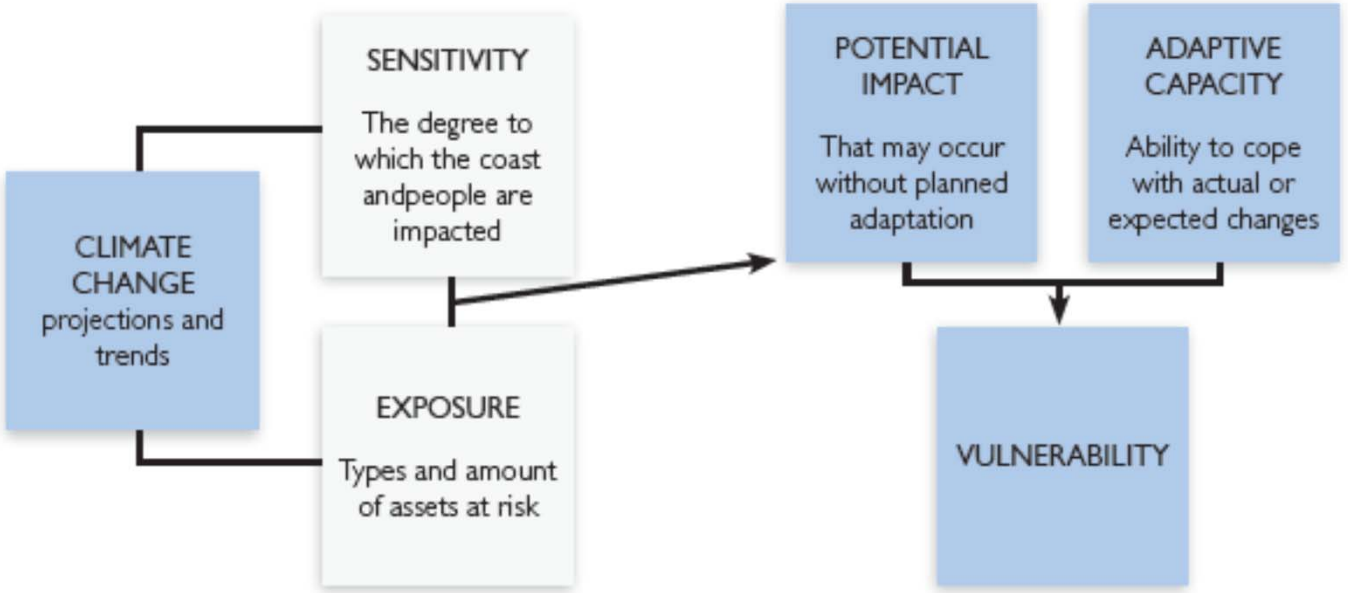
Adaptation planning to address climate impacts

Coastal Conservancy

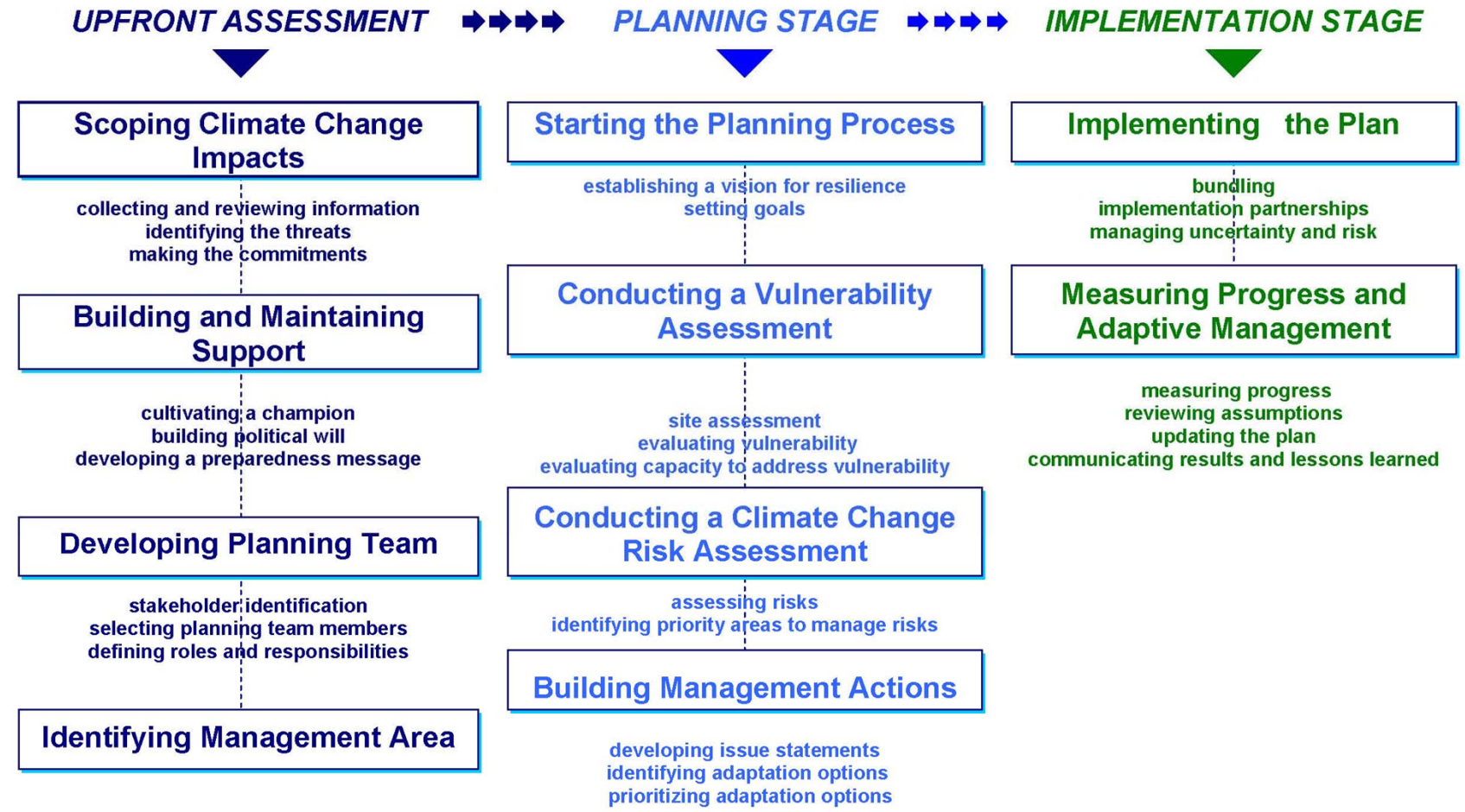
Vulnerability assessments



Source: Adapted from Allison, 2007.

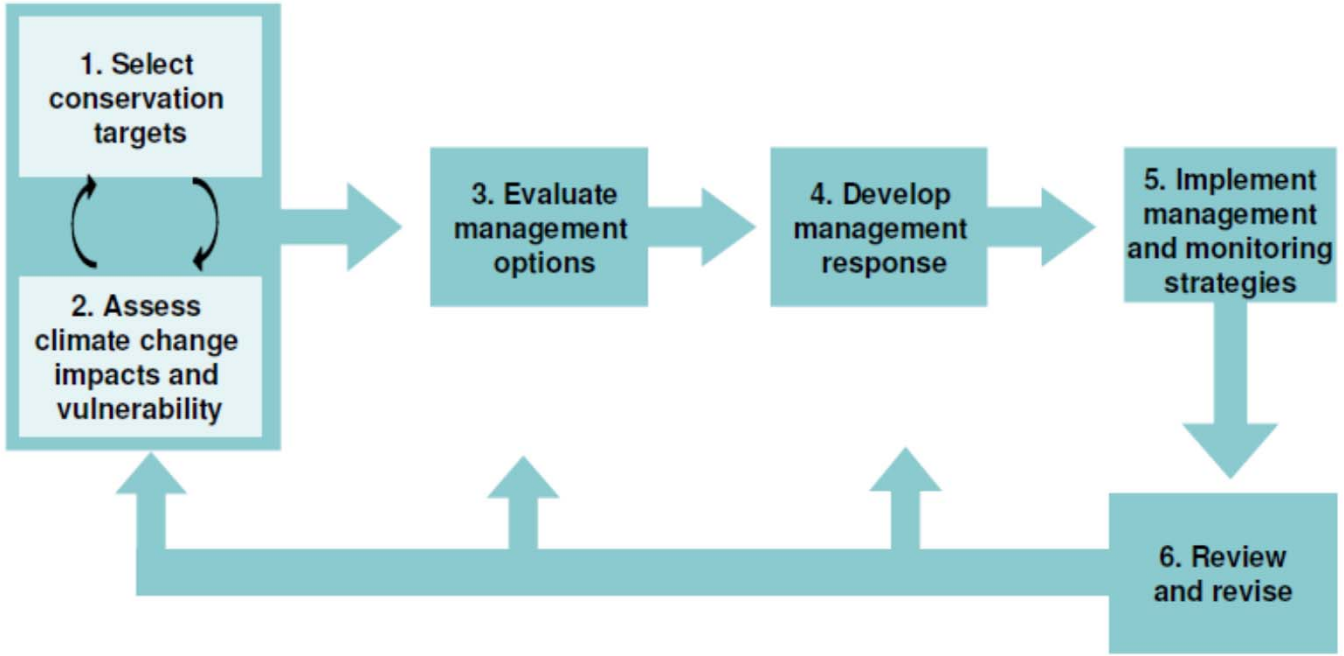
Resources that are exposed and sensitive to climate and less able to adapt to change are vulnerable to climate impacts

Climate Change Planning Model



Courtesy of Anne Walton, NOAA

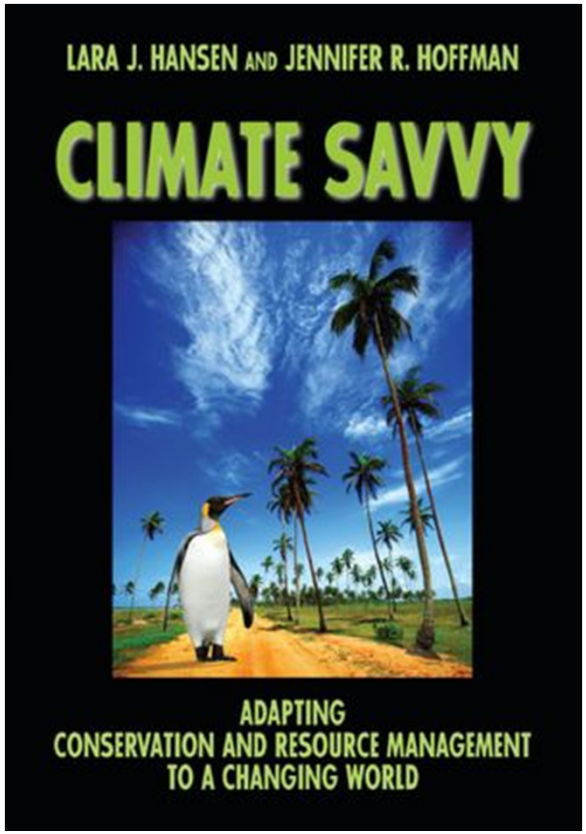
A framework for adaptation planning



From Glick, Staudt & Stein, *A New Era for Conservation*, National Wildlife Federation, 2009

Resources

www.cakex.org

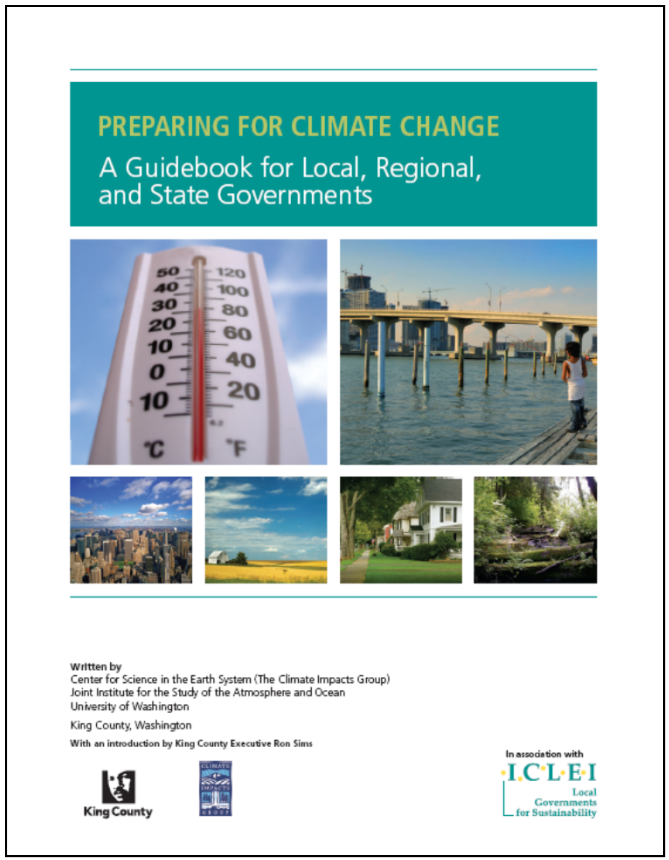


Climate Savvy:
Adapting Conservation and Resource Management to a Changing World
Lara J. Hansen and Jennifer R. Hoffman
Island Press: October 2010

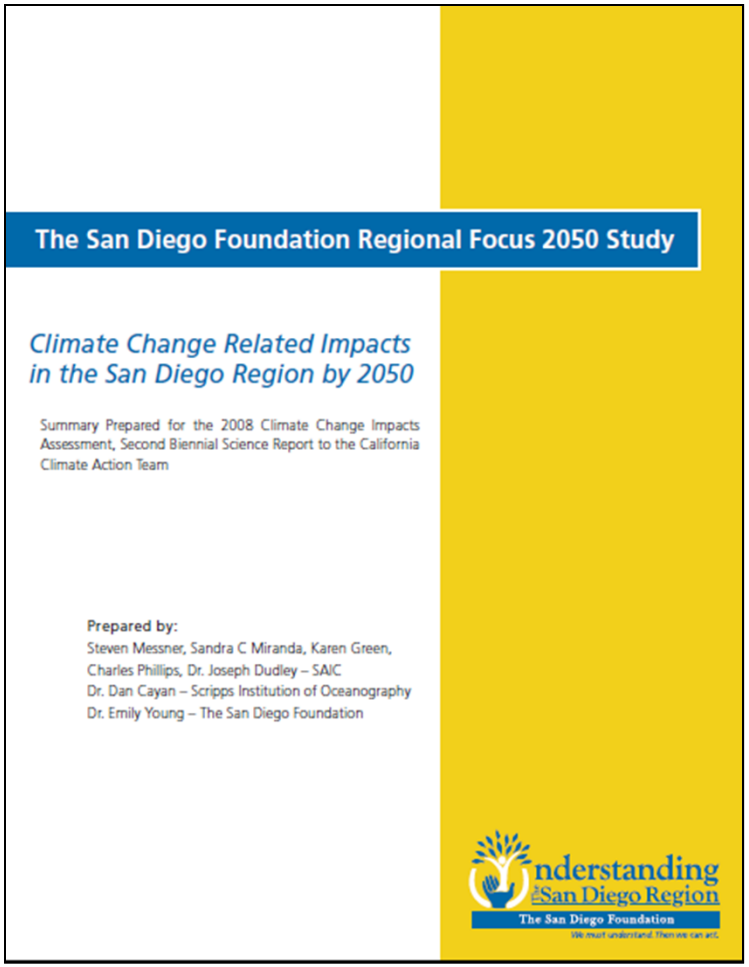
'Preparing for Climate Change' guidebook

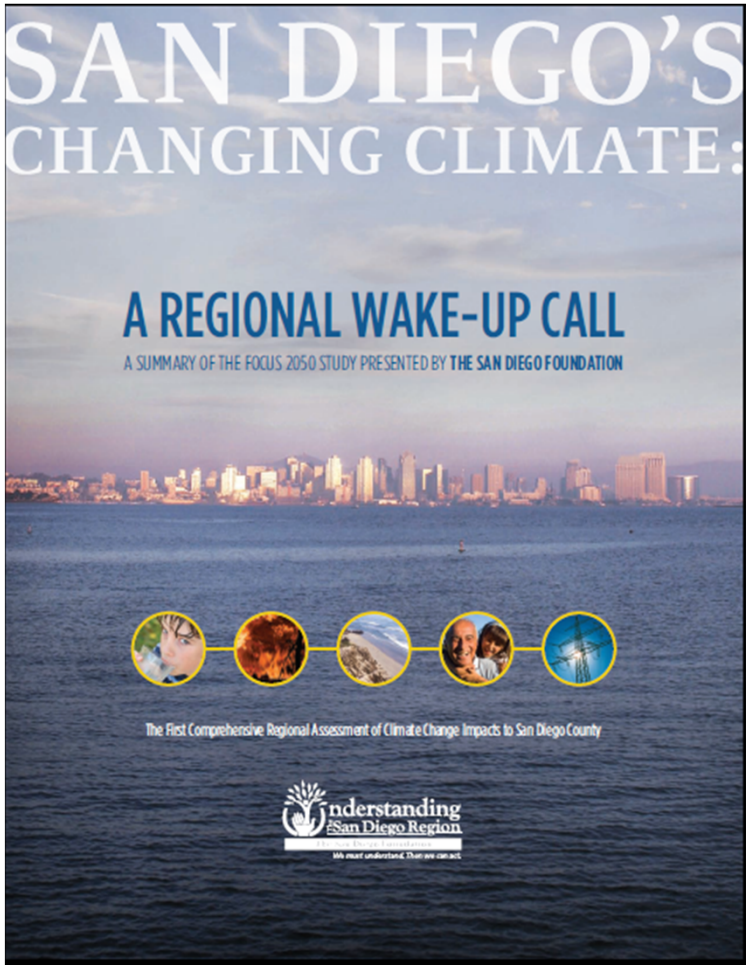
Offers a comprehensive process for

- Assessing climate change impacts to the community
- Building a climate change preparedness team
- Identifying planning areas relevant to climate change
- Conducting climate change vulnerability and risk assessments
- Establishing a vision and principles for a climate-resilient community
- Developing and implementing a preparedness plan: goals and actions
- Measuring progress



San Diego Foundation's Focus 2050 Project






IN 2050, IF CURRENT TRENDS CONTINUE...
San Diego's climate will be hotter and drier.
Sea level will be 12-18 inches higher.
We will face a severe water shortage.
Wildfires will be more frequent and intense.
Public health will be at risk, especially among our elderly and children.
Native plant and animal species will be lost forever.
We will not be able to meet our energy needs.
By 2050, our population is expected to grow by 50% to 4.5 million people. More people competing for fewer resources will further magnify the effects of climate change described in this report.

IN 2050, IF CURRENT TRENDS CONTINUE...

San Diego County will face a severe water shortage.

- San Diego County will require 37% more water than we currently use.
- Our major sources of water — the Colorado River and the rivers of Northern California — could shrink by 20% or more.
- Extended and more frequent droughts will diminish local water supplies.
- We could face an 18% water shortage by 2050.

WHAT CAN WE DO NOW?

- **All consumers can alter their irrigation practices and switch to drought-tolerant landscaping.**
- **Water districts can modify water rates and use incentives to further encourage water conservation and discourage water waste.**
- **Local governments can update laws and codes to require residents, businesses, industry, and agriculture to be more water-wise, especially in irrigation and landscaping practices.**
- **Water managers can invest in expanded water reuse, efficiency, and creative water transfers, as well as desalination practices that use less energy and minimize harmful impacts to the environment.**
- **All water planners must take climate change into account in developing long-term city and county water supply and land use plans.**

Developing adaptation strategies

Constraints

Adaptation science is new

Many recommendations are intuitive, rather than based on empirical studies

Don't really know how individual populations or ecosystems will react to rapid climate change

Management recommendations are often vague and hard to implement

Adaptation planning: a few basic principles

1. Integrate adaptation measures into what you're already doing

2. Use strategies that can produce specific, measurable outcomes.

3. Look for opportunities to bundle solutions

4. Emphasize “low regrets” and “low regrets” solutions

In adding climate responses to current resource management, look for

Low-cost measures with potentially large benefits (**“low-regrets” solutions**) and

Ones that would have little or no adverse effects but would generate net benefits **regardless of the ultimate climate impacts** (**“no-regrets” solutions**)

The value or benefit of these strategies will still be felt regardless of the specific impacts of climate change

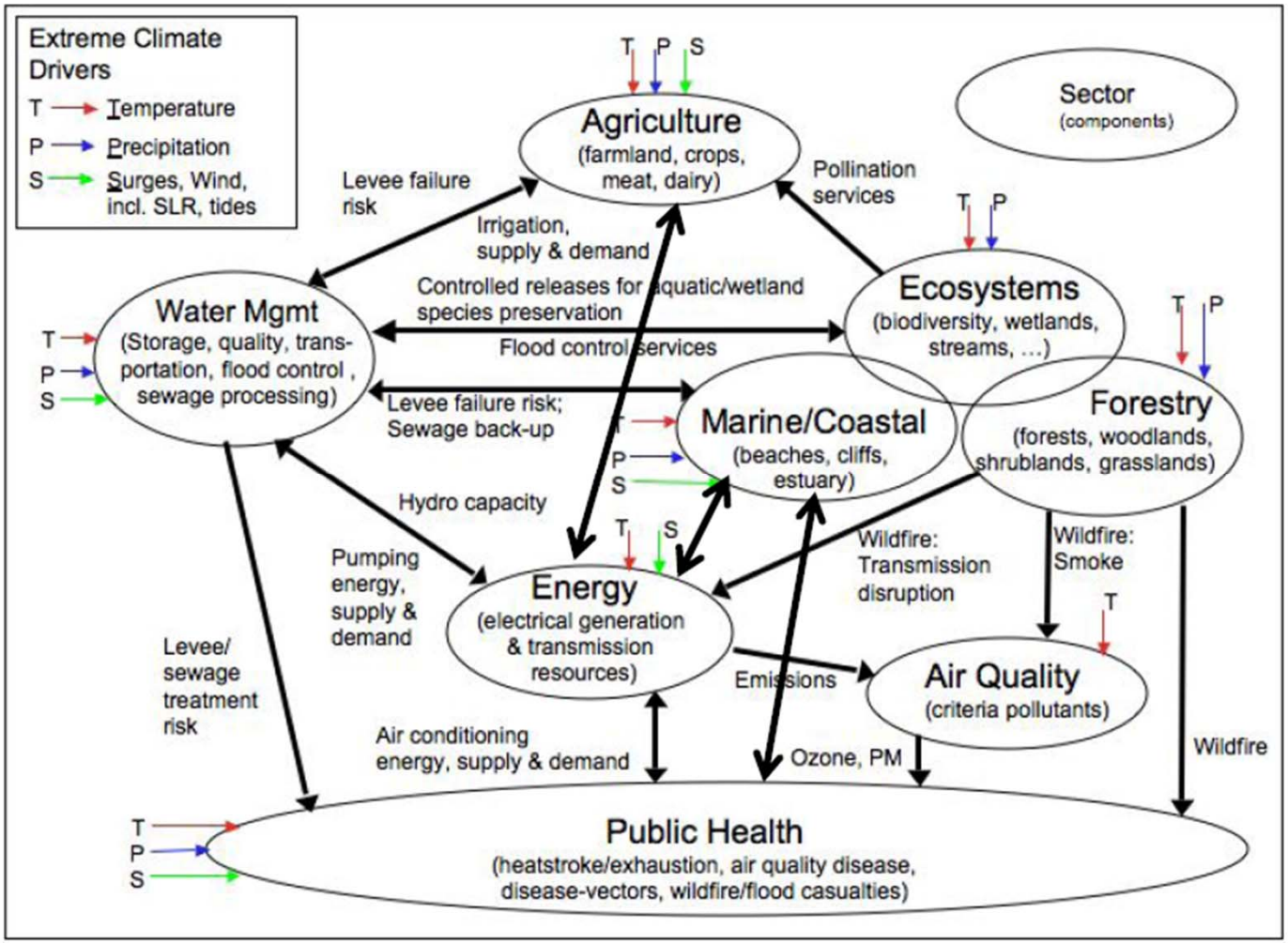
Management Plans for OVLC's Preserves

Assessment: Summarizes **Exposure, Sensitivity** and **Adaptive Capacity** for eight principal conservation values for the Preserve

Management Strategies

1. Consider climate change impacts when developing future restoration projects.
2. Promote public policies and actions that prevent expanded levees from causing additional flooding at the Preserve.
3. Develop adaptive management guidelines for the Preserve.
4. Promote the Preserve as a site for educational research, particularly research that lends information necessary to understand climate adaptations on the Preserve and nearby lands.
5. Develop an active program to reduce other habitat stressors, such as invasive plant species and off-site physical changes to the floodplain.
6. Prioritize recommendations regarding the conservation of lands adjacent to the Preserve to protect a larger area.

5. Consider cross-sector interactions



5. Consider cross-sector interactions

Potential conflicts:

- Dams for water storage vs. habitat and fish passage
- Large scale solar or wind farms vs. protection of desert habitat

Compatible, complementary strategies:

Natural floodplain protection to promote

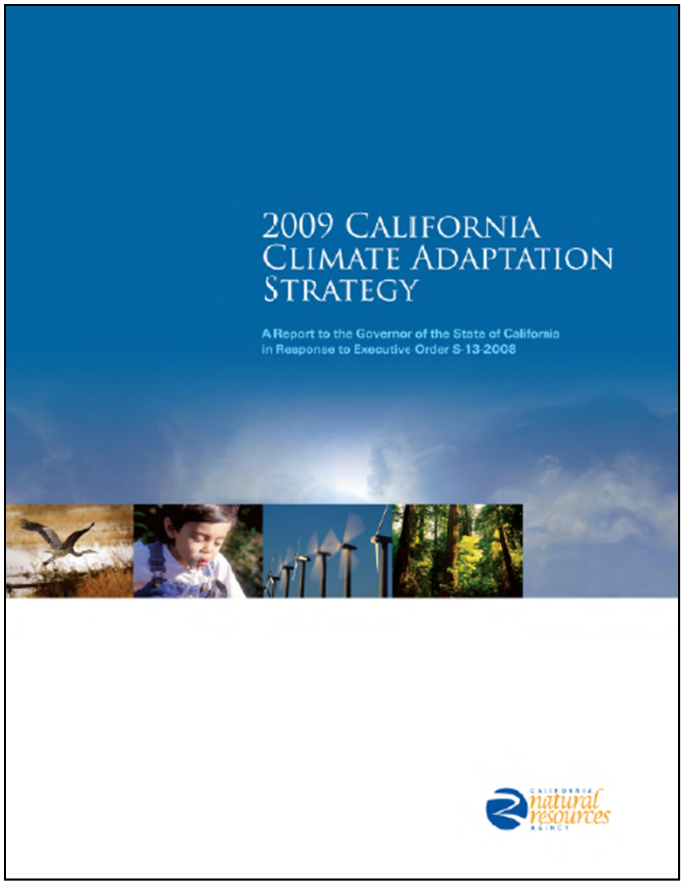
- Flood control
- Habitat conservation
- Groundwater recharge
- Stormwater management
- Agricultural production and/or public recreation

The State's Climate Adaptation Strategy

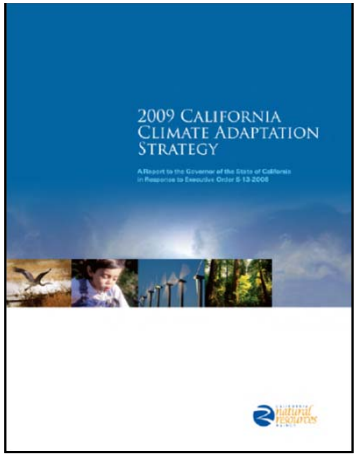
Provides an overview of California's climate future

Assesses impacts and risks by sector

- Public health
- Biodiversity and habitat
- Ocean and coastal resources
- Water management
- Agriculture
- Forestry
- Transportation and energy infrastructure



Water management adaptation strategies



- Provide sustainable funding for statewide and integrated regional water management
- Fully develop the potential of integrated regional water management
- Aggressively increase water use efficiency
- Practice and promote **integrated flood management**
- **Enhance and sustain ecosystems**
- Expand water storage and conjunctive management of surface and groundwater resources
- Fix Delta water supply, quality and **ecosystem conditions**
- Preserve, upgrade and increase monitoring, data analysis and management
- **Plan for and adapt to sea level rise**.
- Identify and fund focused climate impacts and adaptation research and analysis

6. Reduce stressors that will interact negatively with climate change

Manage stressors that exacerbate or are exacerbated by the effects of climate change.

urbanization
pest, diseases, invasive species
pollution
landscape degradation

Stream restoration

Key pressure points for steelhead and other salmonids will likely be higher stream temperatures, altered stream flows, and changes in the frequency and magnitude of peak flows

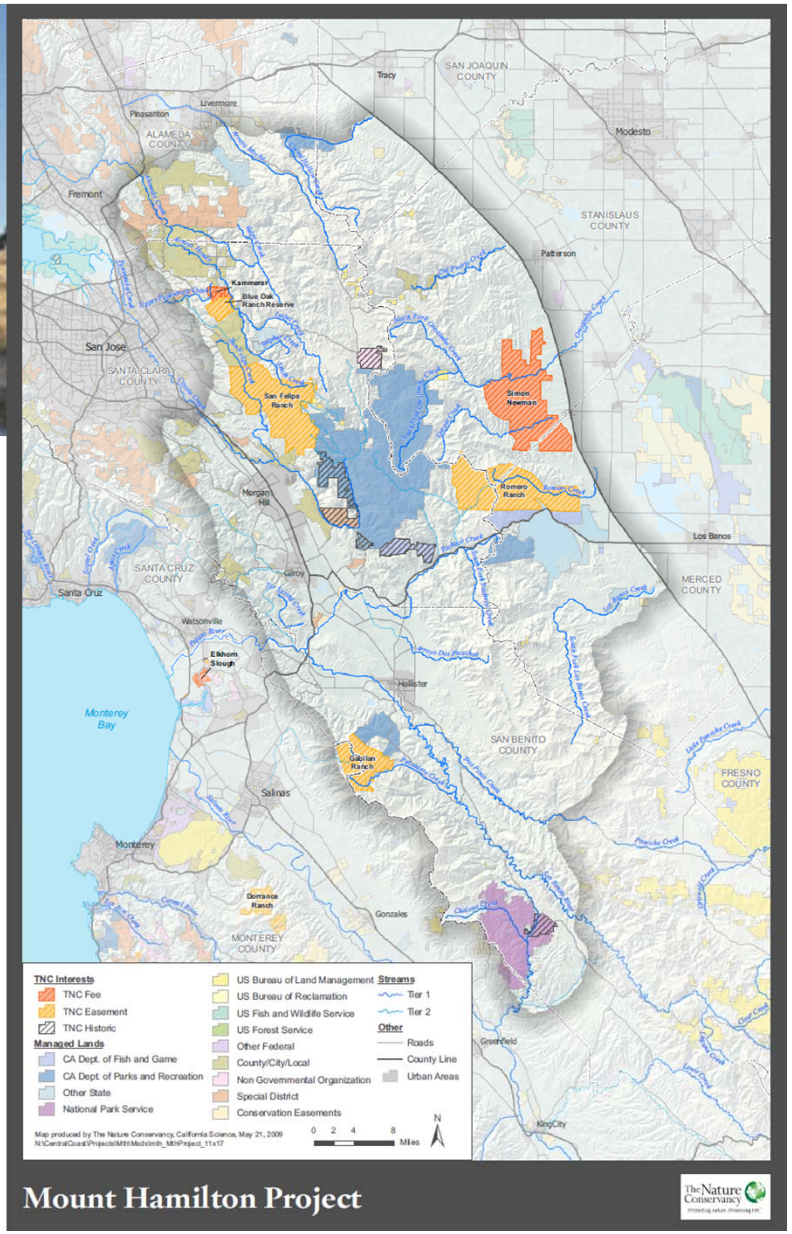
Potential stream restoration strategies:

- Restoring vegetation in riparian zones to provide shade, help decrease water temperatures, and provide complexity for stream habitat.
- Restoring floodplain function to lessen the negative impacts of peak flows
- Protecting or restoring thermal refugia, such as undercut banks or deep stratified pools, as well as off-channel habitat
- **Addressing the larger, critical causes of habitat degradation in a watershed, such as out-of-stream withdrawals and poor water quality.**

The Nature Conservancy's Mount Hamilton Project

Be inclusive: Include other stresses in your analysis because they can drive local strategies

Humans adapt too: Human response to climate change may be more important than ecological response



7. Promote resistance and resilience to climate impacts

Resistance: **the ability to weather disturbance with little change**

Improving community or ecosystem defenses

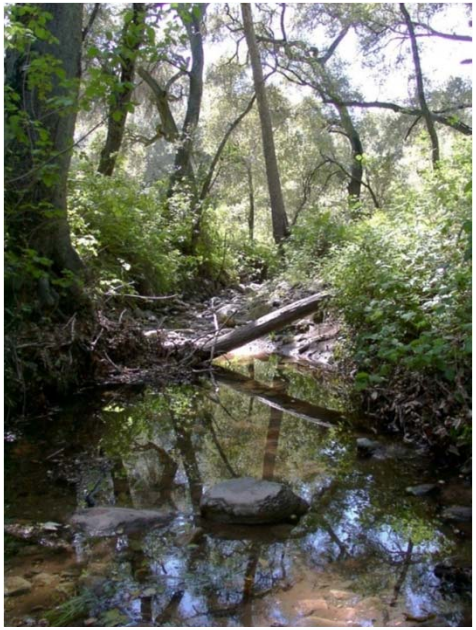
Resilience: **the capacity of a system to persist and absorb change and disturbance---the ability to bounce back**

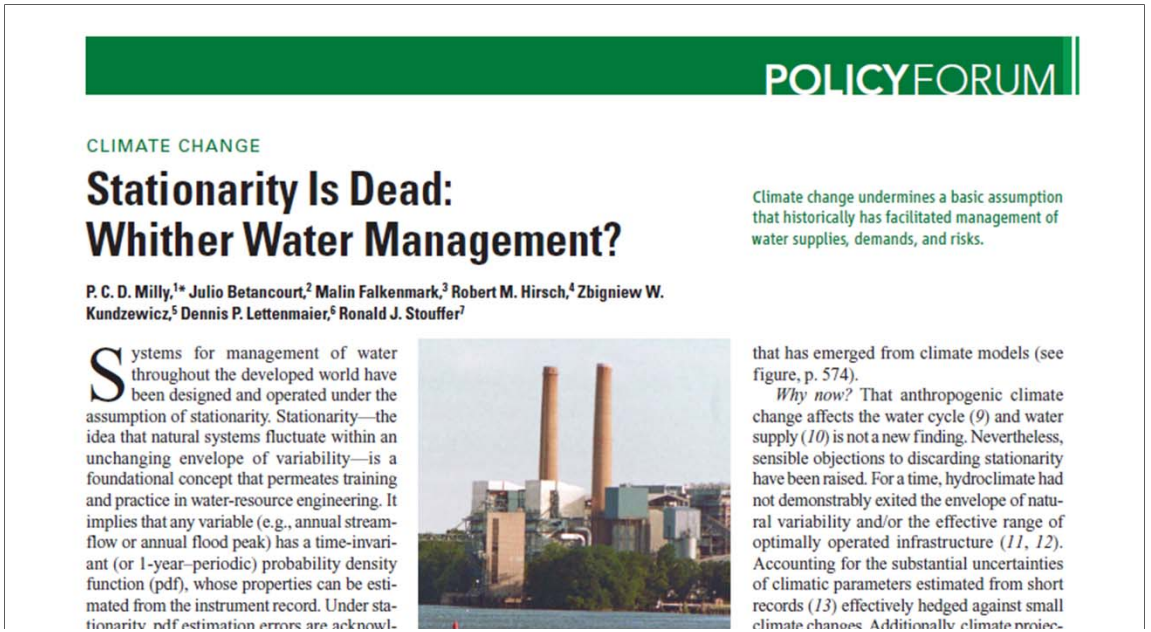
8. Manage for uncertainty and change

Plan for extremes and a wider range of variability

Use a portfolio of diverse approaches to hedge bets and manage risks

Develop flexible responses and the capacity to compensate for potential management mistakes





POLICYFORUM

CLIMATE CHANGE

Stationarity Is Dead: Whither Water Management?

Climate change undermines a basic assumption that historically has facilitated management of water supplies, demands, and risks.

P. C. D. Milly,[1]* Julio Betancourt,[2] Malin Falkenmark,[3] Robert M. Hirsch,[4] Zbigniew W. Kundzewicz,[5] Dennis P. Lettenmaier,[6] Ronald J. Stouffer[7]

Systems for management of water throughout the developed world have been designed and operated under the assumption of stationarity. Stationarity—the idea that natural systems fluctuate within an unchanging envelope of variability—is a foundational concept that permeates training and practice in water-resource engineering. It implies that any variable (e.g., annual streamflow or annual flood peak) has a time-invariant (or 1-year–periodic) probability density function (pdf), whose properties can be estimated from the instrument record. Under stationarity, pdf estimation errors are acknowl-

that has emerged from climate models (see figure, p. 574).

Why now? That anthropogenic climate change affects the water cycle (*9*) and water supply (*10*) is not a new finding. Nevertheless, sensible objections to discarding stationarity have been raised. For a time, hydroclimate had not demonstrably exited the envelope of natural variability and/or the effective range of optimally operated infrastructure (*11*, *12*). Accounting for the substantial uncertainties of climatic parameters estimated from short records (*13*) effectively hedged against small climate changes. Additionally, climate projec-

9. Evaluate the cost and feasibility of options

- Benefits
- Feasibility: technical and institutional
- Costs
- Organizational strengths and risks
- Synergies

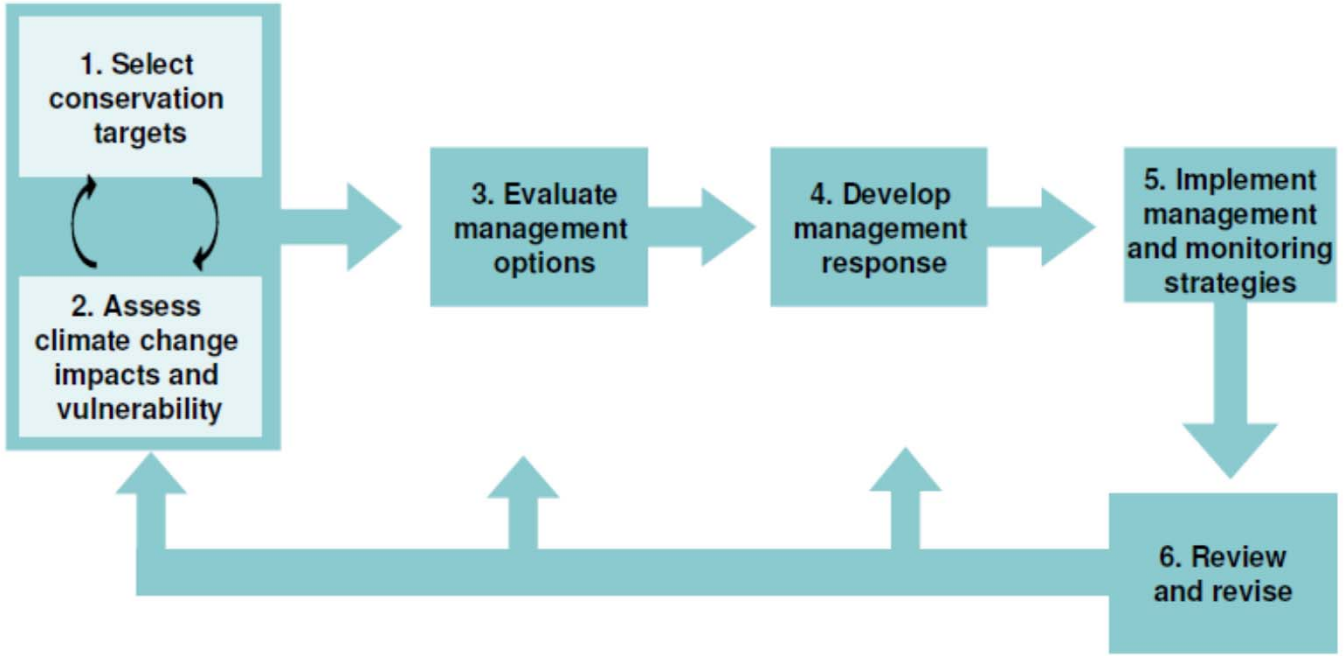
10. A few other considerations

Performance under uncertainty: How will the strategy perform across a range of plausible changes in the climate of Southern California?

Equity: Does the strategy benefit some people, places or interests at the expense of others? Will it have a strong negative effect on any of those people, places or interests?

Develop criteria for prioritizing adaptation strategies

11. Remember: it's an iterative process



From Glick, Staudt & Stein, *A New Era for Conservation*, National Wildlife Federation, 2009

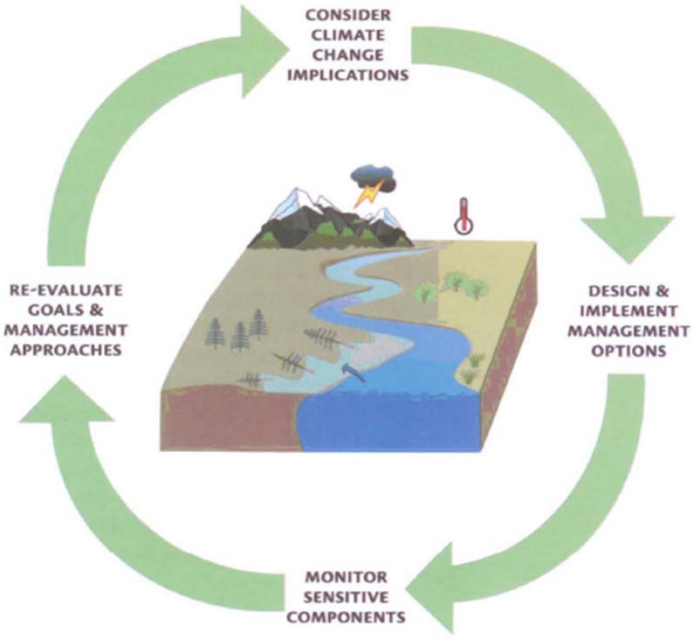
Adaptive management

Not simply planning » doing » monitoring

When properly applied, more than simply better ecological monitoring and response to unexpected management impacts

Not an exercise in trial and error: it's learning by careful experiment

Very different from the typical management approach of "informed trial and error"



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