

# Climate Change Adaptation & Vulnerability Assessments

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The *National Estuary Program FY 2015 and FY 2016 Clean Water Act §320 Funding Guidance* contains new guidance about how EPA plans to make the National Estuary Program a “climate resilient investment” in accordance with Executive Order 13653 and an EPA Policy Statement on Climate Change Adaptation.

“Preparing the United States for the Impacts of Climate Change” appears as Appendix 2. It states that Federal “...agencies should promote risk-informed decision making and the tools to facilitate it;...reform policies and Federal funding programs that may...increase the vulnerability of natural or built systems, economic sectors, natural resources, or communities to climate change related risks.... [and] shall support and encourage smarter, more climate-resilient investments...through agency guidance, [and] grants.”

## New Requirements for National Estuary Programs

- FY15–18 each NEP will complete a broad, risk-based climate change vulnerability assessment of its program.
- By FY 2020, the CCMP of each NEP will be informed by a VA and include appropriate responses to assessment findings, which are to mitigate high risks or revise/drop goals that are at high risk.
- Workplans submitted after September 2020 should be climate resilient investments.

## Context

### Clean Water Act Goals

- Control point and nonpoint sources of pollution and clean up pollution.
- Maintain and improve estuarine habitat.
- Protect and propagate fish, shellfish and wildlife, including control of nonnative species.
- Protect public water supplies and recreational activities, in and on the water.

**National Estuary Programs** improve water quality and focus on the integrity of the whole system: its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values.

### Climate Change Vulnerability Assessment (CCVA)

EPA guidance notes that the CCVA is about the NEP study area and Management Plans; it’s not a regional climate change assessment. It is intended to help NEPs meet their objectives.

“It is a risk-based vulnerability assessment that examines how climate change stressors will affect the ability of an organization (an NEP) to reach its goals. When risks exist, an organization that does not want to accept the possibility of a risk’s consequences will have to adapt. An organizational quality known as “adaptive capacity” is used to characterize its ability to make those adjustments. The adaptive capacity concept can also be used with ecosystems or elements of ecosystems in reference to how much they can cope with climate change. You probably accounted for the adaptive capacity of ecosystems in your vulnerability assessment when you determined the likelihood or consequence of environmental risks.” *EPA Guidance*

The CCVA does require stakeholder engagement. And for all NEPs, as outlined in Section 320 of the Clean Water Act, Congress said that the members of [an NEP’s] initial management committee should include (in addition to states and government agencies), “local governments,” and “affected industries, public and private educational institutions, and the general public...” The Estuary Partnership, like all NEPs, maintains this commitment of having its governing bodies represent diverse interests of the NEP study area. The Management Plans also are long range, regional plans, so while the EPA Climate Change guidance suggests the CCVA is about the NEP, because NEPs are regional bodies, this in some ways becomes a plan for the region, not the only one, but a key one.

Each step in the CCVA has several steps, tables and matrices to complete.

## CCVA Climate Change Stressors

- Warmer summers (overall climate)
- Warmer winters (overall climate)
- Warmer water
- Increasing drought
- Increasing storminess
- Sea level rise
- Ocean acidification

## CCVA Steps

### Establish Goals for Process

Scope and boundaries for CCVA

### Identify Risk

Develop a broad list of foreseeable ways climate change stressors could keep your organization from achieving its goals. (**Estuary Partnership Gray Table**)

Risks threaten things that are of value. A risk is a problem to be managed by finding ways to lower its principal characteristics: likelihood and consequence.

**Risk Paths:** The risk develops along the path between the cause and the effect.

Climate change stressor	Paths	Unrealized goal
<b>Warmer Water</b>	✓ Toxicity of pollutants may increase	<b>Maintain water quality</b>
	✓ Water can hold less dissolved oxygen	
	✓ Greater algae growth may occur	
	✓ Parasites and bacteria have greater abundance, survival or transmission	

**Example risk path**

Characterize each risk in five areas:

- **Consequence:** the effect the risk would have on your organization's goal were it to occur. Low (life will go on; not as important as many other things; could adjust); (b) Medium; (c) High (major disruption; goal is out of reach or not even attainable)
- **Likelihood:** chance of the risk actually occurring (i.e., probability). For the risk, you determine how likely it is to affect the goal. Low; (b) Medium; (c) High
- **Spatial extent:** proportion of geographic area that the risk will affect. Site (e.g., a few waterfront lots, a bridge, a sewage treatment plant); (b) Place or region (e.g., community, harbor, state park, wildlife refuge, sub-watershed); (c) Extensive (most of the watershed or most of the estuary).
- **Time horizon:** when problem begins. Decisions about low or medium problems that will not emerge for decades could be postponed. High-impact problems are already occurring and need some attention right away. More than 30 years; (b) 10–30 years; (c) Already occurring or 0–10 years
- **Habitat type**



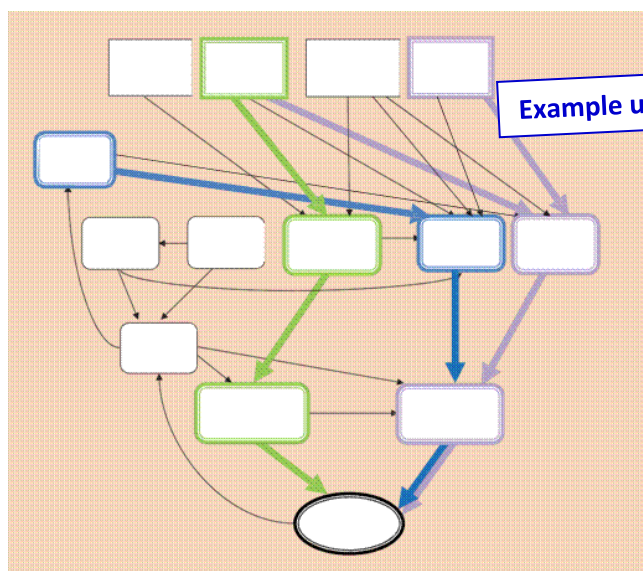
**Evaluate Risk: Comparing Risks:** Develop a consequence/probability matrix and review it with stakeholder input.

**Establish Context for the Action Plan:** Explore opportunities and constraints that influence your organization's choices.

**Evaluate Risk - Deciding on a Course:** Revisit vulnerability assessment, take a closer look at risks to determine which ones your organization will move forward with in the action planning process to decide whether your organization will mitigate, transfer, accept or avoid each risk. Risk management uses four general approaches for responding to any given risk:

- Mitigate
- Transfer
- Accept
- Avoid

	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Medium	Medium	High	High	Extreme
Likely	Medium	Medium	Medium	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High



Example use of risk pathways

Adaptation strategies	Green path	Purple path
Start restoration soon to achieve functions of mature marshes, including attainment of threshold elevations for organic accumulation, ahead of sea level rise	x	
Plan for the temporal progression of habitats (e.g., by establishing climate conditions)	x	
Restoration (e.g., consider marsh levels on downstream estuary restoration efforts)	x	
Support resilience by restoring habitat complexity and facilitating high-energy parts of the system such as tides, wind-driven waves and freshwater flows		x
Practice integrated water management, including water conservation, as a priority	x	x
If it is not possible to make maintaining marsh salinity a top priority for Delta freshwater storage policies, plan for the restoration of tidal wetlands further up the estuary	x	
Develop methods to move sediment into the bay, to keep pace vertically with sea level rise		x
Develop methods to reduce wave action on the front side of marshes		
Adjust policies that prevent coarse sediment from entering the bay (e.g., for streams that don't support salmonids, change policies to allow an increase in sediment load)	x	x
Involve authorities in flood control districts to recouple streams to wetlands		x
Monitor change at the landscape scale to assess management effectiveness		
Develop rapid response plans for catastrophes (e.g., levee breaks), with the political and scientific bases in place to respond properly		

## Select Adaptation Actions

Screen potential adaptation actions and select the ones your organization will move forward for implementation.

- Criteria to assess actions
- Risk reduction potential
- Feasibility and effectiveness
- Cost and cost-effectiveness
- Ancillary costs and benefits
- Equity and fairness
- Robustness

## Implement CCVA

Ensure each action is moving forward.

## Monitor and Review

Check on effectiveness of actions, adapt.

