Maryland Coastal Bays Program

Climate Change Vulnerability Assessment

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Climate Change Vulnerability Assessment (CCVA)

- Steps 1-5 of EPA's "Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans"
- Workbook chosen based on EPA recommendation
  - Workbook written after CCMP was approved
- Process for determining and prioritizing risks that would result from the impact of 7 different climate stressors on CCMP goals

Phase 1: CCVA Steps 1 – 5

- *Step 1—Communication and Consultation**
- *Step 2—Establishing the Context for the Vulnerability Assessment = 14 CCMP Goals**
- Step 3—Risk Identification
- Step 4—Risk Analysis
- Step 5—Risk Evaluation: Comparing Risks

**Steps 1 and 2 were completed through the CCMP process in 2014*

Phase 1: CCVA Steps 1 – 5

Climate Stressors

- *Warmer summers*
- *Warmer winters*
- *Warmer water*
- *Increasing drought*
- *Increasing storminess*
- *Sea level rise*
- *Ocean acidification*

Risk Identification (Step 3)

- Generating a broad list of reasonably foreseeable ways that climate stressors could keep your organization from achieving its goals
- Example:
  - Sea Level Rise (stressor) will lead to more beach erosion (risk) and we might not be able to maintain the endangered bird species nesting sites (goal).

Who worked on Step 3

- MCBP convened Expert Panel, January 2017
- MCBP STAC reviewed the full list of risks
- MCBP Staff and facilitator streamlined the risks to a manageable number

Risk Analysis (Step 4)

- “Initial, high level determination of consequence, likelihood, [and] spatial scale of the impact, and the time horizon until a problem begins for each risk…from Step 3.”
- Also includes Habitat Type
- Examining each Stressor-Risk-Goal pathway separately

Determining Consequence

- The effect the risk would have on the goals were it to occur
  - Low (life goes on, not as important as many other things, can adjust)
  - Medium
  - High (major disruption, goal out of reach or not attainable)

Determining Likelihood

- Chance of the risk actually occurring (i.e. probability). How likely is the risk to affect the goal?
  - Low
  - Medium
  - High

Determining Spatial Extent

- Proportion of geographic area that the risk will affect, e.g. is it isolated or widespread or in between
  - Site (a few waterfront lots, a bridge, a WWTP)
  - Place/region (community, harbor, state park, wildlife refuge, sub-watershed)
  - Extensive (most of the watershed or estuary)

Determining Time Horizon

- Note this is to be determined independent of the likelihood
- When will the problem begin to occur
  - Already occurring or in 10 years
  - 10 – 30 years
  - More than 30 years away

Determining Habitat Type

- Open-ended, fill in most likely type
- Will assist MCBP in Phase 2-Action Plan if risks or actions need to be grouped by habitat type

Who worked on Step 4

- Small groups analyzed the risks in each of the four categories within the CCMP
- STAC reviewed the risk analysis and offered suggestions
- MCBP Staff and facilitator reviewed and streamlined risk analysis

Risk Evaluation: Step 5

- Enter Step 4 data into EPA's online tool
- Online tool generates a Consequences-Probability Matrix, 1 for each CCMP Goal
- 14 Matrices reviewed at 2 public meetings May 2017
- MCBP STAC reviewed
- MCBP Staff and facilitator reviewed for accuracy

FIGURE 5-1. An example consequence/probability matrix.

Likelihood (probability) of occurrence	Low	Medium	High
High	1. Warmer water may stress immobile biota 2. Warmer water may lead to changes in drinking water treatment processes n. _____	1. Warmer water may hold less dissolved oxygen 2. Sea level rise may cause bulkheads, sea walls and revetments to become more widely adopted n. _____	1. Shoreline erosion from sea level rise may lead to loss of beaches, wetlands and salt marshes 2. Combined sewer overflows may increase from more intense precipitation n. _____
Medium	1. Increased wildfires from warmer summers may lead to soil erosion 2. Warmer winters may lead species that once migrated through to stop and stay n. _____	1. Parasites and bacteria may have greater abundance, survival or transmission due to warmer water 2. Warmer summers may drive greater water demand n. _____	1. More frequent drought may diminish freshwater flow in streams 2. More intense precipitation may cause more flooding n. _____
Low	1. Warmer water may lead open seasons and fish to be misaligned 2. Warmer winters may lead to more freeze/thaw cycles that impact water infrastructure n. _____	1. Warmer water may lead jellyfish to be more common 2. Ocean acidification may cause the recreational shellfish harvest to be lost n. _____	1. Contaminated sites may flood from sea level rise 2. Warmer water may promote invasive species n. _____
	Consequence of impact		

Color key: Green | Yellow | Red

A C/P matrix is a tool for visualizing how risks were categorized when they were analyzed for their consequences and likelihoods. Risks plotted in red boxes (upper right), yellow boxes (diagonal from top left to bottom right) or green boxes (lower left) of the matrix are informally referred to as "red risks," "yellow risks" or "green risks" in the remaining steps of the WORKBOOK. The 18 risks shown here and their high-medium-low rankings are used solely for illustrative purposes.

Next Step – Phase 2: Action Plan Steps 6-10

- Step 6—Establishing the Context for the Action Plan
- Step 7—Risk Evaluation: Deciding on a Course
- Mitigate, Transfer, Accept, Avoid
- Step 8a—Finding Adaptation Actions
- Step 8b—Selecting Adaptation Actions
- Step 9—Preparing and Implementing an Action Plan
- Step 10—Monitoring and Review