



Unequal Climate Impacts in the State of California

Climate Vulnerability Metric

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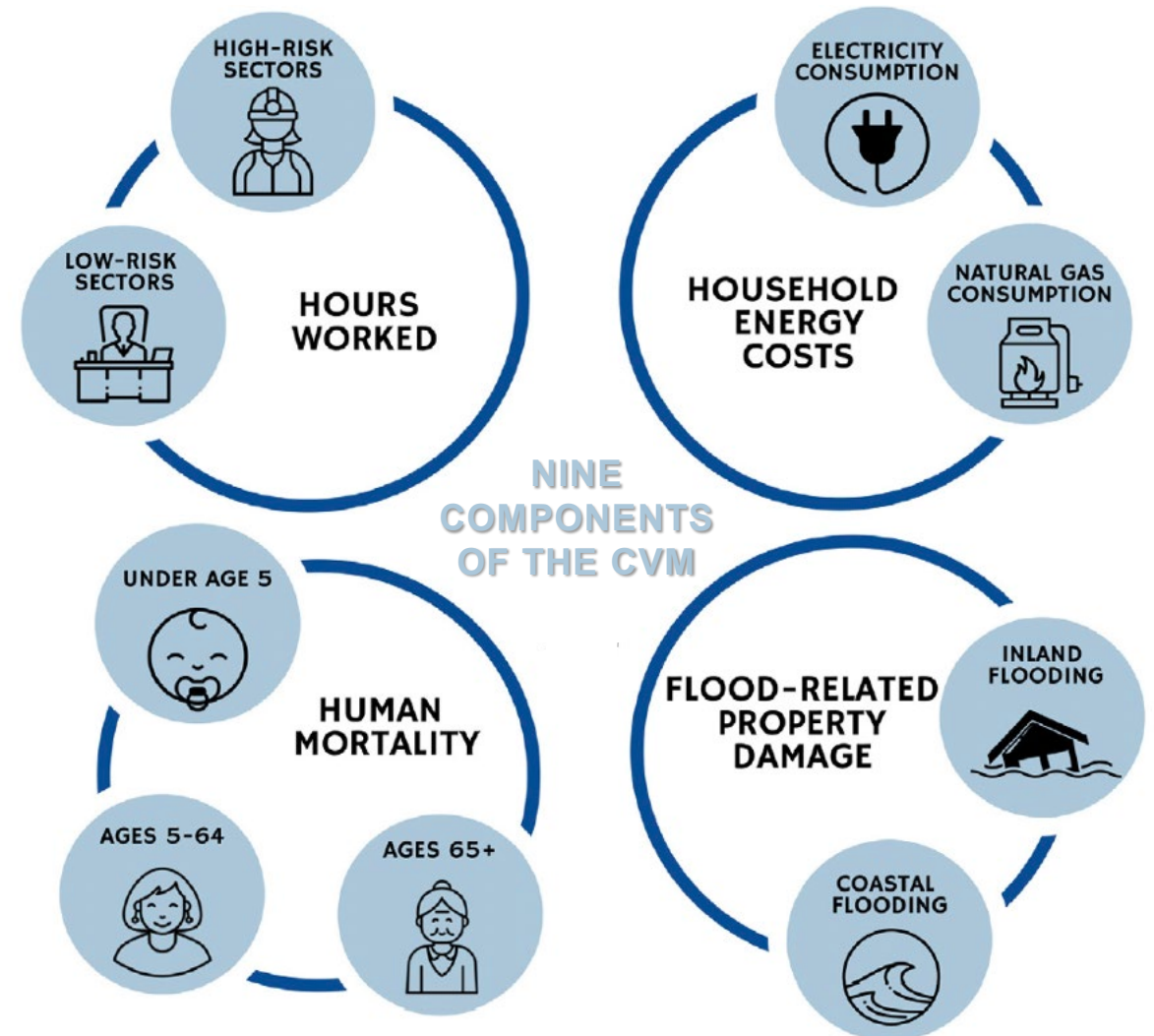


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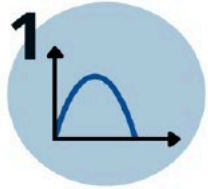


Climate Vulnerability Metric (CVM) overview

- A unique tool focused on quantifying **community-level impacts of climate change on human welfare** across the state
- Constructed by aggregating impacts across the **nine components** shown
- Includes impacts that can be quantified at the census tract level using currently available research, and **can be expanded** to include additional categories as research matures
- Projects impacts through **midcentury** under a **moderate emissions scenario (RCP 4.5)**
- Reported as the aggregate monetized impact of climate change as a percentage of census tract-specific incomes (%), a **format that accounts for current levels of income inequality**

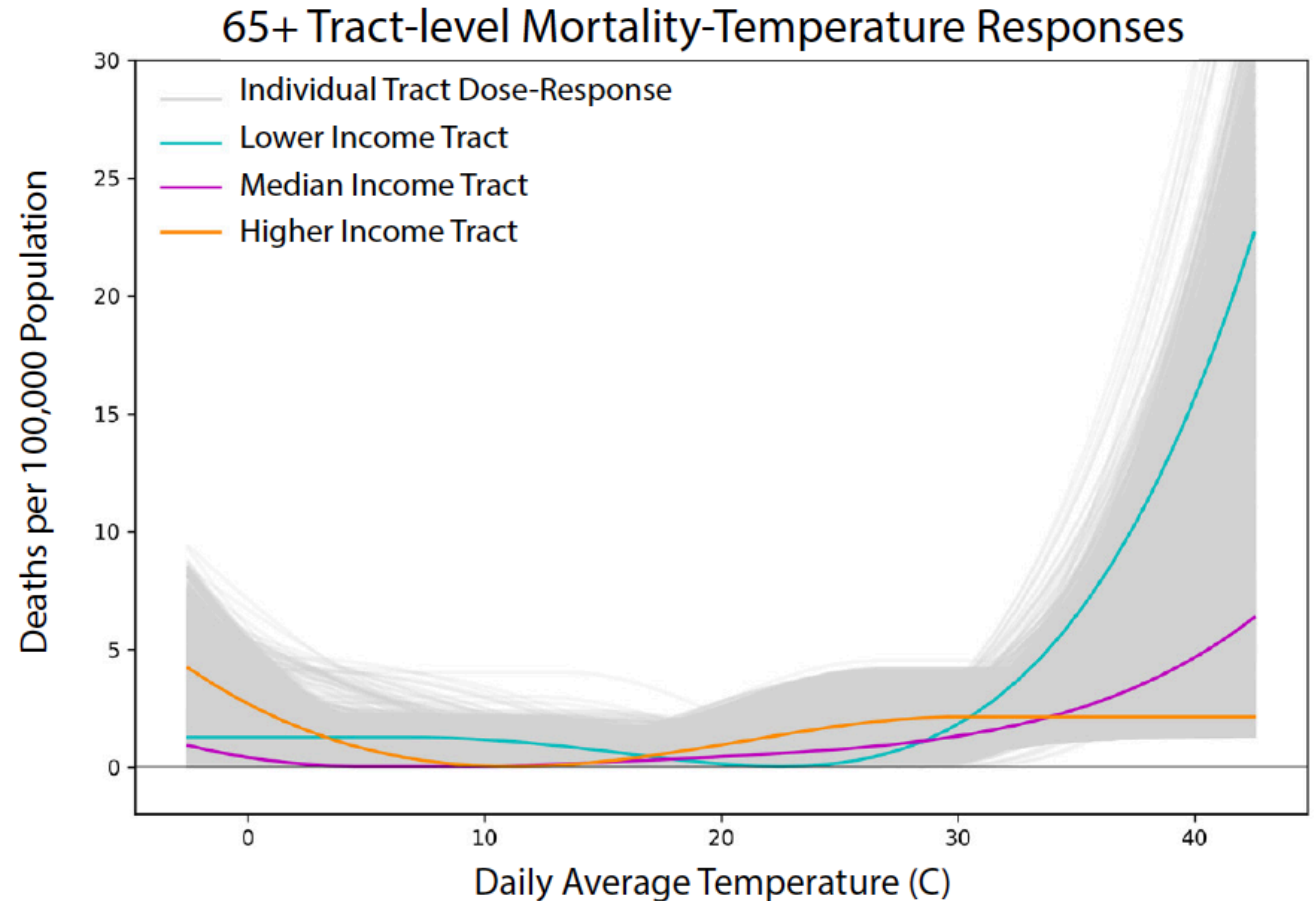


The 5-Step Method for Calculating the CVM



Step One: Create climate dose-response functions

Dose-response functions, like the one on the right, describe the mathematical relationship between the “dose” of a particular climate condition that a population experiences and the corresponding “response” that the population or local economy shows in terms of key social or economic outcomes.



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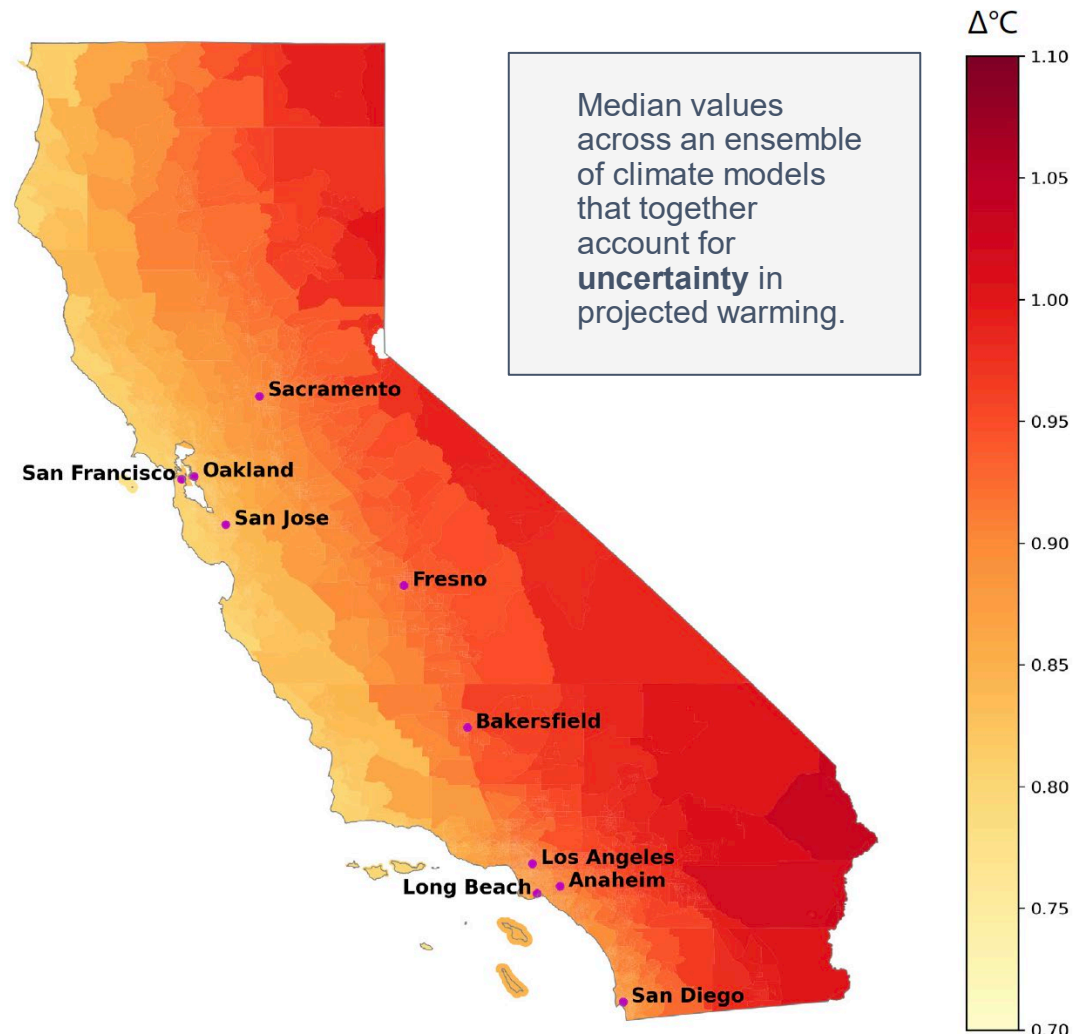


Step Two: Calculate the future impacts of climate change

Downscaled California climate data, consistent with the best available scientific assessments of how warming will evolve in the future, informs the CVM.

The difference between each census tract's response to future climate conditions (2040-2060) and current climate conditions (2010-2030) represents the projected impacts of climate change on human welfare in each category of the CVM.

Change in annual average temperature from 2020 to 2050 under moderate emissions



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Step Three: Assign monetary value to each impact

The Climate Impact Lab is producing evidence-based, hyperlocal climate impact information that can be used to estimate the Social Cost of Carbon, or SCC, the external social cost imposed by emitting one ton of carbon dioxide.

The SCC combines multiple categories of climate change impacts on human welfare, encompassing both market and non-market impacts, into a single global metric. Unlike the SCC, the CVM captures local variation in the costs of climate change.

Category	Market	Non-market
<i>Human mortality</i>		X
<i>Hours worked in high- and low-risk sectors</i>		X
<i>Household energy costs</i>	X	
<i>Flood related property damage</i>	X	

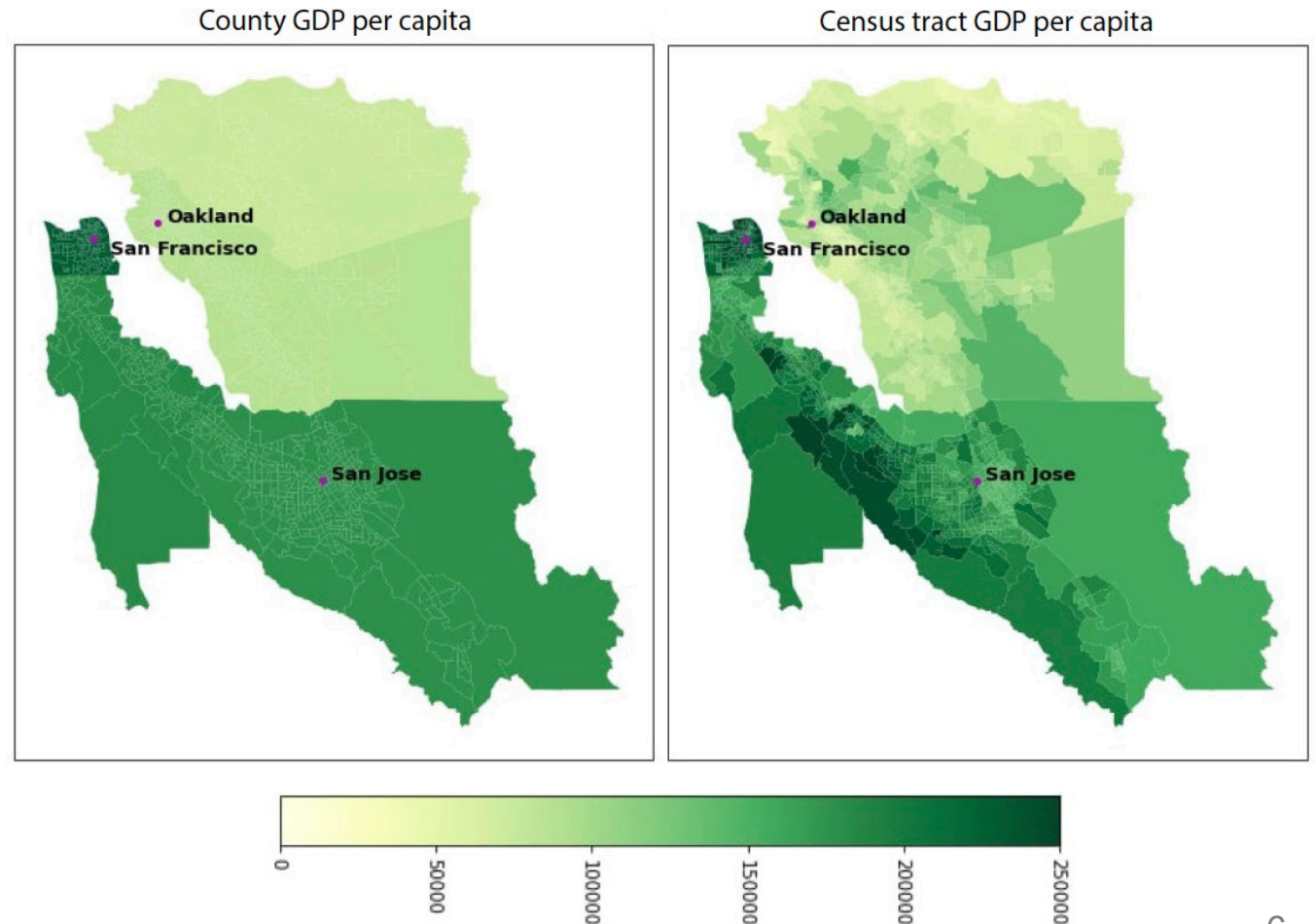
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Step Four: Add up values of impacts across categories and divide by census tract population

Even at the county level, environmental and socioeconomic conditions between communities may vary drastically. Projecting census tract level climate and dividing by census tract population, provides a **granular assessment** that makes it possible to assess which communities face disproportionate impacts.

Downscaling County GDP per Capita to Census Tract Level
2019, in Current Dollars



The 5-Step Method for Calculating the CVM

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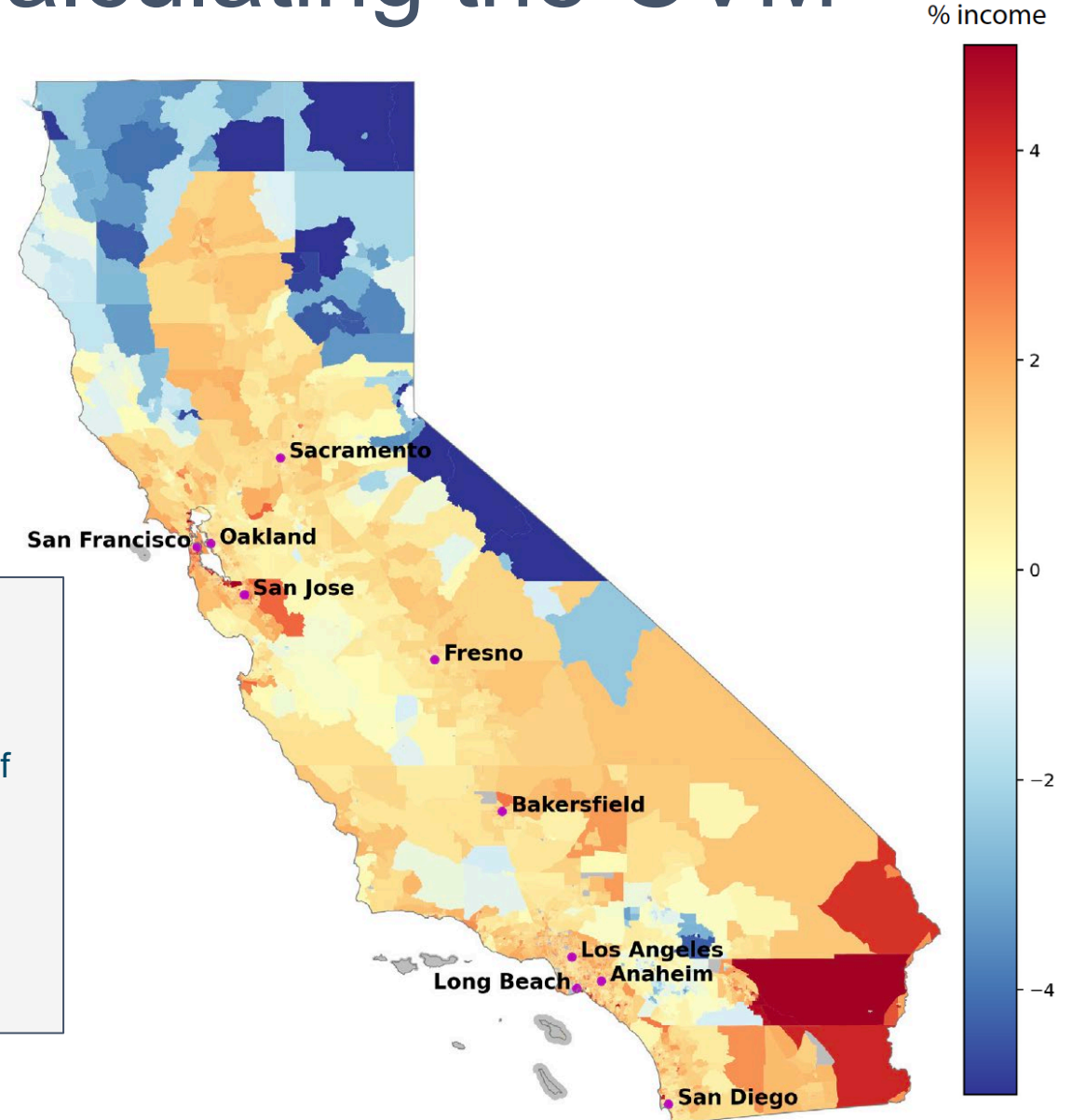


Step Five: Report per capita climate impacts as a share of census-tract incomes (%)

The higher the CVM for a given census tract, the more damaging the projected impacts of climate change on human welfare (see orange and red tracts).

Lower CVM is associated with lower projected impacts of climate change (yellow tracts).

Negative CVM value (blue tracts) represents a projected beneficial impact of climate change, such as through reductions in deaths caused by extremely cold winter weather.



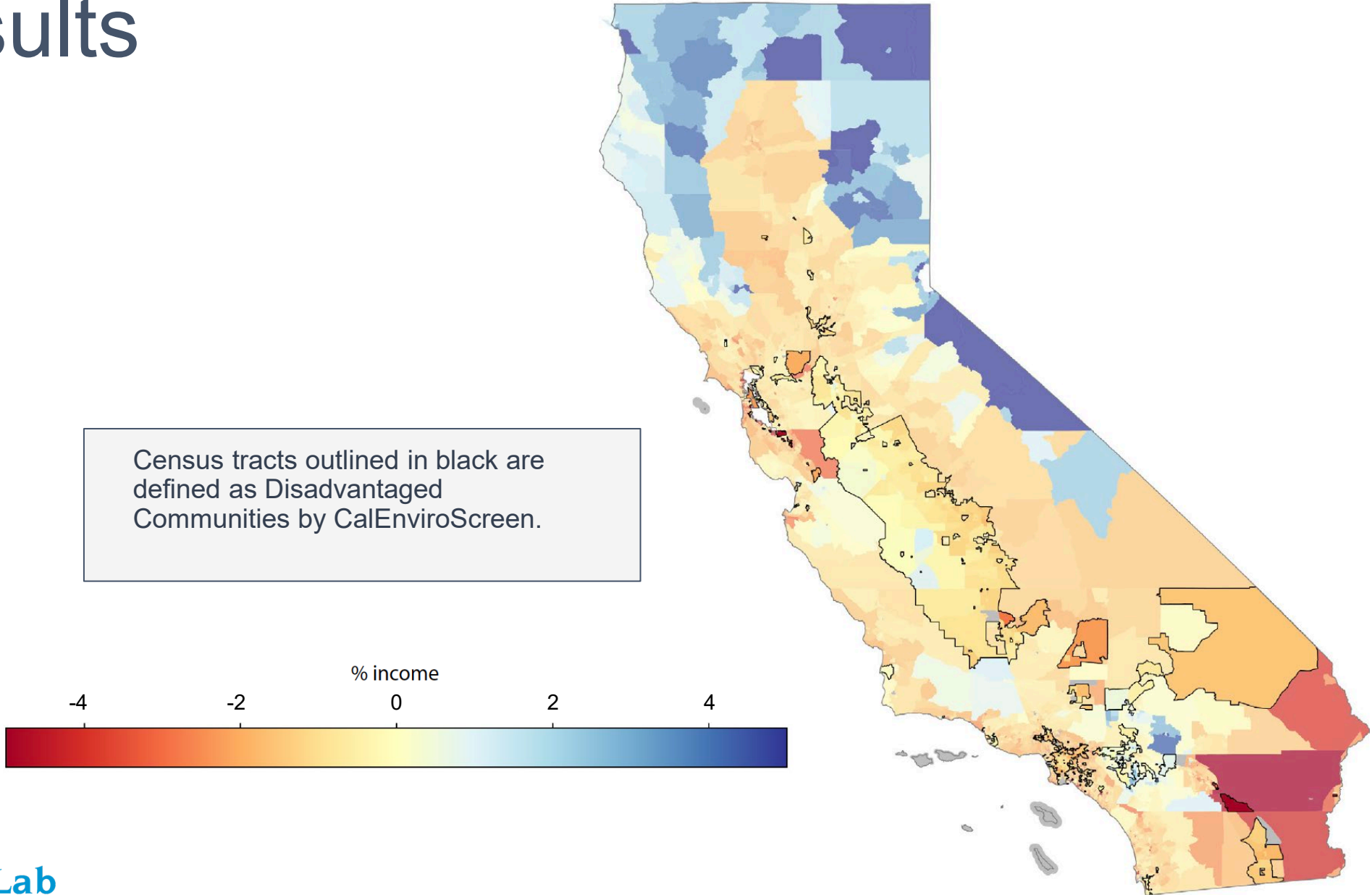
Gaps the CVM aims to fill

- **Capture differences among diverse populations:** Incorporates the fact that individuals and communities differ in their capacity to respond to physical hazards. Ensures climate impacts estimates reflect lived experiences.
- **Provide localized climate risk information:** Assesses climate impacts at census tract level to identify the climate vulnerability within neighborhoods and other community boundaries.
- **Support targeted resiliency and adaptation policies:** Can inform efforts to make California's diverse populations more resilient to climate change, and support efforts to reduce and prevent disparities through targeted funding for climate adaption.

Limitations of the CVM

- **Not representative of the cumulative cost climate change is likely to impose:** Currently available research is not robust enough for CVM to include quantification of many important impacts to individual and household welfare (e.g., climate change-driven changes in wildfires). As climate economics research continues to mature, CVM can be expanded to include additional categories.
- **Not all communities are accurately reflected through census tract tool:** A gap remains in understanding of climate change impacts to certain areas of California, including rural and Tribal communities, due to limited availability of socioeconomic data on adequate scale. Additional research and data are needed to ensure every California community is appropriately represented, especially historically underserved communities.

Results



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