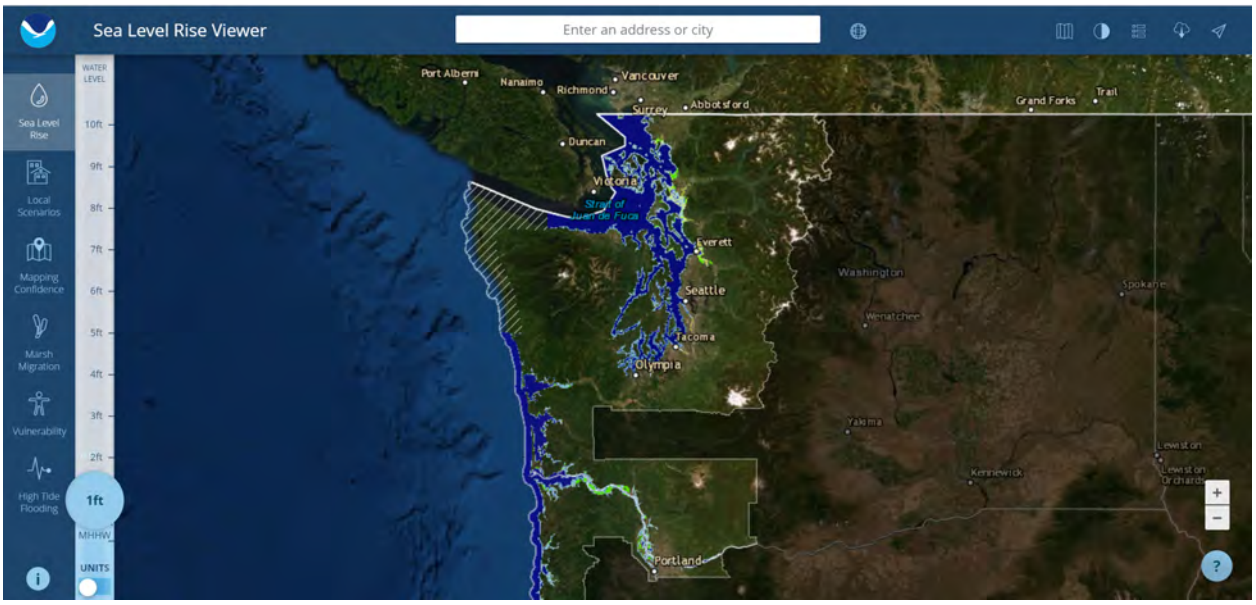
	Very Likely 95% Probability to exceed	Likely 50% Probability to exceed	Unlikely 1% Probability to exceed	Mid-Range 17 -83% Probability to exceed
2050	0.3	0.8	1.5	0.5 -1.0
2070	0.6	1.3	2.6	0.9 -1.7
2100	1.0	2.2	5.0	1.5 -3.0

The two tables shown above, prepared using Miller et al., 2018 sea level rise projections, represent two different greenhouse gas scenarios (RCP 4.5 and RCP 8.5). More information about how to understand sea level projections can be found on the Coastal Hazards Resilience Network website listed under tools and supporting resources below.

The column on the left provides three different time frames for planning consideration. This allows the user to compare projected rises in sea level over different times based upon planning horizons or lifespan of a project.

The row across the top allows the user to select a probability that sea levels will reach or exceed a given amount of sea level. For example, the “very likely” column of numbers relates to the high probability (95%) that sea level will exceed the numbers given. By contrast, the “unlikely” column provides numbers where it is highly unlikely (1%), although possible, that sea levels would reach that number.

3. *Model local sea level rise impacts* - User-friendly online mapping and modeling tools such as the National Oceanic and Atmospheric Administration (NOAA) Sea Level Rise Viewer enable shoreline property owners to view potential impacts of sea level rise in their communities. Community members should model multiple scenarios representing various sea level rise projections to gain a basic understanding of the likelihood of sea level rise affecting them according to current projections.



NOAA Sea Level Rise Viewer Interactive Mapping Tool

4. *Decide to plan* - Based on the outcome of sea level rise projection modeling, communities will identify what is potentially at risk and decide whether coastal resilience planning is in their best interest. In reaching this decision, communities may want to consult with citizen scientists and advocacy groups working on climate change and sea level rise initiatives, such as the Washington Coastal Hazards Resilience Network, to review model results and gain insight on related concerns.

Tools and supporting resources

- Washington Coastal Hazards Resilience Network
  http://www.wacoastalnetwork.com
- Projected Sea Level Rise for Washington State: A 2018 Assessment
  http://www.wacoastalnetwork.com/wcrp-documents.html
- NOAA Sea-Level Rise Viewer
  https://coast.noaa.gov/slr/

Planning template

Use worksheet 1A to build a community profile. Use worksheet 1B to document sea level rise projections, model outputs, and additional information supporting the community's decision to plan.

Worksheet 1A: Community Profile

Instructions and Example:
Describe community characteristics and identify primary concerns and current local plans related to coastal flooding and projected sea level rise.

Community Name & Location: Enter common name of community and general physical location

Community Type: Select Beach Community, Canal or Spit Community, Coastal Bluff Community, or Other

Community Population (estimate)**:**

Coastal Resilience Concerns (Existing Conditions): Identify top (1-3) coastal resilience issues your community currently faces. Issues may be physical (property damage, habitat loss, etc.) or non-physical (quality of life impacts, economic impacts, etc.).

Coastal Resilience Concerns (Future Projections): Identify top (1-3) coastal resilience issues your community is concerned may emerge as a result of projected sea level rise. Issues may be physical or non-physical.

Existing Plans: List existing local community generated plans which address coastal flooding issues or development guidelines. Examples include community Covenants, Conditions & Restrictions (CC&Rs), community design guidelines, neighborhood emergency management plans, community environmental conservation plans, water system plans, etc. Do not include local government plans. An example is provided below:

Existing Plan Title	**Plan Created By**	**Plan Date**	**Plan Location** (web link or physical location and contact number)	**Coastal Resilience Considerations**
Neighborhood CC&Rs	Neighborhood Homeowners Association	January 2020	HOA Website: www.website.com	Shoreline development restrictions Private beach maintenance requirements

Worksheet adapted from US Coral Triangle Initiative Local Early Action Planning Tool

Worksheet 1B: Sea Level Rise (SLR) Projections

Instructions and Example:
Document sea level rise model parameters and outcomes for each scenario in the table below. Communities are encouraged to model numerous scenarios spanning the range of sea level rise projections. An example entry is provided for reference.

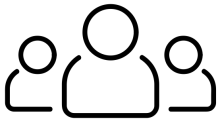
Global Emissions Scenario (RCP 4.5 or RCP 8.5)	**SLR Projection Timeline**	**SLR Projection Probability of Exceedance** (Very Likely, Likely, Unlikely, Mid-Range)	**Projected SLR* (feet)**	**NOAA SLR Viewer Community Impacts**	**Community Planning Recommendation**
RCP 8.5	2100	Mid-Range (17-83%)	1.5-3.0	Yes – Partial Inundation at 2-3 ft.	Conduct coastal resilience planning

*SLR projection source: Miller et al., 2018, *Projected Sea Level Rise for Washington State - A 2018 Assessment*. Prepared for the Washington Coastal Hazard Resilience Network. Prepared for the Washington Coastal Resilience Project. http://www.wacoastalnetwork.com/files/theme/wcrp/SLR-Report-Miller-et-al-2018.pdf.

Establish a Community Planning Team

Objective

This step is intended to identify community representatives to act as the primary planning group responsible for coordinating administrative and logistics requirements of the coastal resilience planning process. This group may vary in size but must provide a holistic representation of the community to optimize effectiveness



Process

1. *Identify potential stakeholders (groups)* - Identify professional, social, and other groups or organizations which may have an interest in community planning efforts. This stakeholder group must be representative of the demographic and economic spectrum within the community and may include outside individuals or groups with technical expertise relevant to the planning issue(s).
2. *Identify stakeholder representatives (individuals)* - For each stakeholder group, identify a specific candidate to represent the group's interest in the planning process. Include contact information and, when possible, preferred contact days/times.
3. *Conduct outreach* - Contact stakeholder representatives to discuss planning issues and request involvement in the planning process. Obtain agreement to participate and document constraints on availability.
4. *Establish Team Roles* - Identify volunteers for key positions within the planning team to include administrative, logistics, and communication leads. Team members assigned to these positions should be willing and able to commit to involvement for the duration of the planning process and are instrumental in ensuring timely and effective completion. Specific responsibilities of each position may vary based on planning team size and complexity of planning issues addressed.

Tools and supporting resources

Stakeholder identification is most effective when conducted in a group setting. Community members are encouraged to solicit input from formal and informal representative organizations such as local government advisory groups and homeowner's or neighborhood associations.

Planning template

Use worksheets 1C and 1D to document stakeholder identification, outreach, and role establishment.

Worksheet 1C: Identifying and Involving Stakeholder Groups

Instructions and Example:
Identify formal and informal groups of people with potential interest in the planning issue and/or process outcomes. Document their interest and importance to the process in the table below. An example entry is provided for reference

What are the main groups of people involved in the community?	Describe their interest	How important is this group to the planning process?	How and when should they be involved in the planning process?
Property owners	Property ownership and community resource access	Very important	From the beginning of the process. Involve them in issue identification, all regular planning meetings, progress updates, and regular feedback opportunities.
Community associations			
Non-governmental organizations			
Community service organizations			
County Departments			
State Agencies			
Federal Agencies			
Other			

Worksheet adapted from US Climate Resilience Toolkit "Documenting Steps to Resilience"

Worksheet 1D: Identifying and Involving Individual Stakeholders

Instructions and Example:
Identify individual representatives for stakeholder groups that should be involved in the planning process Use the below table to document coordination with potential stakeholder group representatives and their involvement in the planning process. An example is provided for reference

Stakeholder Group	**Individual Stakeholder**	**Contact Information** (preferred phone and email)	**Planning Team Role**	**Comments**
Property owners	John Doe	Cell: 555-5555 Email: jdoe@mail.com	Administrative Coordinator	Available M/W evenings 5pm-7pm Has legal experience

Worksheet Adapted from US Climate Resilience Toolkit "Documenting Steps to Resilience"

Step 2: Identify Community Values and Vulnerable Assets

Objective

This step is intended to identify community values, goals, and their supporting assets. Values should include aspects of the community which members desire to maintain or preserve, goals should be big picture and reflect community aspirations, , and assets should reflect the capital (physical or otherwise) which supports community values and goals.

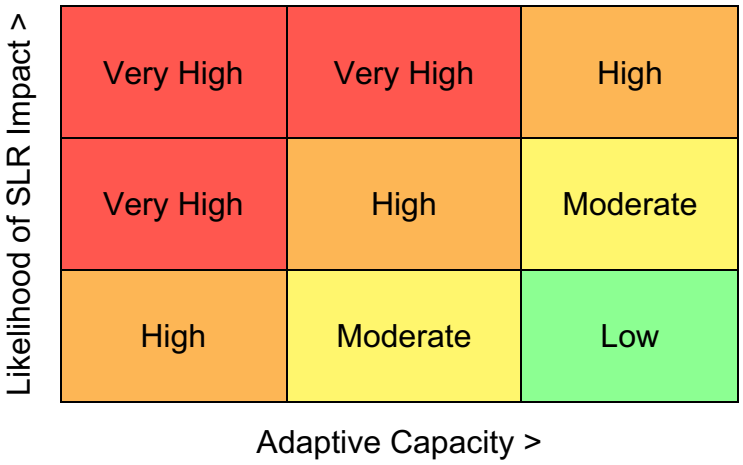
Process

1) *Identify community values and goals* - Stakeholders collectively identify values that contribute to community character, culture, and identity; as well as aspirational goals that reflect and help to achieve the identified values for the future of the community. It is imperative that members of all stakeholder groups are involved in this step to ensure values and goals represent diverse community perspectives.

2) *Identify supporting assets* - Stakeholders identify tangible and intangible assets within the community which support or enable community values and goals. Assets should extend beyond critical infrastructure necessary to maintain basic community services, and include elements such as individual and community property, shared community knowledge, culturally significant sites and activities, and natural resources.

3) *Identify asset vulnerabilities* – Stakeholders document climate and non-climate stressors affecting key community assets and identify the "tipping point" at which an asset will lose its functionality or negatively impact community values and goals. This step includes a vulnerability assessment for each asset in which community members determine whether effects of projected sea level rise for each scenario modeled in step 1 might negatively impact a given asset to the point where it is no longer able to perform its primary function in support of community values and goals. Vulnerability ratings take into account the likelihood sea level rise may affect the asset based on NOAA Sea Level Rise Viewer model output, and the asset's adaptive capacity, or ability to be modified to maintain its primary function despite projected sea level rise impacts. A matrix identifying vulnerability ratings based on likelihood of sea level rise impact and adaptive capacity is provided below as an aid to completing this step. As shown in the matrix, low likelihood of sea level rise impact combined with high adaptive capacity results in low asset vulnerability; whereas high likelihood of sea level rise impact and low adaptive capacity result in high asset vulnerability.

Asset Vulnerability Matrix



Tools and supporting resources

Online tools such as the U.S. Climate Resilience Toolkit *Steps to Resilience*, and the University of Kansas *Community Toolbox* provide examples of community asset identification which may assist in beginning a community-specific asset identification process.

- U.S. Climate Resilience Toolkit - *Steps to Resilience (Step 1: Explore Hazards)* https://toolkit.climate.gov/steps-to-resilience/explore-hazards
- University of Kansas - *Community Toolbox* https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/identify-community-assets/main

Planning template

Use worksheet 2A to document community values, goals, and assets. Use worksheet 2B to document asset vulnerability.

Worksheet 2A: Community Values, Goals, and Assets

Instructions and Example:
Document values which define community character, goals related to the values, and assets (physical and non-physical) supporting both the values and goals which may be impacted by projected sea level rise. Include asset condition and comments as applicable. Example provided for reference. An example is provided for reference

Community Value	**Community Goal**	**Asset & Type** (Built Environment, Natural Resource, Social, etc.)	**Asset Condition** (poor, fair, good, excellent)	**Comments**
Connection to natural environment	Improve community access to beach and wetland	Coastal trail network	Good	Trail network exists, but requires clearing and maintenance

Worksheet adapted from US Coral Triangle Initiative Local Early Action Planning Tool and NOAA coastal adaptation guidance

Worksheet 2B: Community Asset Vulnerability

Instructions and Example:

Document issues which may affect community assets as well as climate and non-climate stressors which contribute to their potential impact. An example is provided for reference.

- Identify climate and non-climate stressor trends (improving, worsening, etc.), what the tipping point would be for the asset to be significantly impacted, and the estimated probability that the tipping point scenario will occur.
- Identify the asset adaptive capacity (or ability to be modified to maintain its primary function) over a range of potential impacts.
- Finally, identify the asset vulnerability as a function of probability of tipping point occurrence and adaptive capacity (high probability of occurrence and low adaptive capacity lead to high vulnerability; low probability of occurrence and high adaptive capacity lead to low vulnerability, etc.). Reference the vulnerability matrix included in step 2 process description to assist with rating asset vulnerability.

Community Asset	**Climate Stressor and Trend**	**Non-Climate Stressor and Trend**	**Tipping Point**	**Probability of tipping point occurring** (unlikely, likely, very likely)	**Asset Adaptive Capacity** (low, moderate, high)	**Asset Vulnerability** (low, moderate, high, very high)
Coastal trail network	Sea level rise projected increase of 1-3ft by 2100	Erosion from surface water runoff degrades trail	Trail network inaccessible due to inundation and erosion	Likely	Moderate – trail function is restored once area is drained	Moderate

Worksheet adapted from US Climate Resilience Toolkit "Documenting Steps to Resilience"

Step 3: Analyze Risk and Establish Thresholds for Action

Risk management is a fundamental component of coastal resilience planning. This step of the process includes identification of risk to community assets introduced by projected sea level rise; and establishment of thresholds for community action based on risk tolerance.

Analyze Risk

Objective

This step is intended to assess risk introduced by projected sea level rise to community assets identified in the previous step. The process should account for potential environmental stressors (flooding, septic system overflow, groundwater contamination, etc.) and non-environmental stressors (evacuation planning, property preservation, family concerns, etc.) associated with sea level rise and reflect an overall risk assessment based on probability of occurrence and magnitude of impact if a major flooding event takes place. This process should be conducted for each community asset.

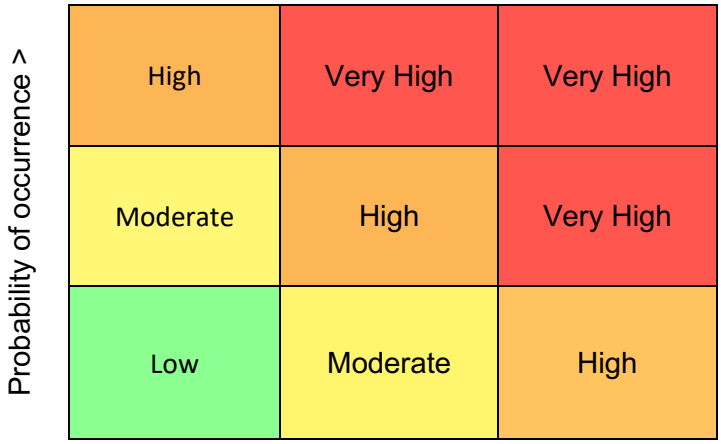
Process

1) *Determine the probability of sea level rise impacts* - Using sea level rise projections and timelines modeled in step 1, estimate the probability of impacts on assets identified in step 2. Categorize probability of exceedance as very likely (95% model), likely (50%), or unlikely (1%). See step 1 for information on how to read and interpret sea level rise probability tables.

2) *Determine the magnitude of projected sea level rise impacts* - Based on the extent of coastal flooding modeled in step 1 and asset condition and characteristics defined in step 2, estimate the magnitude of projected impacts in terms of potential functionality loss. Characterize magnitude of loss as low (asset damaged but functional), moderate (asset functionality degraded but can be recovered), or high (non-functional total asset loss).

3) *Assign relative risk characterization* - Based on cross-comparison of probability and magnitude of projected sea level impacts to community assets, identify the resulting risk characterization for each asset under various modeled scenarios. A sample risk characterization matrix is provided below.

Risk Characterization



Adapted from the U.S. Climate Resilience Toolkit

Tools and supporting resources

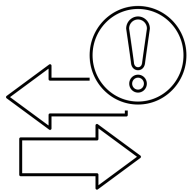
The U.S. Climate Resilience Toolkit and FEMA Community Rating System Floodplain Management Planning Guide (Section 512) provide additional guidance on conducting risk assessments which may prove beneficial to communities undertaking the process.

- U.S. Climate Resilience Toolkit - *Steps to Resilience (Step 2)* https://toolkit.climate.gov/steps-to-resilience/assess-vulnerability-risks
- FEMA CRS Coordinator's Manual - Floodplain Management Planning (Section 512) https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf

Establish Thresholds for Action

Objective

This step is intended to identify acceptable risk at the community asset level, and establish thresholds for community action in the event the level of risk becomes unacceptable. This step is heavily dependent on community goals and values, and thresholds will likely be specific to each community.



Process

1) *Evaluate the effects of asset degradation on community values and goals* - Given the characterization of sea level rise risk to assets developed in the previous step, identify the resulting qualitative impact on community values and goals. Classify outcomes as no effect (values and goals unaffected), attainment challenge (values and goals temporarily impacted), or attainment barrier (values and goals unattainable).

2) *Determine an acceptable level of risk* - Determine an acceptable level of risk for each asset identified in step 2 based on the potential impact on community values and goals. For example, a community may value outdoor recreation (value) made possible by a neighborhood waterfront trail (asset) which has been identified for community-funded improvements (goal), and is unlikely to be impacted by sea level rise and if impacted would only result in a moderate loss (moderate risk characterization). In this scenario, the community may determine that this level of risk is acceptable, as the asset may be repaired and would continue to support community values and goals. Increased probability or magnitude of loss may result in an unacceptable level of risk.

3) Establish a threshold for action - Determine a threshold for action relative to the acceptable level of risk for each asset. Communities may elect to establish thresholds lower than their absolute risk tolerance as a proactive measure. Conversely, action thresholds may exceed risk tolerance in cases that require resources beyond those available to the community.

4) *Monitor changing risks* - Regularly review available County, State, and local citizen science resources such as the Washington Coastal Hazards Resilience Network and Puget Sound Partnership for updates to sea level rise projections. Update risk characterization accordingly and monitor risk levels in relation to action thresholds.

Tools and supporting resources

The U.S. Climate Resilience Toolkit and FEMA Community Rating System Floodplain Management Planning Guide (Section 512) provide additional guidance that may inform decisions to take community action.

- U.S. Climate Resilience Toolkit - *Steps to Resilience (Step 2)*
  https://toolkit.climate.gov/steps-to-resilience/assess-vulnerability-risks

- FEMA CRS Coordinator's Manual - Floodplain Management Planning (Section 512)
  https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf

The Washington Coastal Hazards Resilience Network is an excellent resource for current information related to sea level rise and best practices in coastal resilience planning.

- Washington Coastal Hazards Resilience Network website
  http://www.wacoastalnetwork.com/

Planning template

Use worksheet 3, sections 1 and 2 to document the probability and severity of risks and potential consequences of sea level rise for community assets.

Use the worksheet 3 sections 2 and 3 to document the overall risk to individual assets and community risk tolerance.

Use the worksheet 3 summary table to consolidate risks and action thresholds across community assets.

Worksheet 3: Risk Assessment and Community Action Threshold

Instructions

Complete a risk assessment worksheet and risk characterization matrix for each community asset evaluated.

- Complete sections 1 and 2 of the risk assessment worksheet for each asset and modeled scenario to identify probability of sea level rise impacts (from Worksheet 1B) and severity of potential consequences of projected sea level rise on the ability of the selected asset to perform its primary function.
- Complete sections 3 and 4 of the worksheet to identify overall risk of sea level rise to the asset using a risk characterization matrix, and community risk tolerance specific to the asset being analyzed
- Enter risk analysis outcomes for each asset and scenario evaluated in the risk assessment summary table. An example is provided for reference.

Worksheet 3: Risk Assessment and Community Action Threshold

Asset:		
SECTION 1: Potential Sea Level Rise Consequences Circle all applicable across the three categories		
Economic	**People & Society**	**Environmental**
Movement of goods impaired **Movement of people impaired** **Employment centers disrupted** **Disproportionate impacts on certain business sectors** **Lost income** **Increased maintenance or repair costs** *Other:*	**Damage to housing and potential displacement** **Loss of recreation opportunities** **Residents unable to obtain key services** **Disproportionate impacts on certain community members** **Loss of cultural or historical resources** **Personal injury or loss of life** **Overall decline in quality of life** *Other:*	**Biodiversity or species loss** **Habitat fragmentation and/or loss** **Loss of flood protection benefits** **Water quality decline** **Loss of carbon sequestration function** *Other:*

SECTION 2: Severity of Consequences Using the descriptions below, identify the OVERALL potential level of impact	
Rating	**Description**
MINOR	Financial costs to the municipality or community are possible but would be minimal. No expected loss of life, minimal decline in quality of life and little disruption to livelihoods. Property and ecosystem damage might occur but could be repaired without substantial cost or time.
MODERATE	Some financial costs to the municipality or community are possible and would be moderate. No expected loss of life, but there could be a decline in quality of life and some disruption to livelihoods. Recovery of property and ecosystem damage would take longer and be more costly.
SEVERE	Large financial costs or significant inconveniences would be incurred by the municipality or community. The possibility of loss of life or livelihood exists. Significant, and potentially permanent, property or ecosystem damage might occur.

Worksheet adapted from NOAA Coastal Resilience Planning Guidance

Worksheet 3: Risk Assessment and Community Action Threshold

Asset:

SECTION 3: Risk Characterization Matrix

Characterize overall risk based on both probability of sea level rise impacts (from Worksheet 1B) and severity of consequences (from Worksheet 3 Section 2) Identify Circle all applicable across the three categories

Risk Characterization

Probability of occurrence > (from Worksheet 1B)			
	High	Very High	Very High
	Moderate	High	Very High
	Low	Moderate	High

Severity of Consequences > (from Worksheet 3 Section 2)

SECTION 4: Risk Tolerance Approach

Circle all applicable across the three categories

Considerations for risk tolerance:

- What you know about the asset – its uniqueness, function(s) or service(s) it provides, how it connects to other assets, etc.
- How risk averse the community is based on the values or culture of the community.
- How much you/the community can afford to be wrong – someone is going to be liable for the asset, how much are we willing to have something bad happen?
- The type and severity of potential consequences identified in sections 1 and 2.

Rating Description

RISK TOLERANT	MODERATE RISK	RISK AVERSE
Asset can adapt or will experience minimal impacts. Consequences are expected to be low or acceptable.	Some level of acceptable risk. Impact will have some consequences, but these will be tolerable and/or can be overcome relatively easily.	Very little acceptable risk. Impact will be difficult to overcome and should try to be avoided. Planning and actions might include worst case scenarios.

Worksheet adapted from the U.S. Climate Resilience Toolkit "Documenting Steps to Resilience" and NOAA Coastal Resilience Planning Guidance

Worksheet 3: Risk Assessment and Community Action Threshold

Risk Assessment Summary Table

For each asset and sea level rise scenario evaluated enter the projected sea level rise and probability of exceedance (from Worksheet 1B), the severity of consequences of projected sea level rise impacts (from Worksheet 3, Section 2), the scenario risk characterization (from Worksheet 3, Section 3), and overall risk tolerance (from Worksheet 3, Section 4).					
Community Asset	**Projected Sea Level Rise** (Worksheet 1B)	**Probability of Exceedance** (Worksheet 1B)	**Severity of Consequences** (Worksheet 3 Section 2)	**Risk Characterization** (Worksheet 3 Section 3)	**Risk Tolerance** (Worksheet 3 Section 4)
Coastal trail network	Sea level rise projected increase of 1-3ft by 2100	Likely	Minor Trail function is restored once area is drained	Moderate	Moderate Community desires to maintain or improve asset

Worksheet adapted from US Climate Resilience Toolkit "Documenting Steps to Resilience" and NOAA Coastal Resilience Planning Guidance

Step 4: Develop and Implement Coastal Resilience Strategies and Projects

This section provides guidance on identifying potential strategies and projects which may address community issues related to sea level rise, evaluating their feasibility, and leveraging available resources for implementation. Throughout this step, communities may seek technical assistance from local government or professional organizations involved in planning, design, construction, and/or environmental conservation to most accurately estimate feasibility of prospective solutions.

Develop Solutions

Objective

This step is intended to identify potential sea level rise adaptation strategies and project alternatives capable of mitigating unacceptable risk to community assets and values while complying with applicable guidelines and regulations. In this step community planning groups will develop a list of local sea level rise adaptation strategies and projects, and assess their effects on community asset resilience, economic viability, local and regional environmental impact, and implementation feasibility, among other factors. This process is intended to result in a prioritized list of viable short, medium, and long-term projects representing applicable protection, accommodation, and managed retreat adaptation strategies for which the community may pursue funding and implementation support.

Process

1) *List potential strategies and projects* – Use local recommended sea level rise adaptation management practices if these have been identified. Otherwise, refer to other resources listed at the end of this guide to identify strategies and/or projects which may address potential impacts of sea level rise in shoreline communities.

2) *Conduct feasibility analysis* - Estimate tangible costs and benefits, environmental impacts, regulatory requirements, and implementation challenges associated with prospective projects or strategies. Evaluate projects across these and any other pertinent areas to determine feasibility. Document feasibility determination in table form (example below) for visual comparison of selected projects. Review of similar past projects and/or subject matter expert consultation may be necessary to analyze complex projects.

Community Asset	Adaptation Strategy	Costs	Benefits	Acceptance	Required Resources	Environmental Impact	Regulatory Requirements	Average Feasibility Rating	Additional Notes
Asset A	Strategy 1								
Asset A	Strategy 1								Selected Alternative
Asset A	Strategy 1								

Feasibility Ratings (copy and paste in matrix): Feasible Potentially Feasible Not Feasible

Adaptation Project Feasibility Matrix
Adapted from the U.S. Climate Resilience Toolkit

3) *Determine strategy urgency* - Identify the timeframe in which potential strategies must be resourced and implemented to maintain an acceptable level of risk to community assets. Classify strategies as immediate (current year), short-term (1-5 yrs.), or long-term (5+ yrs.).

Tools and supporting resources

The U.S. Climate Resilience Toolkit and FEMA Community Rating System Floodplain Management Planning Guide provide additional guidance related to developing and prioritizing resilience projects which may inform community efforts.

- U.S. Climate Resilience Toolkit - *Steps to Resilience (Steps 3&4)* https://toolkit.climate.gov/steps-to-resilience/investigate-options

- FEMA CRS Coordinator's Manual - Floodplain Management Planning (Section 512) https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf

The Washington State Department of Ecology, Washington Department of Fish and Wildlife, local government planners and advisory groups such as the Northwest Straits Commission, and the American Planning Association are among the organizations which can provide access to resources, expertise, and in some cases planning assistance for community project development.

- Washington State Department of Ecology Shoreline & Coastal Management website https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management

- Washington Department of Fish and Wildlife - *Your Marine Waterfront: A guide to protecting your property while promoting healthy shorelines*
  https://wdfw.wa.gov/publications/01791

- Northwest Straits Commission website
  https://www.nwstraits.org/

- American Planning Association - Community Planning Assistance Teams website

  https://www.planning.org/communityassistance/teams/

Planning template

Use worksheet 4A sections 1 and 2 to document proposed projects and project feasibility analyses.

Use worksheet 4A section 3 to summarize viable alternative adaptation strategies.

Worksheet 4A: Develop Solutions

Instructions and Example:

Use this worksheet to identify potential adaptation strategies which may address projected sea level rise impacts to vulnerable community assets; compare feasibility of alternatives and select a preferred strategy for each community asset; and develop a prioritized list of strategies for future implementation. Additional detail on how to complete and document this step are provided below for reference:

- Select potential adaptation strategies specific to each vulnerable community asset (asset vulnerability identified in Worksheet 2B). The example below provides an example of adaptation strategies. Others may apply for your community.

Sea Level Rise Adaptation Practice Recommendation Table

PROTECT	ACCOMMODATE	RETREAT
SHORT-TERM STRATEGIES (Now - 2050)		
Soft Shorelines	Advanced Septic Systems	On-Site Retreat
Beach Nourishment	Anchored Septic Systems	Off-Site Retreat
Bulkhead/Seawalls	Community Drainfields	
Breakwater	Elevated Structures	
Dikes/Levees	Floodable Spaces	
Dry Floodproofing	Raised Ground	
Floodwall	Water Supply Diversification	
Revetment	Wet Floodproofing	
	Utility Relocation & Consolidation	
PROTECT	ACCOMMODATE	RETREAT
MID-TERM STRATEGIES (2050 - 2070)		
Soft Shorelines	Community Drainfields	Off-Site Retreat
Beach Nourishment	Elevated Structures	
Bulkhead/Seawalls	Floodable Spaces	
Dikes/Levees	Raised Ground	
Dry Floodproofing	Utility Relocation & Consolidation	
Floodwall	Water Supply Diversification	
	Wet Floodproofing	
PROTECT	ACCOMMODATE	RETREAT
LONG-TERM STRATEGIES (2070 - 2100)		
Soft Shorelines	Community Drainfields	Off-Site Retreat
	Water Supply Diversification	
	Utility Relocation & Consolidation	
	Floodable Spaces	

- Complete an adaptation strategy worksheet (Worksheet 4A, Section 1) for each potential

strategy.

- Summarize strategy worksheets in a feasibility matrix (Worksheet 4A, Section 2) to compare strategies for each asset.
- Enter the selected strategy(ies) for each asset into a summary table (Worksheet 4A, Section 3). An example entry is provided for reference.

Worksheet 4A: Develop Solutions

Section 1. Adaptation Strategy Development

<table>
<tr><td colspan="7">Asset:</td></tr>
<tr><td colspan="3">Strategy:</td><td colspan="4">What are you hoping to gain by this strategy? How would this reduce vulnerability?</td></tr>
<tr><td>Costs</td><td>Benefits</td><td>Acceptance</td><td>Required Resources</td><td>Environmental Impacts</td><td>Regulatory Requirements</td><td>Timing/Urgency</td></tr>
<tr><td>What is the estimated monetary cost of the strategy?

High

Moderate

Low

Estimated Cost:</td><td>Is this strategy effective for a range of future climate projections?

Yes

No; only low scenario

No; only high scenario

Why?</td><td>To what degree is the community likely to accept the adaptation option?

Poor

Fair

Good

Excellent

Why?</td><td>What County STAFF TIME might be required for this option?

Existing

New or Additional

Notes:</td><td>What impact will the strategy have on the environment?

Natural Resource impacts

Cultural Resource impacts

Shoreline/Land Use impacts

Other</td><td>What regulatory requirements apply?

Development permitting

Environmental permitting

Other:</td><td>What is the proposed implementation timeline (start and completion)?

Immediate (current year)

Short Term (1-5 years)

Long Term (5+ years)

Urgency drivers:</td></tr>
<tr><td>Are there additional costs associated with this strategy?

Social

Political

Other:</td><td>Does this strategy achieve multiple benefits/goals?

Societal

Economic

Other:</td><td rowspan="2">To what degree is there political support for the adaptation option?

Poor

Fair

Good

Excellent

Why?</td><td>What TECHNICAL EXPERTISE might be required for this option?

Existing

New or Additional

Notes:</td><td rowspan="2">Will potential impacts require SEPA environmental review?

Yes

No

Unsure

Notes:</td><td rowspan="2">Will a waiver, variance, or conditional use permit be required?

Yes (type)

No

Unsure

Notes:</td><td rowspan="2">If implementation is delayed, what cost(s) might be incurred?</td></tr>
<tr><td>Are these additional costs anticipated to be:

High

Medium

Low

Notes:</td><td>Are the costs equitably and justifiably distributed?

Yes

No

Unsure

Notes:</td><td>What MAINTENANCE is required for this strategy?

Continuous

Periodic

None

Notes:</td><td>Is this strategy contingent on other actions being implemented first? If so, what?</td></tr>
</table>

Worksheet adapted from NOAA Coastal Resilience Planning Guidance

Worksheet 4A: Develop Solutions

Section 2. Adaptation Strategy Feasibility Matrix

Community Asset	Adaptation Strategy	Costs	Benefits	Acceptance	Required Resources	Environmental Impact	Regulatory Requirements	Average Feasibility Rating	Additional Notes
Coastal Trail Network	Coastal Trail Network Reroute								Permit and SEPA approval required

Feasibility Ratings (copy and paste in matrix):  Feasible  Potentially Feasible  Not Feasible

Worksheet adapted from US Climate Resilience Toolkit "Documenting Steps to Resilience"

Worksheet 4A: Develop Solutions

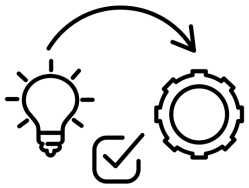
Section 3. Adaptation Strategy Summary

Priority	**Community Asset**	**Adaptation Strategy**	**Overall Feasibility** (Average. feasibility rating)	**Timing/Urgency** (immediate, short-term, long-term)	**Key Considerations** (barriers, contingencies, resource requirements, etc.)
1	Coastal Trail Network	Coastal Trail Network Reroute		Short-term	Permit required

Implement Solutions

Objective

This step provides guidance on implementation of selected community coastal resilience planning actions, to include development of an implementation plan, project permitting, and identification of funding sources.



Process

1) *Develop an Implementation Plan* - Plans should include the mechanism by which coastal resilience strategies are to be implemented (regulatory update, study, project, etc.), potential barriers to implementation, identification of key stakeholders necessary to facilitate the implementation process, and permits and/or approvals necessary for implementation. The plan should also include an implementation timeline as a basis for progress evaluation.

2) *Identify funding sources* - Most strategies will require some form of funding to implement. As part of the implementation process, communities should confirm funding sources as well as processes and timelines associated with accessing available funds.

Tools and supporting resources

Federal, state, and local project implementation and funding support may be available for selected adaptation projects. This may take the form of conservation and emergency preparedness grants including FEMA pre-disaster grants and Salmon Recovery Program funding; conservation district financial assistance; property tax reductions through the Washington State Public Benefit Rating System for natural shoreline restoration; and free or low-cost technical assistance for soft shore projects through organizations such as the Northwest Straits Foundation. The U.S. Coastal Resilience Toolkit and Shore Friendly program provide listings of nationwide, state, and local funding opportunities available today. In the future, local government incentives may be available for coastal resilience projects.

- U.S. Climate Resilience Toolkit (Implementation Resources) https://toolkit.climate.gov/steps-to-resilience/take-action
- U.S. Climate Resilience Toolkit (Funding Opportunities) https://toolkit.climate.gov/content/funding-opportunities
- FEMA Pre-Disaster Mitigation Grant Program https://www.fema.gov/pre-disaster-mitigation-grant-program

- Shore Friendly Program (Resource Listing)
  http://www.shorefriendly.org/resources/resources-in-your-area/

- Open Space Public Benefit Rating System (County Programs)
  https://access.wa.gov/search-access-washington.html?q=public+benefit+rating+system

Planning template
Use worksheet 4B to document proposed project implementation plans and funding sources.

Worksheet 4B: Implement Solutions

Instructions and Example:

Use this worksheet to develop an implementation plan for adaptation strategies which may address projected sea level rise impacts to vulnerable community assets. Include implementation mechanisms, implementation process leads, supporting resources such as partnerships and funding sources. Additional detail on how to complete and document this step are provided below for reference:

- Complete a strategy implementation worksheet for each selected strategy and associated vulnerable community asset (selected strategies identified in Worksheet 4A, asset vulnerability identified in Worksheet 2B).
- Enter implementation factors for each strategy in the below summary table. Strategies should be listed in priority order. An example entry is provided for reference.

Worksheet 4B: Implement Solutions

Section 1. Adaptation Strategy Implementation Plan

<table>
<tr><td colspan="4">Strategy:</td></tr>
<tr><td colspan="4">Mechanism:</td></tr>
<tr><td colspan="2">Circle the primary instrument for implementation:

Regulation Legislation Incentive

Planning Process Program Project</td><td colspan="2">The primary instrument is:

New

Modification of Existing

Existing, No Modification Needed</td></tr>
<tr><td colspan="4">Potential Barriers to Implementation</td></tr>
<tr><td colspan="2">What are possible factors that may hinder implementation?</td><td colspan="2">What are some actions to overcome these barriers?</td></tr>
<tr><td colspan="4">Stakeholders and Partnerships</td></tr>
<tr><td>Who makes the decision whether to implement the strategy?</td><td>What partnerships can you leverage for implementing the strategy (either internal or external)</td><td colspan="2">Which stakeholders will be impacted by implementation of the strategy? How can you engage them in implementation?</td></tr>
<tr><td colspan="4">Funding</td></tr>
<tr><td>Do funding sources already exist?

Yes

No</td><td>Funding sources are:

Internal

External</td><td colspan="2">What is the process to request funding?</td></tr>
<tr><td colspan="4">Steps</td></tr>
<tr><td colspan="2">What needs to be completed before implementation can begin? Indicate appropriate timing next to activity. (Examples: data collection, further research, change in policy(s), building awareness, conducting training and/or outreach, etc.)</td><td colspan="2">Ideas on measuring success and determining the effectiveness of the strategy over time.</td></tr>
</table>

Worksheet adapted from NOAA Coastal Resilience Planning Guidance

Worksheet 4B: Implement Solutions

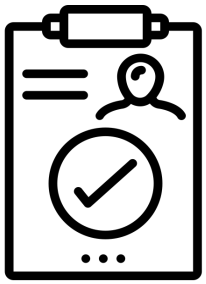
Section 2. Adaptation Strategy Implementation Plan Summary

Priority	Community Asset	Stakeholders	Adaptation Strategy	Implementation Mechanism	Implementation Partners	Implementation Funding Source	Implementation Timeline	Key Considerations (barriers, contingencies, resource requirements, etc.)
1	Coastal Trail Network	Community Property Owners	Coastal Trail Network Reroute	New Project	Shore Friendly Program	50% Community funds 50% Conservation Grant	Start < 6mo. Complete < 1 yr.	Permit and SEPA approval required

Step 5: Monitor Outcomes

Objective

This step is intended to provide guidance on community monitoring of adaptation strategies and project outcomes, documentation of project effectiveness, and identification of lessons learned to inform future iterations of the planning process. Effective monitoring and feedback allow communities to optimize the community-based planning process. This step requires community planning group dedication and continuity to ensure lessons learned are effectively passed on and applied to future initiatives.



Process

1) *Establish a project monitoring team* - Identify community planning team members responsible for periodic follow-up to ensure projects are on track and to document outcomes.

2) *Conduct periodic evaluation of adaptation strategy implementation* - Document progress of adaptation strategy implementation based on the schedule and milestones established in the implementation plan. Identify primary causes for delays if encountered, as well as key factors contributing to timely completion.

3) *Evaluate strategy outcomes* - Continue periodic post-implementation monitoring to determine whether strategy or project objectives are achieved. Use this evaluation to inform continued and/or future planning efforts.

4) *Document lessons learned* - Identify things that worked well and challenges encountered throughout the implementation process and post-implementation period. Ensure lessons learned are made publicly available to inform future community planning efforts.

Tools and supporting resources

Tools and resources which may assist with this step include CRS Floodplain Management Planning guidance on plan maintenance and U.S. Climate Resilience Toolkit guidance on post-implementation monitoring.

- U.S. Climate Resilience Toolkit - *Monitoring Guidance*
  https://toolkit.climate.gov/steps-to-resilience/take-action

- FEMA CRS Coordinator's Manual - Floodplain Management Planning (Section 512) https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf

Planning template

Use worksheet 5 to outline a post-implementation monitoring plan and capture lessons learned.

Worksheet 5: Monitor Outcomes

Instructions and Example:
Use this worksheet to document implementation progress and post-implementation outcomes. Capture best practices, challenges, and lessons learned to inform future plans. An example is provided for reference.

Adaptation Strategy Implementation Plan Summary

Priority	Community Asset	Adaptation Strategy	Implementation Status (Planned, In Progress, Complete, Delayed)	Implementation Challenges	Implementation Best Practices	Post-Implementation Asset Vulnerability (low, moderate, high)	Lessons Learned	Future Planning Recommendations	Date of Update
1	Coastal Trail Network	Coastal Trail Network Reroute	Complete	Permitting delay (1mo.)	Regular (monthly) community updates	Low	Ensure permitting requirements and timelines are confirmed prior to project start	Project complete. No further action.	1/24/20
2									
3									
4									
5									

Finalizing the Coastal Resilience Plan

With the initial coastal resilience planning process complete, community planning teams have a basis from which to move forward with prioritized implementation of coastal adaptation strategies. The final plan should be a consolidated document which includes the completed contents of worksheets 1-5 and a plan cover sheet which includes the following information:

[County/City]
Community Coastal Resilience Plan
[Community Name and Location]
[Date of Report and revision number]

Part 1: Community Planning Issues and Team

- Community Profile (Worksheet 1A)
- Basis for Planning: Sea Level Rise Projections (Worksheet 1B)
- Planning Team: Stakeholder Groups and Representatives (Worksheets 1C &1D)

Part 2: Community Values and Vulnerable Assets

- Community Values, Goals, and Assets (Worksheet 2A)
- Community Asset Vulnerability (Worksheet 2B)

Part 3: Risk Analysis and Threshold for Community Action

- Community Risks and Thresholds for Action (Worksheet 3)

Part 4: Resilience Strategy Development and Implementation

- Proposed Adaptation Strategies (Worksheet 4A)
- Implementation Plan (Worksheet 4B)

Part 5: Post-Implementation Monitoring and Lessons Learned

- Adaptation Strategy Implementation Plan Monitoring Summary (Worksheet 5)

Completed plans should be made publicly available to community members and shared with the local government planning departments. The planning process is iterative and requires regular review of factors that led to decision points related to risks, thresholds for action, and implementation timelines. As implementation and monitoring plans progress, it is imperative that planning process leads remain engaged with local government and community organizations involved in shoreline planning to incorporate updated information pertinent to coastal resilience plans as it becomes available.

Additional Information and Resources

For additional information related to shoreline planning and development regulations, please visit the Washington State Department of Ecology "Shoreline Coastal Management" website: https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management

A consolidated list of online tools and resources referenced throughout this guidebook is provided below:

Sea Level Rise Projections and Modeling

- Projected Sea Level Rise for Washington State: a 2018 Assessment
  http://www.wacoastalnetwork.com/wcrp-documents.html
- NOAA Sea-Level Rise Viewer
  https://coast.noaa.gov/slr/

Planning Aids

- U.S. Climate Resilience Toolkit Steps to Resilience
  https://toolkit.climate.gov/#steps
- FEMA CRS Coordinator's Manual - Floodplain Management Planning (Section 512)
  https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf
- Washington Department of Fish and Wildlife - *Your Marine Waterfront: A guide to protecting your property while promoting healthy shorelines*
  https://wdfw.wa.gov/publications/01791
- American Planning Association - Community Planning Assistance Teams website
  https://www.planning.org/communityassistance/teams/
- University of Kansas - *Community Toolbox*
  https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/identify-community-assets/main

Funding & Incentive Programs

- U.S. Climate Resilience Toolkit (Funding Opportunities)
  https://toolkit.climate.gov/content/funding-opportunities
- FEMA Pre-Disaster Mitigation Grant Program
  https://www.fema.gov/pre-disaster-mitigation-grant-program
- Shore Friendly Program (Resource Listing)
  http://www.shorefriendly.org/resources/resources-in-your-area/

- Open Space Public Benefit Rating System (County Programs)
  https://access.wa.gov/search-access-washington.html?q=public+benefit+rating+system

Community Organizations and Citizen Science

- Washington Coastal Hazards Resilience Network website
  http://www.wacoastalnetwork.com/
- Northwest Straits Commission website
  https://www.nwstraits.org/