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A Workbook for Developing Risk-Based Climate Change Adaptation Plans

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Why Climate Change Adaptation—

Climate change will affect the ability of organizations to meet their goals and objectives.

Climate change
- will make existing problems worse
- will bring new problems

To continue being an effective organization, you need to incorporate climate change into your planning.

Why this WORKBOOK ?

Lots of recognition from experts that an iterative risk management and VA's are the way to go for climate change adaptation

(IPCC, NRC, ICCATF, NOP, GAO, etc.)

Despite that, almost no risk-based plans exist.

We could not find any guide for how to do risk-based planning that was going to work for our primary user groups.

WORKBOOK is based on *ISO 31000—Risk Management*

A risk-based approach

If *risks* are how climate changes could keep your organization from meeting its goals...

How do you decide what to do when –
- You could easily have more than 100 discrete risks
- There could be just as many potential responses
- You don't have the resources to do everything

Risk Management helps users –
- identify their risks, and focus on the right ones
- find actions that do the most to reduce overall risk

Lower your risks. Achieve your goals.

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THE WORKBOOK methodology is best when:

- Users are comfortable using science to inform decisions
- Users have sufficient knowledge of their system to understand how CC may affect the way it functions

- The study area is large enough that risks are numerous and diverse
- The study area is small enough that managers know the territory
- Qualitative risk analysis is well suited
- Many stakeholders are involved
- Responses will have to be prioritized

WORKBOOK foundation

Every place-based organization is unique
- impacts, situation, context, purpose, resources

Place-based orgs are looking at 100+ discrete risks, from various stressors, in many sectors

The four cornerstones of the Nat'l Estuary Program:
(1) Focus on the watershed
(2) Integrate science into decision-making
(3) Foster collaborative problem solving
(4) Involve the public

Other work (EPA, NOAA, OFAs, ICLEI, NGOs, states)

WORKBOOK organization

Climate change adaptation has two halves

1. Vulnerability Assessment
2. Action Plan (includes executing the plan)

In a Vulnerability Assessment—

Assess climate risks: identify, analyze, evaluate

In an Action Plan—

use the VA to set priorities

identify, develop, implement responses

Adaptation reduces (eliminates) risks from CC.

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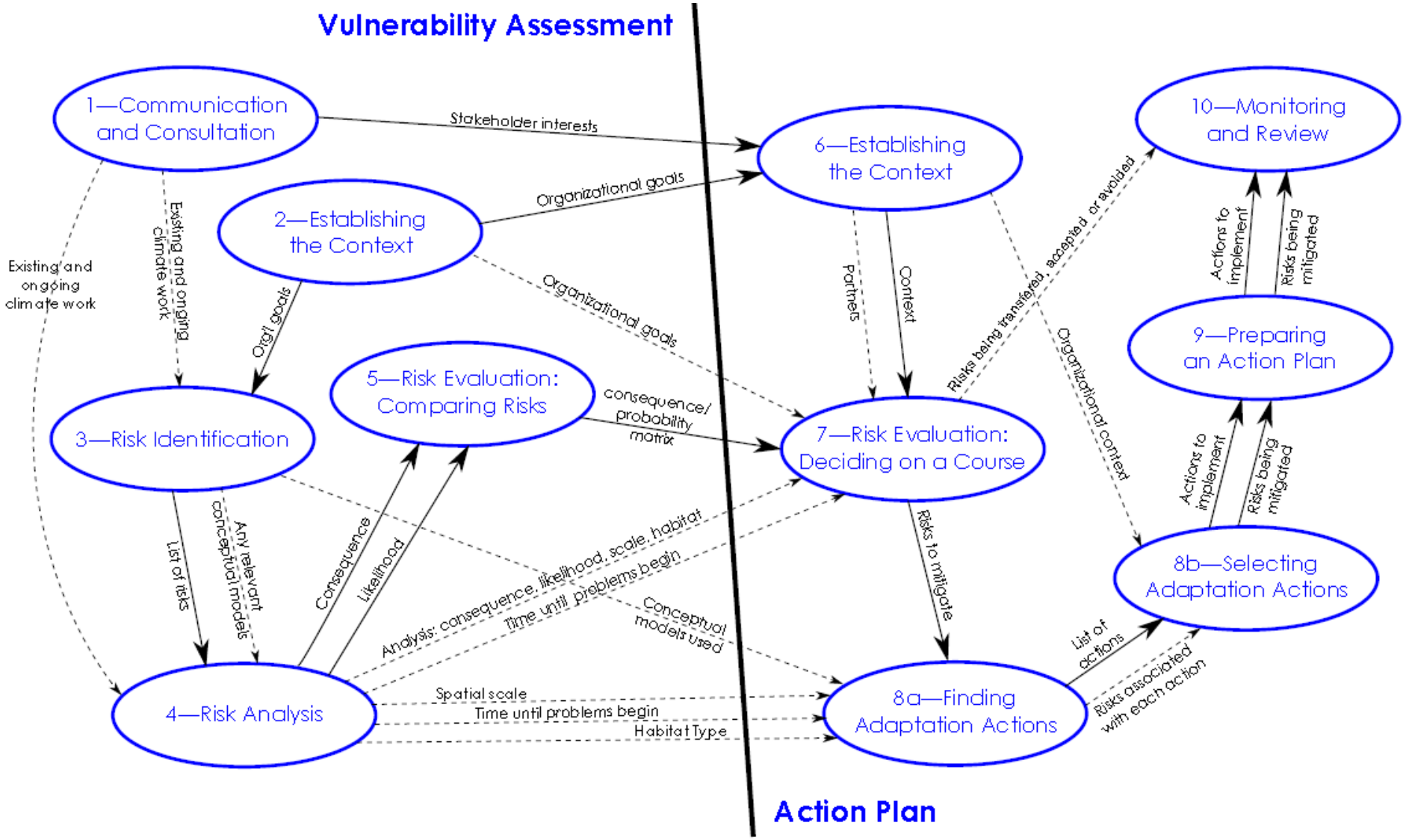

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VULNERABILITY ASSESSMENT

1—Communication and Consultation

2—Establishing the Context

3—Risk Identification

4—Risk Analysis

5—Risk Evaluation: Comparing Risks

Step 1*—Communication and Consultation

- Inform your stakeholders about what you are up to (internal and external stakeholders)
- Ask your stakeholders to help

Step 2—Establishing the Context for the VA

- Why does your organization exist?
- What are your organization's goals and objectives?
  - These should exist: you don't need new ones.

Step 3—Risk Identification

A *risk* is the possibility of a given climate change stressor to affect the ability of your organization to meet its goals and objectives.

Climate change stressors—

- Warmer summers
- Warmer winters
- Warmer water
- Drought
- Increasing storminess
- Sea level rise
- Ocean acidification + other CO_2 effects

Step 3—Risk Identification example

Organizational goal: Control point and nonpoint sources of pollution and maintain water quality

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Stressor: Warmer Water

Risks

- Toxicity of pollutants might increase;
- Water will hold less dissolved oxygen;
- Greater algae growth may occur
- Parasites and bacteria may have greater abundance, survival, or transmission
- Etc.

Step 4—Risk Analysis

- The process of comprehending a risk
  - The *consequence* if it were to occur
  - The *likelihood* of it occurring
  - Spatial extent of the risk
  - Time until the problem begins
  - Type of environment

Step 5—Risk Evaluation: Comparing Risks

- Develop a consequence/probability matrix
- Reach consensus w/ stakeholders, decision makers
- Revise matrix if necessary
- Get a deeper understanding
  stressors, objectives, habitat type

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 widespread 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 mis-aligned 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

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ACTION PLAN

6—Establishing the Context

10—Monitoring and Review

7—Risk Evaluation: Deciding on a Course

9—Preparing an Action Plan

8a—Finding Adaptation Actions

8b—Selecting Adaptation Actions

Step 6—Establishing the Context… Action Plan

- Parts of your context (STAPLEE criteria)
  - Social
  - Technical
  - Administrative
  - Political
  - Legal
  - Economic
  - Environmental
- Who are your potential partners?
  affects your options for reducing risk

Step 7—Risk Evaluation: Deciding on a Course

Select a high level approach for each risk in your VA

- Mitigate
- Transfer
- Accept
- Avoid

Step 8a—Finding Adaptation Actions

- Only risks selected for mitigation move forward into this step
- For each risk you selected for mitigation...
  Find/create a conceptual model for the risk
  hopefully the same one you used in Step 3?
- Find actions that act along the risk path to reduce consequence or likelihood of the risk

Step 8b—Selecting Adaptation Actions

- For actions that you think will reduce C/P...
- A set of assessment questions about the action
  - Risk reduction potential
  - Feasibility and effectiveness
  - Cost and cost-effectiveness
  - Ancillary costs and benefits $<$ *Sustainability*
  - Equity and fairness
  - Robustness
- Good actions will pass all the screening tests.

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Step 8b—Selecting Adaptation Actions

Roughly sort the good actions by their primary target risk.

Possible action 01
Project to take on 06
Possible action 11
Another possible action 14
Something you might do 15
Something you might do 17
Another possible action 02
Something you might do 03
Possible action 07
Something you might do 09
Action for consideration 10
Action for consideration 16
Project to take on 18
Action for consideration 04
Another possible action 05
Another possible action 08
Project to take on 12
Possible action 13
Action for consideration 19
Project to take on 20

Top to bottom is most to least risk reduction

Action Group A
- Possible action 11
- Something you might do 09
- Action for consideration 16
- Another possible action 05

Action Group B
- Possible action 01
- Possible action 13

Action Group C
- Project to take on 06
- Another possible action 08
- Action for consideration 19

Something you might do 15

Action Group D
- Possible action 07
- Project to take on 18

Something you might do 17

~~Another possible action 14~~ ——duplicates C

Action for consideration 10

~~Another possible action 02~~ ——duplicates 07

Something you might do 03

Project to take on 12

~~Action for consideration 04~~ ——duplicates 19

Project to take on 20

Step 9—Preparing an Action Plan

- Who is responsible for this action?
- What are the next steps?
- Keep track of actions and risks

Step 10—Monitoring and Review

- Set a schedule
- Is the action plan being implemented?
- Is the action plan up to date for any new info?
- Is the vulnerability assessment up to date?

Being Prepared for Climate Change

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