# CEQ 2023 NEPA Guidance on GHG Emissions and Climate Change
# Social Cost of Greenhouse Gas Emissions

***Presented by***
***Rich Walter, Vice President, Environmental Planning ICF***

Note: This presentation represents the individual opinions of the presenter and not those of ICF.
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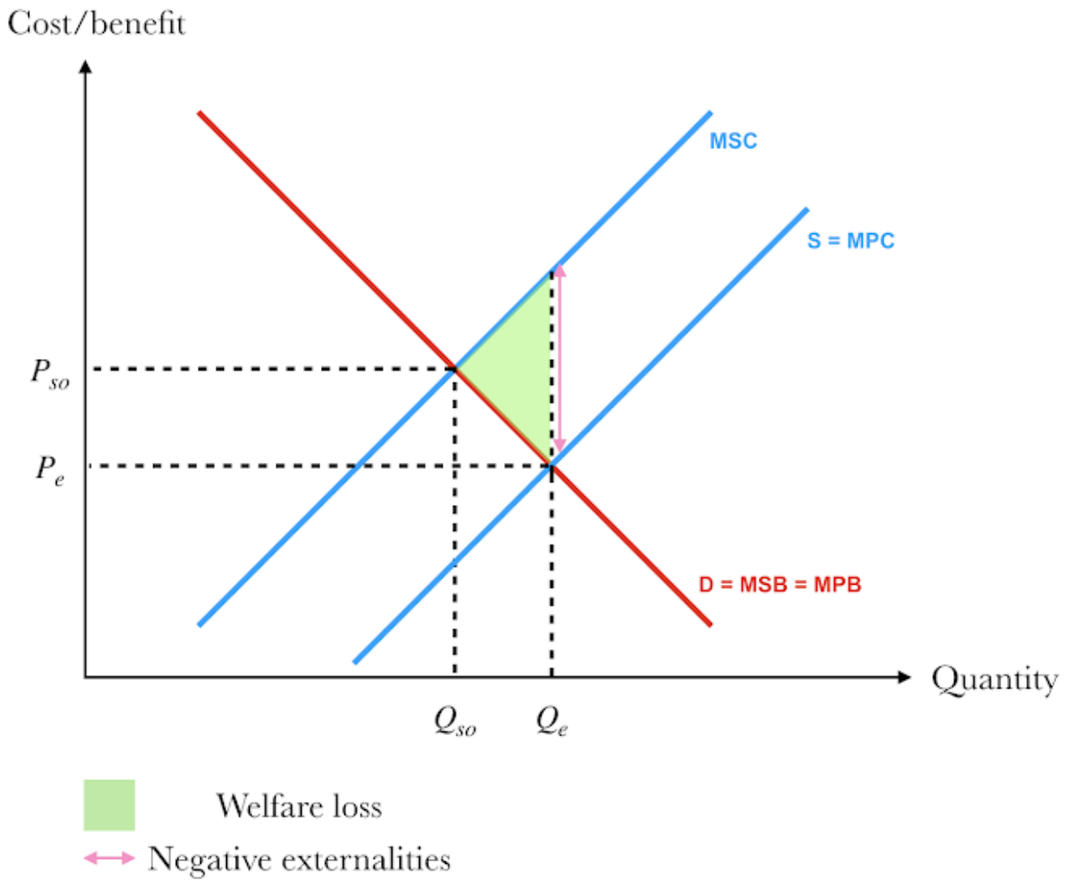
# CEQ Guidance: NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (2023)

- *"Recommending that agencies provide additional context for GHG emissions, including through the use of the best available social cost of GHG (SC–GHG) estimates…*
  - *…to translate climate impacts into the more accessible metric of dollars,*
  - *…allow decision makers and the public to make comparisons,*
  - *…help evaluate the significance of an action's climate change effects, and*
  - *…better understand the tradeoffs associated with an action and its alternatives…"*

# When the Prices Aren't Right…

- **Market Failure**
  - An inefficient distribution of goods and services in the free market.
  - Individual incentives for rational behavior do not lead to rational outcomes for the group.
- **Externalities**
  - When one's actions affect another's well-being and the relevant costs/benefits are not reflected in prices.
  - *Positive externality*: One benefits from an action that another pays for (aka "free rider" problem).
  - *Negative externality*: One is harmed by an action by another but the price of that action does not reflect the harm.



# SC-GHG Basics

- **Social Cost of Greenhouse Gases (SC-GHG)**
  - Social Cost of Carbon (SCC)
  - Social Cost of Nitrous Oxide (SCN)
  - Social Cost of Methane (SCM)

- Cost of the **economic damages** that would result from emitting one additional ton of emissions into the atmosphere.

- Helps policymakers/decisionmakers/public **understand the impacts more broadly** of decisions that would increase or decrease emissions.

- When economic benefits are a prime rationale for a project or policy, and the project or policy increases or decreases greenhouse gases, then the SC-GHG can help reveal the **full economic costs and benefits**.

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# Draft SC-GHG Values (Sept. 2022)

*EXTERNAL REVIEW DRAFT*

*Table ES.1: Estimates of the Social Cost of Greenhouse Gases (SC-GHG), 2020-2080 (2020 dollars)*

| | SC-GHG and Near-term Ramsey Discount Rate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | SC-$CO_2$ *(2020 dollars per metric ton of $CO_2$)* | | | SC-$CH_4$ *(2020 dollars per metric ton of $CH_4$)* | | | SC-$N_2O$ *(2020 dollars per metric ton of $N_2O$)* | | |
| Emission Year | 2.5% | 2.0% | 1.5% | 2.5% | 2.0% | 1.5% | 2.5% | 2.0% | 1.5% |
| 2020 | 120 | 190 | 340 | 1,300 | 1,600 | 2,300 | 35,000 | 54,000 | 87,000 |
| 2030 | 140 | 230 | 380 | 1,900 | 2,400 | 3,200 | 45,000 | 66,000 | 100,000 |
| 2040 | 170 | 270 | 430 | 2,700 | 3,300 | 4,200 | 55,000 | 79,000 | 120,000 |
| 2050 | 200 | 310 | 480 | 3,500 | 4,200 | 5,300 | 66,000 | 93,000 | 140,000 |
| 2060 | 230 | 350 | 530 | 4,300 | 5,100 | 6,300 | 76,000 | 110,000 | 150,000 |
| 2070 | 260 | 380 | 570 | 5,000 | 5,900 | 7,200 | 85,000 | 120,000 | 170,000 |
| 2080 | 280 | 410 | 600 | 5,800 | 6,800 | 8,200 | 95,000 | 130,000 | 180,000 |

*Values of SC-$CO_2$, SC-$CH_4$, and SC-$N_2O$ are rounded to two significant figures. The annual unrounded estimates are available in Appendix A.4 and at: www.epa.gov/environmental-economics/scghg.*

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# Choosing a Discount Rate

- Discounting is used to measure the difference between present values and future values because:
  - People tend to prefer their immediate well-being to future well-being.
  - People may reasonably expect to grow wealthier in the future.
  - Money received today can be saved or invested to earn a return.
- Policymakers can use discounting to adjust for this difference and ensure that the costs and benefits of a policy are compared consistently
  - **Discount rate of zero:** Present benefits and future benefits are valued equally. No preference between receiving a benefit today or in the future.
  - **Low discount rate**: Present benefits are only slightly more valuable than future benefits.
  - **High discount rate**: Present benefits are much more valuable than future benefits.

*"I would gladly pay you Tuesday for a Hamburger Today"* - J. Wellington Wimpy (From the Popeye Comics)

*Unique Challenge with Climate Change:* Costs of mitigation occur in the near-term, but benefits often occur in the long-term, which can result in discounting of benefits far in the future.

# Choosing a Discount Rate

- EXAMPLE: Economic Damage Caused by Hurricane Katrina estimate by NOAA at $170 Billion
- Table below shows how the Discount Rate would value a Katrina-like event today and in the future

| Year | 1% | 3% | 7% |
|---|---|---|---|
| 2022 | $170 Billion | $170 Billion | $170 Billion |
| 2030 | $157 Billion | $133 Billion | $95 Billion |
| 2050 | $128 Billion | $72 Billion | $22 Billion |
| 2075 | $105 Billion | $39 Billion | $5 Billion |

# How do I work this?

- **Step 1:Estimate project increase (or decrease) in GHG emissions by year**
  - Construction: 200,000 MT CO2 from 2025 to 2030
  - Operations: 50,000 MT CO2 per year from 2030 to 2050

- **Step 2: Use the current recommended discount rates (**2.5%, 2.0%,and 1.5%)

- **Step 3: Identify the SC-GHG by gas for the years of emission and discount rate**
  - 2025 130, 210, 360
  - 2030 140, 230, 380
  - 2040 170, 270, 430
  - 2050 200, 310, 480
  - Interpolate between the values by decade for each year

- **Step 4: Multiply the emissions times the appropriate SC-GHG by year**

- **Step 5: Results:**

| | 2.5% | 2.0% | 1.5% |
|---|---|---|---|
| Construction | $27M | $44M | $74M |
| Operations | $178M | $283M | $451M |
| **Total** | **$205M** | **$327M** | **$525M** |

# CEQ 2023 NEPA Guidance on GHG Emissions and Climate Change Climate Resiliency

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# Quick Notes on Jargon, Part One

- **Climate Change** – Changes in long-term weather conditions in a particular location; can be caused by natural factors (e.g., the Sun, volcanic eruptions, etc.) or anthropogenic factors (e.g., global warming due to greenhouse gas emissions). Includes changes in temperature, precipitation, storm frequency and severity, etc.

- **Climate Change Effects**– Effects caused by climate change including changes in flood risks, heat events/stress, growing conditions and seasons, sea level rise, change in disease vectors, storm damage, changes in species habitat, etc.

- **Climate Change Adaptation**– Refers to actions taken to reduce risks or the severity of climate change effects such as investments to be more resilient to increases in heat waves, changes in storm frequency or intensity, sea level rise, disease vectors, etc.

- **Climate Resiliency** – The ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate.

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# Three Fundamental Aspects of Climate Change Impact Analysis

1. Project Impacts on Climate Change

– Basic question: What is my project's GHG emissions contribution?
– Desired result: To disclose the contribution to **cumulative** global warming and related climate change effects and consider mitigation to address

2. Project Impact on the Environment in light of Climate Change Effects

– Basic question: How does my project affect the environment, taking into account reasonably foreseeable change in the environment?
– Desired result: To disclose the full character of project effects and adopt mitigation to address

3. Impacts of Climate Change on the Project

– Basic question: How would climate change affect my project?
– Desired result: To develop a project/plan that is resilient to climate change effects given the inevitability of some climate change

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# CEQ 2023 NEPA Guidance on GHG Emissions and Climate Change

- *"NEPA reviews should consider the ongoing impacts of climate change and the foreseeable state of the environment, especially when evaluating project design, siting, and reasonable alternatives."*
- *"The analysis…should focus on those aspects of the human environment that are impacted by the agency's potential action and climate change… consider how climate change can make a resource, ecosystem, human community, or structure more vulnerable."*
- *"Federal proposals may also be affected by climate change, so they should be designed in consideration of resilience and adaptation to a changing climate"*

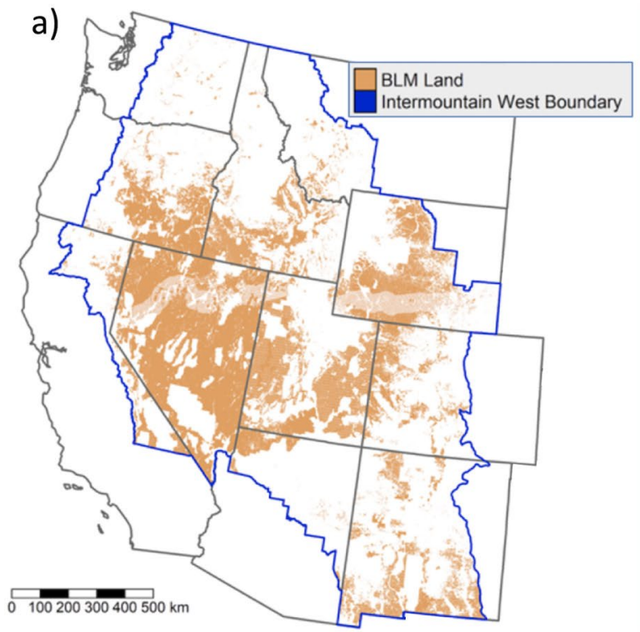
# Taking a “Hard Look” at Climate Change

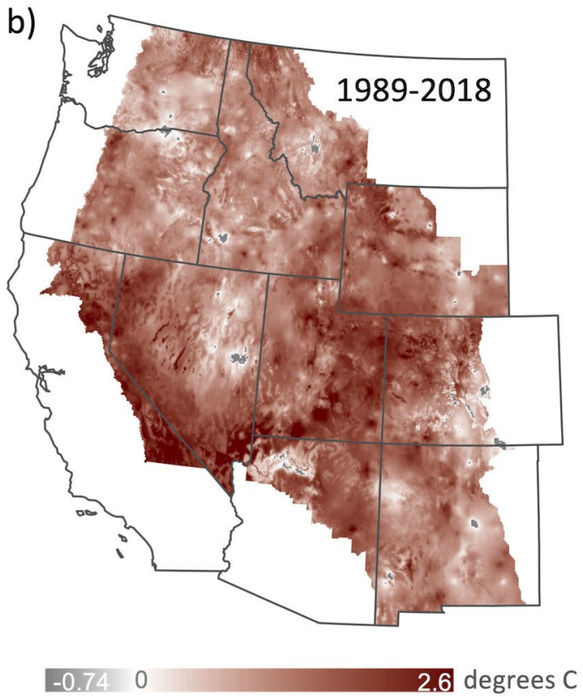
- **Affected Environment (Climate Change Effects)**
  - Describe Climate Change Effects relative to the resource study area (s)
    - For every relevant resource areas (biological resources, hydrology, public health, etc.), describe the reasonably foreseeable changes due to climate change expected during the project/action’s lifetime

climate.nasa.gov

# Taking a “Hard Look” at Climate Change

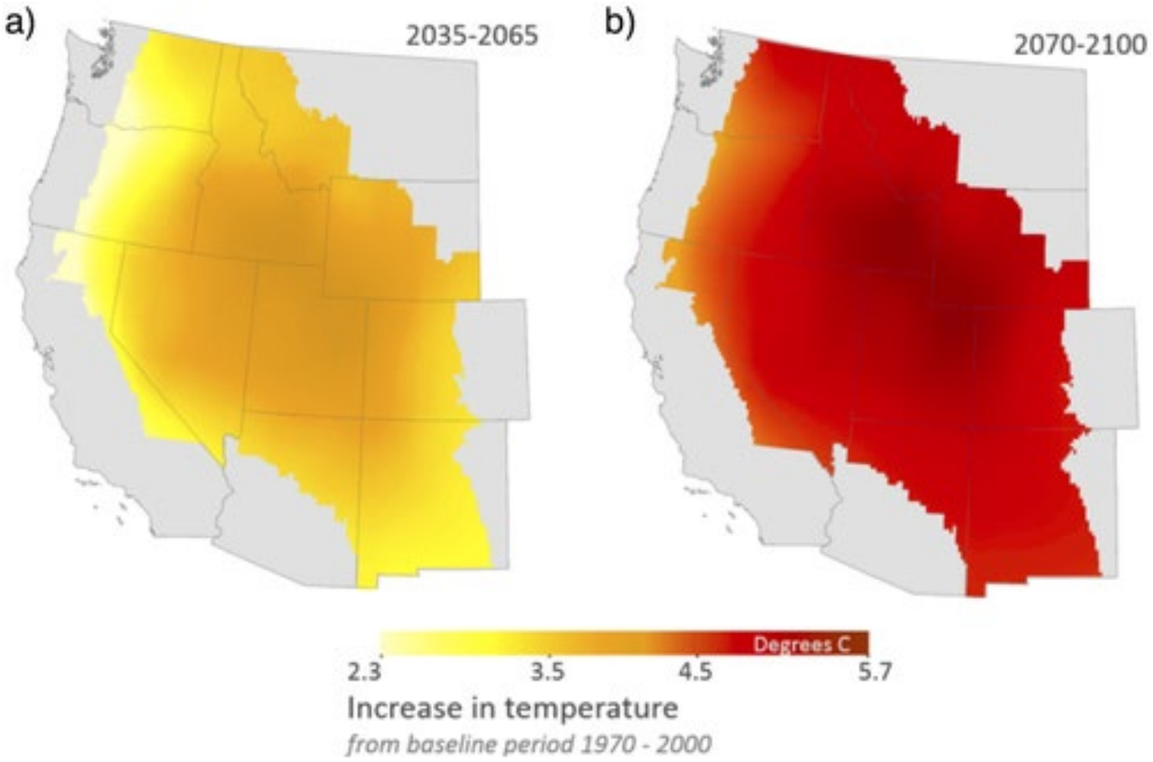
- **Affected Environment (Climate Change Effects)**
  - Example: Describe current and future changes in the environment




Increase in surface air temperature

*From 1895-1924 base period*




Increase in temperature

*from baseline period 1970 - 2000*

**Impacts of climate change on multiple use management of Bureau of Land Management land in the Intermountain West, USA,**
Elaine M. Brice,Brett A. Miller,Hongchao Zhang,Kirsten Goldstein,Scott N. Zimmer,Guenchik J. Grosklos,Patrick Belmont,Courtney G. Flint,Jennifer E. Givens,Peter B. Adler,Mark W. Brunson,Jordan W. Smith. Ecosphere, 10 November 2020.
https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecs2.3286#:~:text=Elaine%20M.%20Brice,Jordan%20W.%20Smith

# Taking a "Hard Look" at Climate Change

**Project Effect +Climate Change Effects = ???**

- **Env. Consequences (Climate Change Effects)**
  - Assess the action's effect on the environment, taking into account *reasonably foreseeable changes due to climate change*
  - Examples:
    - **Biological resources** – Consider changing habitat conditions for rare and common species when evaluating effects on species and habitats
    - **Flooding** – Consider changes in precipitation, storm event intensity/frequency, sea level rise when assessing effects on flooding.
    - **Water supply** – Consider changes in surface water/groundwater conditions with climate change when assessing effect on water supply

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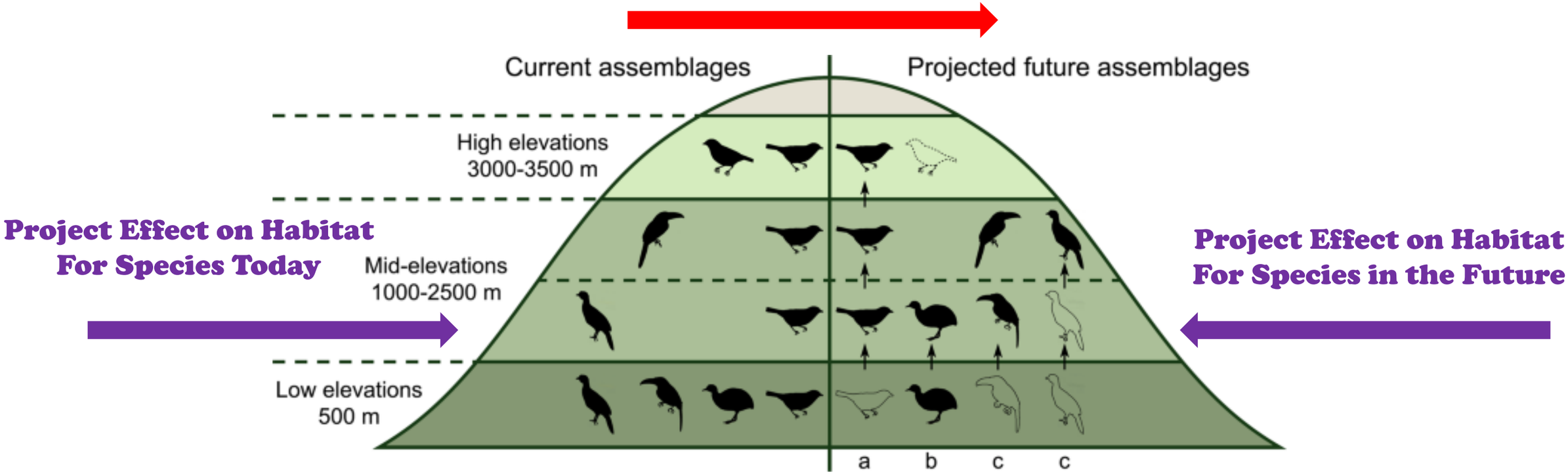
# Taking a “Hard Look” at Climate Chane

**Project Effect +Climate Change Effects = ???**

**Changes in Habitat Suitability for Different Species Due to Climate Change**




**Project Effect on Habitat For Species Today**

**Project Effect on Habitat For Species in the Future**

Projected impacts of climate change on functional diversity of frugivorous birds along a tropical elevational gradient, Irene M. A. Bender, W. Daniel Kissling, Katrin Böhning-Gaese, Isabell Hensen, Ingolf Kühn, Larissa Nowak, Till Töpfer, Thorsten Wiegand, D. Matthias Dehling & Matthias Schleuning Scientific Reports volume 9, Article number: 17708 (2019)

# Taking a “Hard Look” at Resiliency

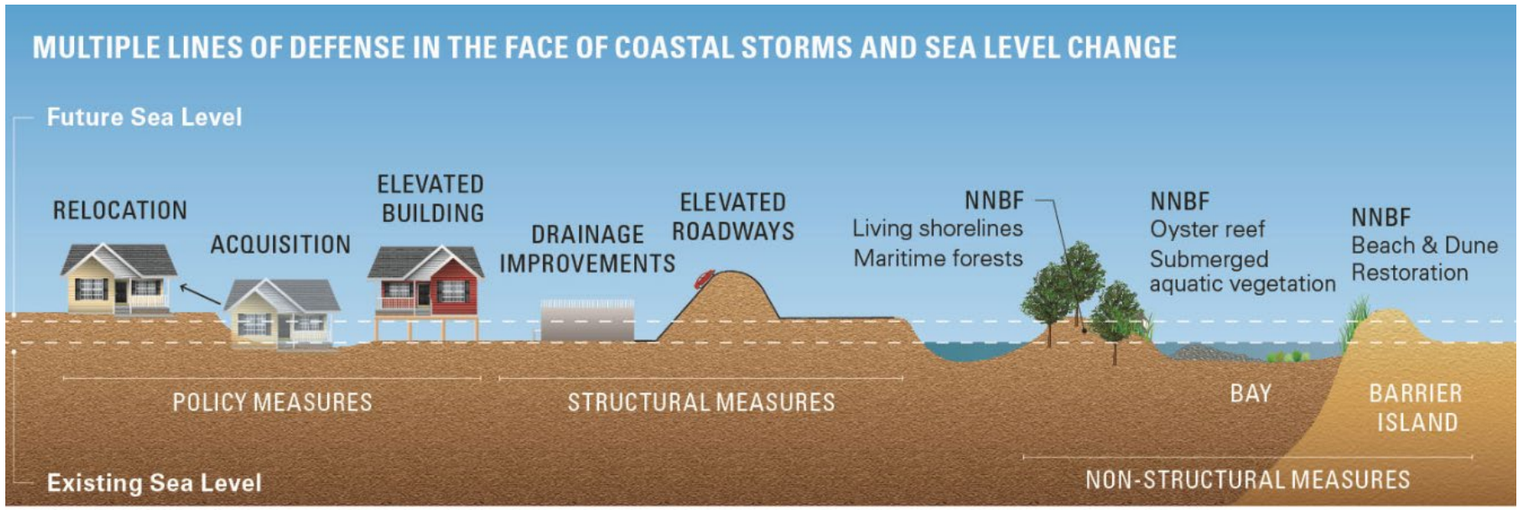
- **Env. Consequences (Project Resiliency)**
  - Discuss the effects on the project due to reasonably foreseeable changes in the climate
  - Examples:
    - Project functionality if subject to increased flooding over time
    - Project resiliency in light of increased heat stresses or other physical changes in the environment.

Source: Barr Foundation

# Taking a "Hard Look" at Resiliency

## Mitigation (Climate Resiliency)

- Consider mitigation measures that would address the project/action exacerbation of climate change effects such as:
  - Reducing project's effect on water supply
  - Reducing project's contribution to flooding
  - Reducing project's effect on wildlife habitat or considering future habitat needs of affected species
- Consider mitigation measures to make the project itself more resilient such as:
  - Setback from coastal flooding areas with SLR or flood-proofing
  - Reducing contribution to heat island effect
  - Incorporate renewable energy, fuel cell power to increase resiliency to power blackouts

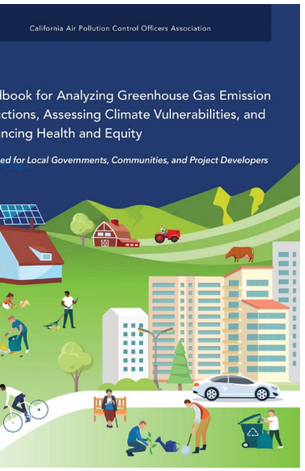



Source: Georgetown Climate Center, Adaptation Clearinghouse

# Taking a “Hard Look”: Resources

***Climate Adaptation Tools and Resources***

- **USEPA:** Tools for Climate Change Adaptation, including Air Quality, Water, Waste, Public health, Adaptation Planning and Environmental Justice Screening and Mapping Tool https://www.epa.gov/arc-x/tools-climate-change-adaptation
- **FHWA:** Climate Change Adaptation Guide
- **NPS:** Coastal Adaptation Strategies Handbook
- **USDOD:** Climate Adaptation Plan
- **USDA**: Quick Guide to Adaptation Planning for natural Resource Professional
- **NOAA**: Adapting to Climate Change: A Planning Guide for State Coastal Managers
- **Others:** Adaptation Planning Guide (California Natural Resources Agency); CAPCOA Handbook, many others…



# final thought...

"*Le mieux est le mortel ennemi du bien*."

- Montesquieu, *Pensées*,~*1726-1727*

# Thank you!

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