Big Changes, Small Planet
The Causes and Consequences of Climate Change

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A Stable Climate

Visual Concept: Katharine Hayhoe
A Changing Climate

Visual Concept: Katharine Hayhoe
Historical Global Temperature

Observed globally averaged combined land and ocean surface temperature anomaly 1850–2012

Annual average

Decadal average

IPCC – AR5
Future Global Temperature

IPCC – AR5
How do we know what we know?

Sevante Arhenius – First Global Warming Calculation in 1896
The Greenhouse Effect

CO₂ and other greenhouse gases trap heat in Earth’s atmosphere.
Global Climate Models

Horizontal Grid (Latitude-Longitude)

Vertical Grid (Height or Pressure)

Image: NOAA
Climate change impacts in California
Sierra: Less Snow More Rain

Snow as Percent of Total Annual Precipitation at Tahoe City

Percent


CA Impacts Report
Declining snowpack in a warmer world

Decrementing California Snowpack

These figures show projections of how two climate scenarios may reduce Sierra snowpacks to 40% and 20% of recent historical averages.

Historical Average (1961–1990)

- 100% remaining

2070–2099

- Lower Warming Range: Drier Climate
  - 40% remaining

- Medium Warming Range: Drier Climate
  - 20% remaining

Source: Scripps 2006

April 1 snow water content (inches):

- ~0
- 15
- 30
- 45
Bay Area: 50 inch rise + ‘1 year’ storm event
Sea Level Rising

Golden Gate Annual Average and 19-Year Mean Tide Levels

- Annual Average Tide
- 19-Year Mean Tide

CA Impacts Report
EVERYONE HIT — VULNERABLE POPULATIONS HIT HARDEST
CA Temps Up 1.5°F
Small changes in the average can generate many more extreme events

![Graph showing an +6°F rise in average temperature results in a 15X rise in heat waves. Historical average shows 4 days, while projections to 2089 show 60 days. Source: Cal-adapt.org, Projections: GFDL, high emissions scenario.]
Heat-related deaths, California

Maria Isabel Jimenez
May 14, 2008
17 y.o. picking grapes

Jose Hernandez
June 20, 2008
64 y.o. picking squash

Ramiro Rodriguez
July 9, 2008
48 y.o. picking nectarines

source: California Dept of Public Health
We Have Choices
Questions?