Climate Resiliency Decision-Making Matrix & Methodology

Climate Smart Tool

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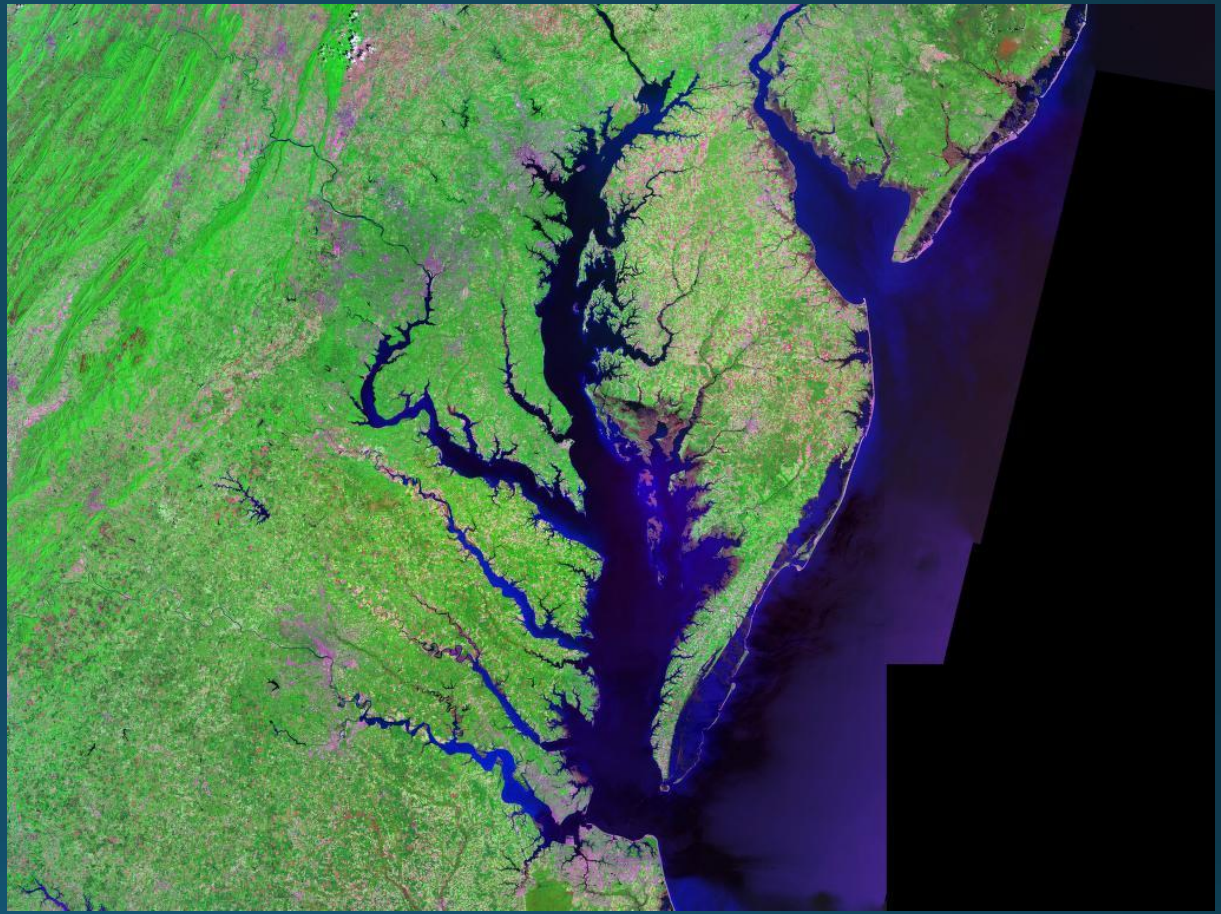


Overview

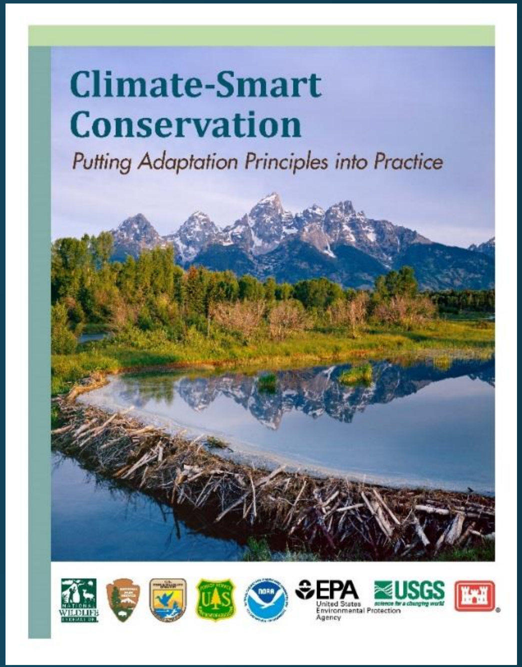
Climate Resiliency Goals

Increase the resiliency of the Chesapeake Bay watershed to adverse impacts from changing environmental & climate conditions

- Monitor:
  - Impacts of climate changes & sea level conditions
  - Effectiveness of restoration programs and projects
- Implement restoration &protection projects
  - Enhance resiliency
  - Address erosion, flooding, more intense & frequent storms & sea level rise

Project Goals

- Advance climate resilience objectives, including application of Climate-Smart conservation
- Develop a matrix methodology that works across the GITs/workgroups
- Use a regionally developed framework/methods to integrate climate change into CBP management strategies and actions
- Engage with selected GITs/workgroups as case studies



Stein et al. (2014)
http://www.nwf.orgClimateSmartGuide

What is climate smart?

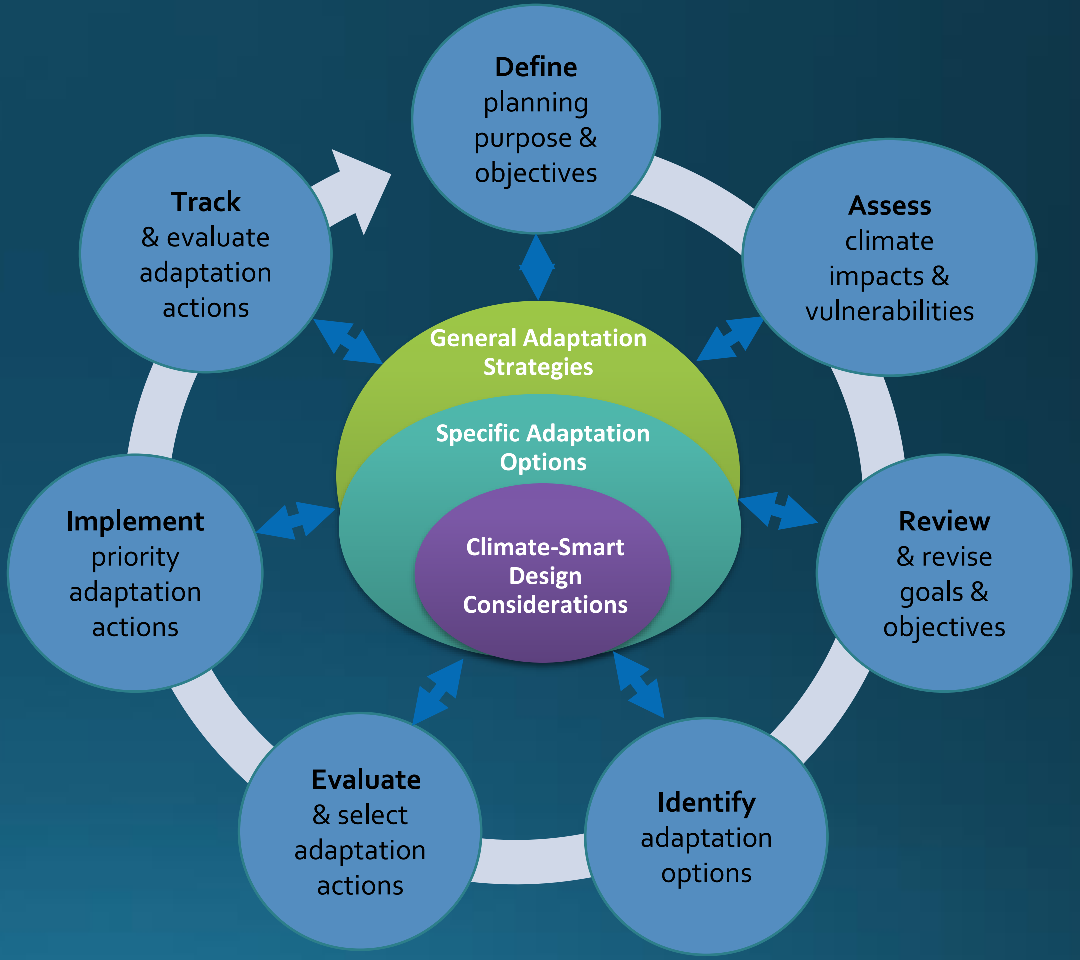
Climate-Smart Framework & Decision-Support Tool:

Develop a structured, science-based framework through which the principles of climate-smart adaptation planning can be effectively applied to all Chesapeake Bay Agreement Goals and Outcomes.

Why 'Climate Smart' & This Process?

- Climate change will influence the success and effectiveness of Chesapeake Bay restoration work

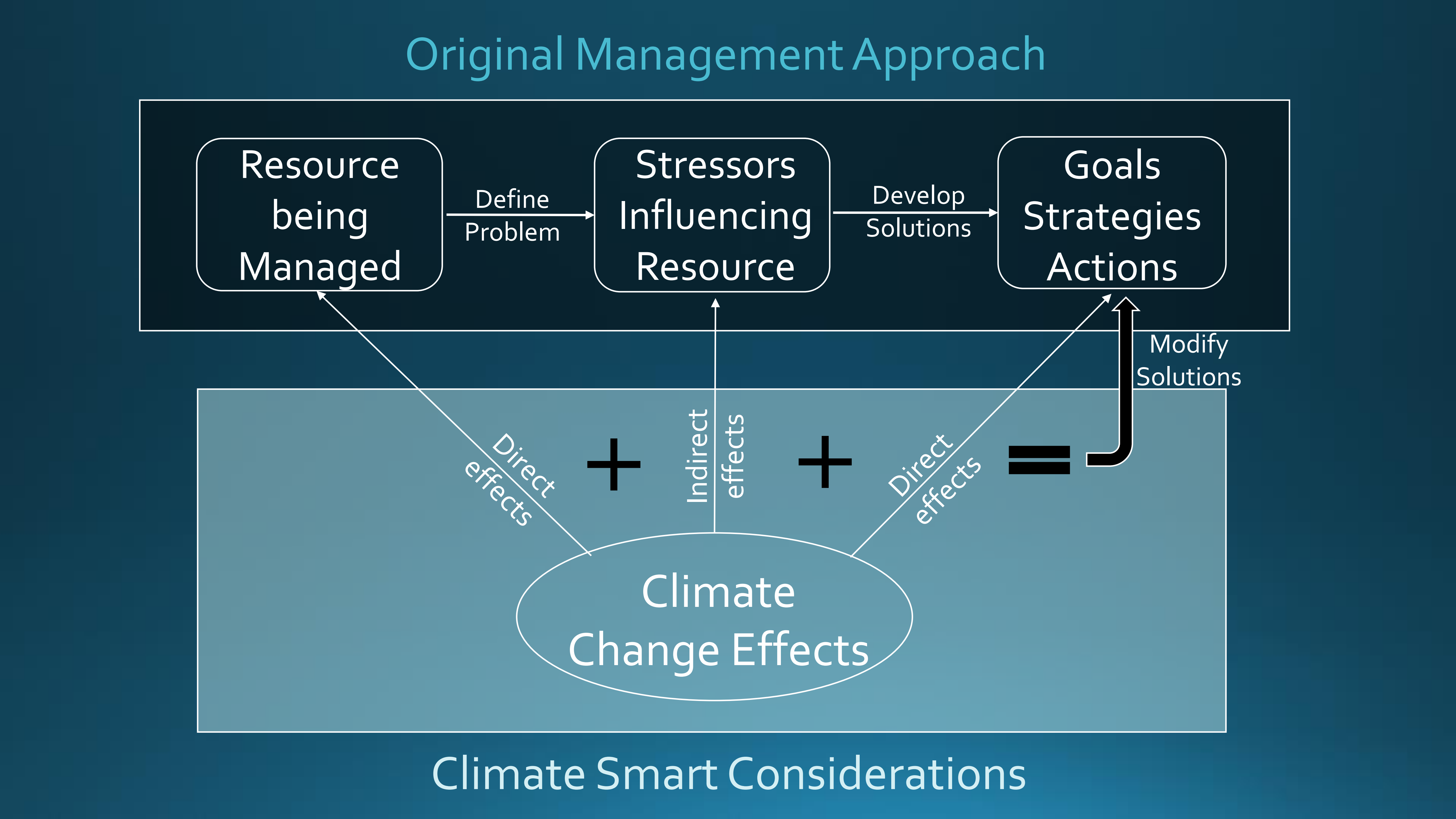
- The framework includes adaptation strategies to support actions, as well as rules for designing management actions to be "climate-smart"



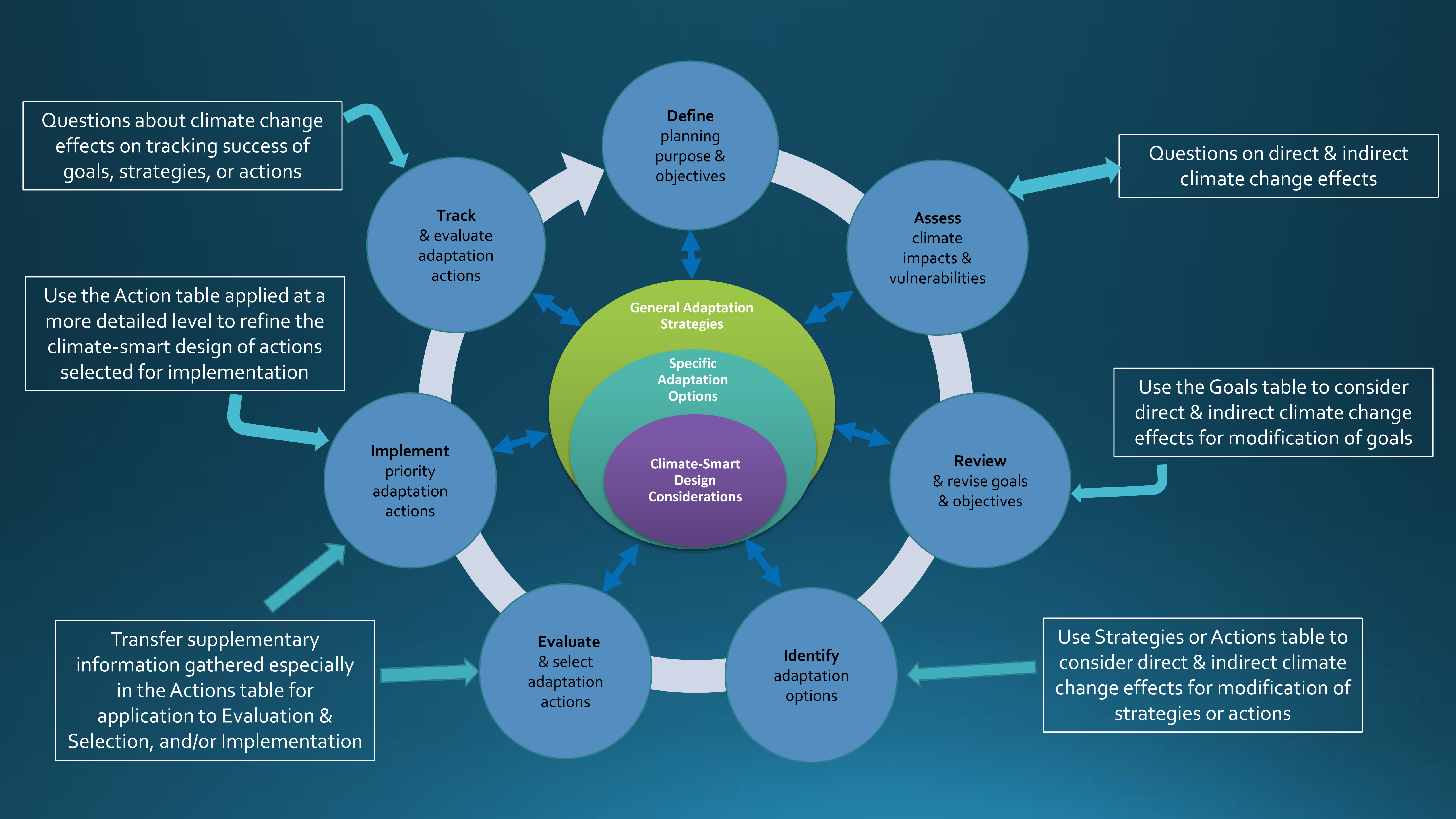
Climate adaptation matrices

Vulnerability Assessment as Input

COMMUNITY NAME: West Maui			
INDICATORS OF A CHANGING CLIMATE			
Climate Threat			Impacts
Indicator	Magnitude and direction of change over time based on community knowledge and latest climate science	Changes in environmental conditions (Climate Stressors)	Potential impacts to natural and social resources
• Air temperature	Air temperature has increased and is projected to continue to increase in the Main Hawaiian Islands. Historical: In the Main Hawaiian Islands, from 1919 to 2006, average temperature for all stations increased by 0.04°C (0.08°F) per decade with natural variability. The rate of warming accelerated to 0.16°C (0.30°F) per decade from 1975 to 2006. The rate of increasing temperature from 1975 to 2006 is greater at high-elevation stations (0.27°C or 0.48°F per decade at greater than 800 meters above sea level). The annual number of below-freezing days has decreased between 1958 and 2009. An increase in the frequency of occurrence of the Trade Wind Inversion over Hawai'i since the late 1970s (Cao et al., 2007) is consistent with continued warming and drying trends throughout Hawai'i, especially for high elevations. Projected: In the Central North Pacific region, under the B1 and A2 scenarios, mean annual air temperature will continue to increase compared to 1971 to 2000. For 2055, B1 values range from 1.5° to 2.5°F, and A2 values range from 3° to 3.5°F higher.	Warmer temperatures, higher rates of evapotranspiration, changes in rainfall patterns with potential increase in drought conditions	Shifts in composition and distribution of native and non-native species, leading to losses of soil-stabilizing vegetative cover that could result in increased soil erosion
• Sea-surface temperature	Water temperature has increased and is projected to continue to increase in the Main Hawaiian Islands. Historical: Pacific Ocean temperatures exhibit strong inter-annual and decadal fluctuations, and since the 1950s also exhibit a warming trend from surface to 200 m depth by as much as 3.6°F. Projected: In the Central North Pacific region, projected increases in SST range from 1.8° to 2.3°F by 2055 under B1 and A2 emission scenarios (compared to 1990 levels).	Warming seas, changes in ocean stratification	Coral bleaching and potential loss of reef structure and associated fish; shifts in marine species distribution and migration patterns; impacts to fishing sector
• Sea level	Sea level has risen and is projected to continue to rise in the Main Hawaiian Islands. Historical: Global average sea level has risen by about 8 inches since 1900. Since the early 1990s, the rate of globally averaged sea level rise has been estimated to be 0.134 ± 0.016 inches per year based on satellite altimeter measurements. This is twice the estimated rate for the 20th century as a whole based on tide gauge reconstructions. Regional sea level trends may differ significantly from the globally averaged rate over multi-year to multi-decadal time scales. Maui had a island-wide average shoreline change rate at – 0.13 ± 0.05 m/yr over the last century due to multiple factors. Projections: In the Central North Pacific region, sea level over this century is expected to rise at about the same rate as the projected increase in global mean sea level, with regional variations. Climate model predictions estimate approximately 6 to 24 inch rise in global sea level by 2100. Including potential contributions due to changes in the dynamics of ice-sheet discharge results in an additional 4 to 8 inches of rise. So-called "semi-empirical models" yield higher estimates of global sea level rise, ranging from approximately3 to 5 feet by 2100. Why semi-empirical models yield higher values than estimates based on climate models is not understood.	Increased storm surges and king tides, more frequent coastal inundation, larger areas of inundation, greater rates of coastal erosion	Damage to key infrastructure, homes, and culturally important areas; decreased near-coastal water quality, coastal flooding and drainage issues



Original Management Approach
Resource being Managed
Define Problem
Stressors Influencing Resource
Develop Solutions
Goals Strategies Actions
Modify Solutions
Direct effects
+
Indirect effects
+
Direct effects
=
Climate Change Effects
Climate Smart Considerations


Questions about climate change effects on tracking success of goals, strategies, or actions
Define planning purpose & objectives
Questions on direct & indirect climate change effects
Track & evaluate adaptation actions
Assess climate impacts & vulnerabilities
Use the Action table applied at a more detailed level to refine the climate-smart design of actions selected for implementation
General Adaptation Strategies
Specific Adaptation Options
Climate-Smart Design Considerations
Use the Goals table to consider direct & indirect climate change effects for modification of goals
Implement priority adaptation actions
Review & revise goals & objectives
Evaluate & select adaptation actions
Identify adaptation options
Transfer supplementary information gathered especially in the Actions table for application to Evaluation & Selection, and/or Implementation
Use Strategies or Actions table to consider direct & indirect climate change effects for modification of strategies or actions

Tailor Applicability to all GITs/WGs

- Different decisions
  - Toxics focus different from habit or organism-based groups, etc.
- Mechanisms of implementation differ
  - Often ‘opportunistic’
  - Can apply to assess the value of opportunities

Workshops

Workshop Goals & Process

- Progress toward providing a structured but easily applied process to make workgroup or GIT management decisions ‘climate smart’
- Work through exercises to
  - Understand how the matrices work
  - Find strengths & weaknesses when applied to workgroup or GIT elements
  - Develop information specifically relevant to the WG or GIT

Climate Smart Habitat Restoration Workshops

1. Case study: Restore submerged aquatic vegetation (SAV) along the shoreline of Kirwans Landing Lane on Kent Island, Maryland. (Strawman examples)
2. Case study: By 2025, restore, enhance and preserve wetland habitats that support a wintering population of 100,000 black ducks
3. Case study: hypothetical Coan River project grounded in the real TMDL using BMPs that might commonly be utilized to remediate PCB contamination

Case Study: Black Duck

- Example of Climate-Smart Decision Tool Result:

Key Climate Influence

- Sea level rise was identified as a key stressor on the targeted resource (wetlands)

Next Step

- SLR was taken into consideration in the Black Duck Tool by incorporating output from SLAMM

Case Study: Black Duck

- Possible Improvements
  - Could consider more stressors identified in the Climate-Smart Decision Tool (invasive species, increasing temperatures, storm surge/flooding, saltwater intrusion) in Management Strategies.

Climate Smart Toxics Workshop

1. Case studies: Worked through 3 projects including a hypothetical Coan River project grounded in the real TMDL
2. Pilot most specific level (implementable actions)
3. Inputs for work plan revisions
4. Used BMPs that might commonly be utilized to remediate PCB contamination

Lessons Learned

- Some workgroups need additional capacity to develop/complete future steps and objectives which are useful for stakeholders (i.e. toolkits)
- Time consuming especially when not all experts are in the room.
- The framework and tool does not apply/designed for all actions in a workgroup (i.e. education/outreach efforts).
- Some workgroups have additional challenges that impact their ability to incorporate climate smart decision making

"The process of considering climate when determining actions was more cumbersome than necessary and wasn't applicable to all of our actions though. The most useful thing, to me, that came of it was simply a reminder to consider how climate change will affect our ability to reach our goal."

- Brooke Landry

CBP SAV WG Chair

Suggestions:

- To facilitate ease of use of the tool, consider using a checklist rather than a table format
- The matrices are very time-intensive; a checklist might be a more useable format
- The table columns could become the checklist questions that each group asks themselves for their own projects
- Should include an example of how to help answer these questions
- Possibly two tables? A simplified one for folks with less expertise, and then a more comprehensive one for detailed expert audience
- It might be best to talk to the workgroups about their outcomes, discuss on the ground projects and what could be done to get closer to achieving the goal

Next Steps

- Explicit consideration of climate resilience by WG's during SRS process
- "Hardwire" climate into both SRS materials and dialogue with Management Board
- Climate Resiliency Workgroup serve as "consultant" to work groups in SRS preparation (pre-meetings, STAR)
- Climate Resiliency Workgroup utilizing lessons learned to refine the process and seeking volunteers for two more workshops applying the Climate Smart Tool to their workgroups as GIT funded projects for 2019-2020