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# Introduction to Vulnerability Assessments

## FOR THE GOLDEN GATE BIOSPHERE NETWORK



# Defining Vulnerability



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**Climate change vulnerability refers to the degree to which a resource is susceptible to and unable to cope with the adverse impacts of climate change**

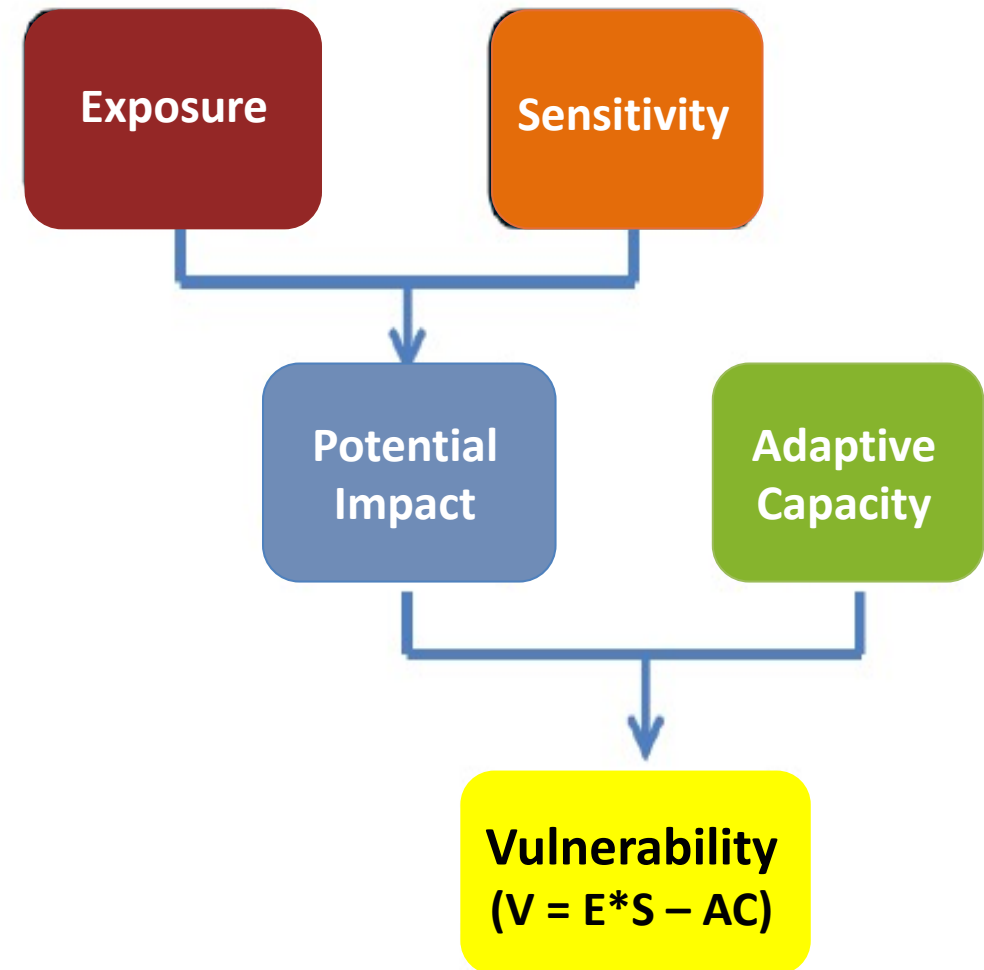
# Vulnerability Assessment



## Purpose of a vulnerability assessment:

Identify *which* resources are most vulnerable and *why*

- **Exposure**
- **Sensitivity**
- **Adaptive Capacity**



# Vulnerability Assessment - *Exposure*



**EXPOSURE** is a measure of *how much change* in climate that a resource is likely to experience

## Factors considered:

- Direction and magnitude of change in climate stressors and disturbance regimes
- Degree of uncertainty associated with projected changes



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# Vulnerability Assessment - *Sensitivity*



**SENSITIVITY** is a measure of whether and how a resource is likely to be affected by a given change in climate factors

## **Factors affecting sensitivity:**

- Climate drivers
- Disturbance regimes
- Non-climate stressors

# Vulnerability Assessment – *Adaptive Capacity*



**ADAPTIVE CAPACITY** is a measure of a resource's ability to accommodate or cope with climate change impacts with minimal disruption

## **Factors affecting adaptive capacity:**

- Extent & integrity
- Connectivity
- Resistance & recovery
- Diversity
- Public, societal, and cultural value
- Management potential



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# Why Assess Vulnerability?

## Vulnerability assessments can help:

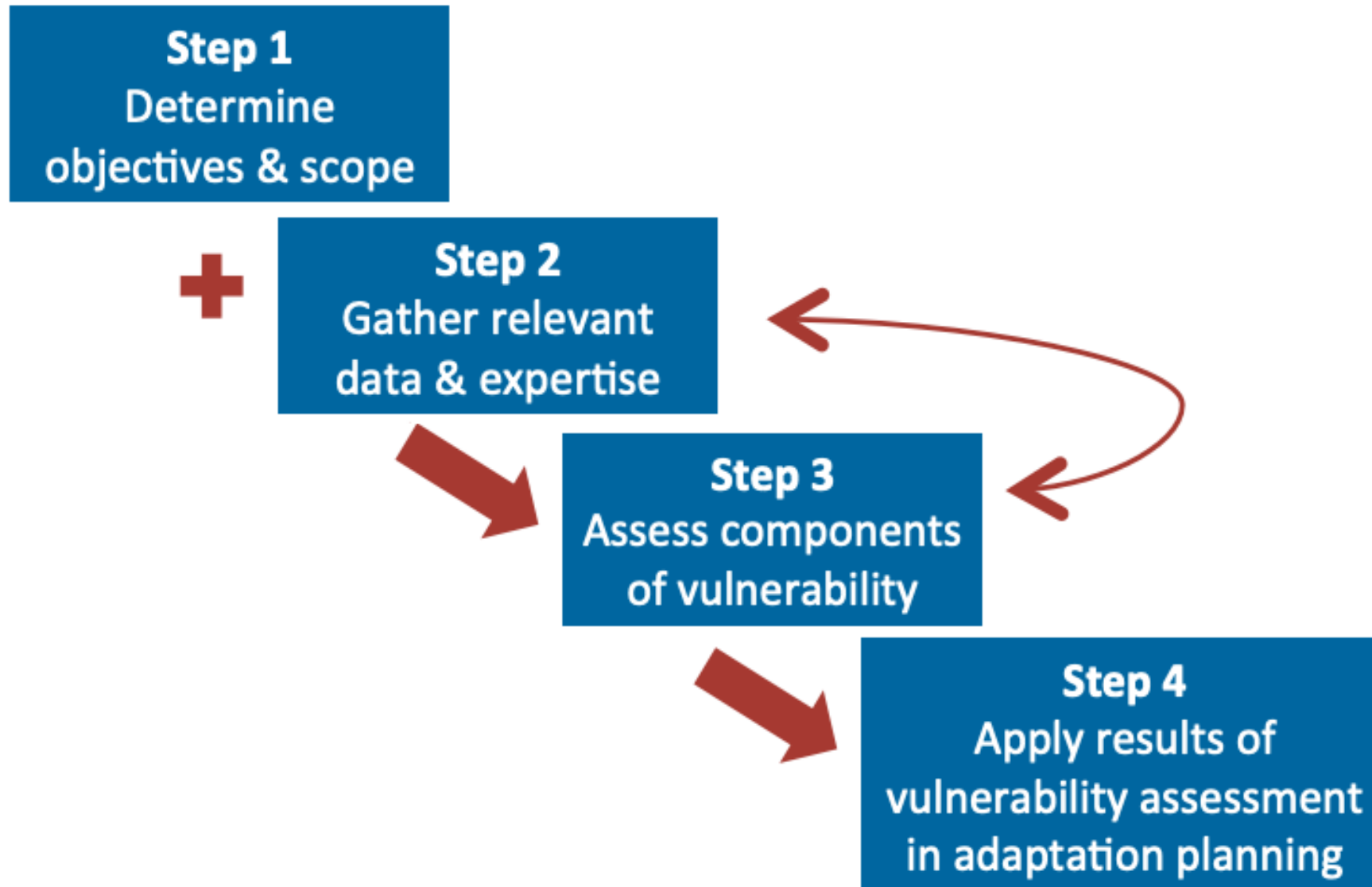
- Prioritize the focus of management actions
- Develop strategies to address climate change
- Efficiently allocate resources

## Vulnerability assessments cannot:

- Make a management decision for you



# Vulnerability Assessment Steps





# Steps 1 and 2



## 1. Determine objectives and scope

- Audience/user needs
- Goals and objectives
- Assessment targets (species, habitats)
- Scale (temporal and spatial)
- Appropriate approach (no “one size fits all”)

## 2. Gather relevant data and expertise

- Review existing literature
- Reach out to experts
- Obtain/develop climate and ecological response projections

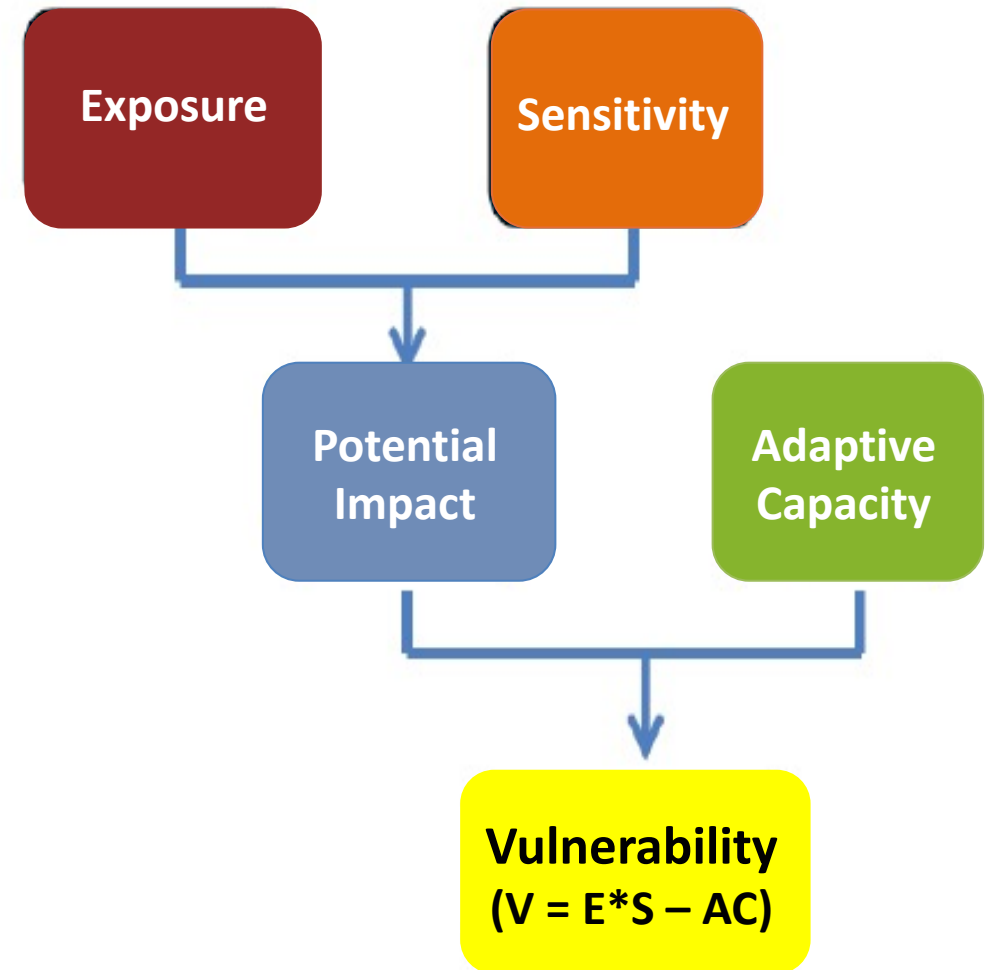


# Step 3



## 3. Assess components of vulnerability

- Assess sensitivity, exposure, and adaptive capacity
- Estimate overall vulnerability
- Document confidence levels and uncertainties





# Assessing Exposure

Measure of how much of a change in climate a resource is likely to experience

## Factors to consider when assessing exposure:

- *Climate models*
  - Shifts in temperature, precipitation
  - Increasing availability of finer scale data (e.g., downscaling)
- *Ecological response models*
  - Sea level inundation
  - Climate-related vegetation shifts
  - Hydrologic projections

Climate Variable	Projected Future Trends
Air temperature	↑ 1-2°C by mid-century (annual)
Extreme heat events	↑ frequency
Precipitation	Variable
Drought	↑ frequency; ↑ risk of multi-year drought
Snowpack	↓ annual depth
Timing of snowmelt	Shift ~10-30 days earlier by 2100
Wildfire	↑ total area burned

# Assessing Sensitivity



Measure of whether and how a resource is likely to be affected by a given change in climate

## Factors affecting the sensitivity of species, habitats, and ecosystems:

- Specialized habitat or microhabitat requirements
- Narrow environmental tolerances or physiological thresholds
- Dependence on interactions with other species, impacts of non-climate stressors



# Assessing Adaptive Capacity



Ability of a resource to accommodate or cope with climate change impacts with minimal disruption

## Factors that can influence the amount of adaptive capacity of your species or habitat:

- *Intrinsic factors*
  - “Plasticity”
  - Ability to resist or recover from stressors
- *Extrinsic factors*
  - Barriers to dispersal/migration
  - Institutional capabilities





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