THE CLIMATE GAP

Inequalities in How Climate Change Hurts Americans & How to Close the Gap



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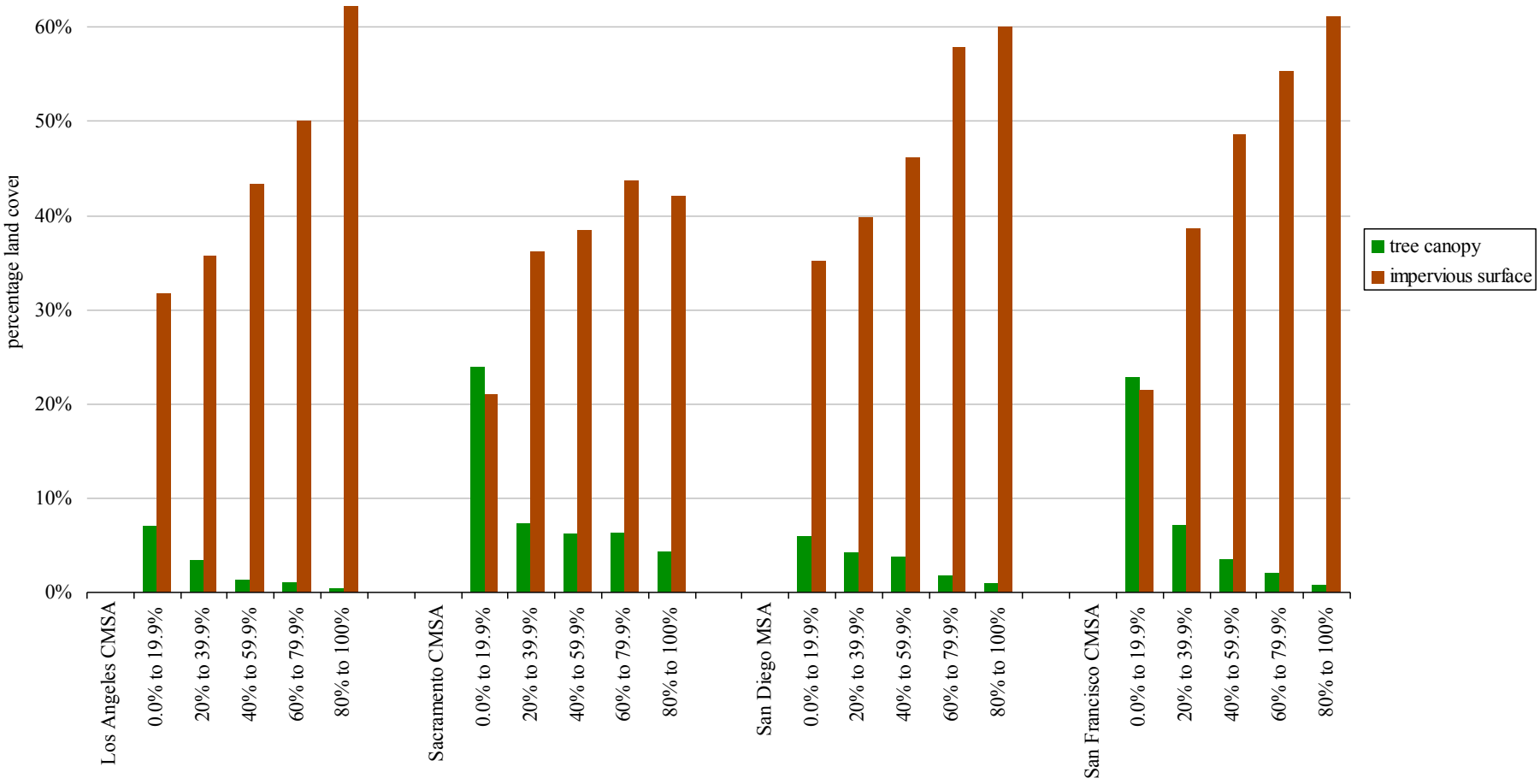
The Climate Gap: People of color and the poor will...

- Suffer higher mortality and health impacts
  - More frequent and intense heat waves
- Be exposed to higher air pollution levels
  - Current pattern of pollution exposure and health inequality could become even worse
- See the "spending gap" widen
  - Pay a greater cost for basic necessities
- Experience reduced economic opportunities
  - Shifting job opportunities, greater job losses

Heath Island Risks and the Built Environment

land cover characteristics
across comparable neighborhood racial/ethnic minority groups



Shonkoff, Morello-Frosch, et al. *Climatic Change*, Forthcoming

Heat Waves

Disparate Impact of Heat-Related Mortality by Race/Ethnicity– California, 1999-2003

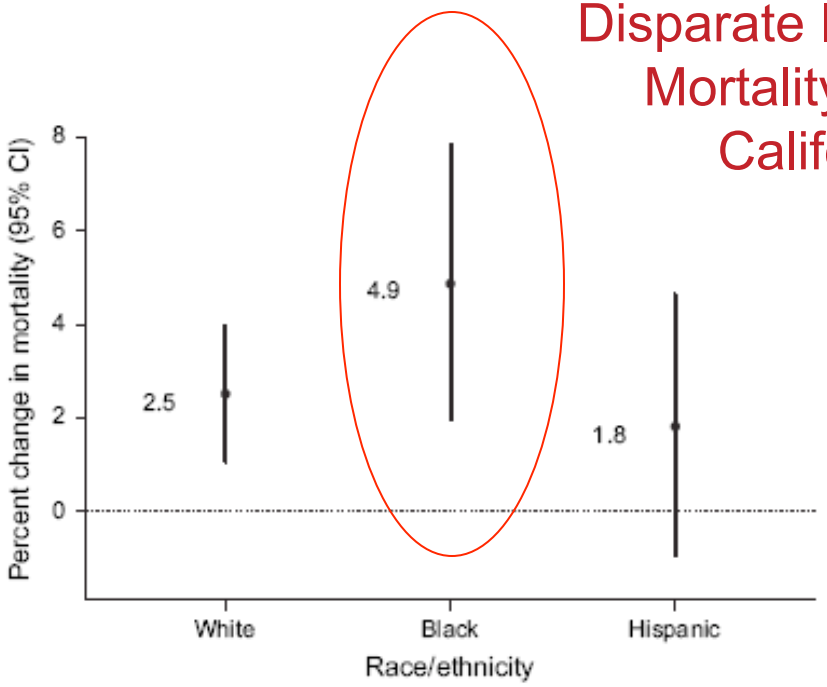
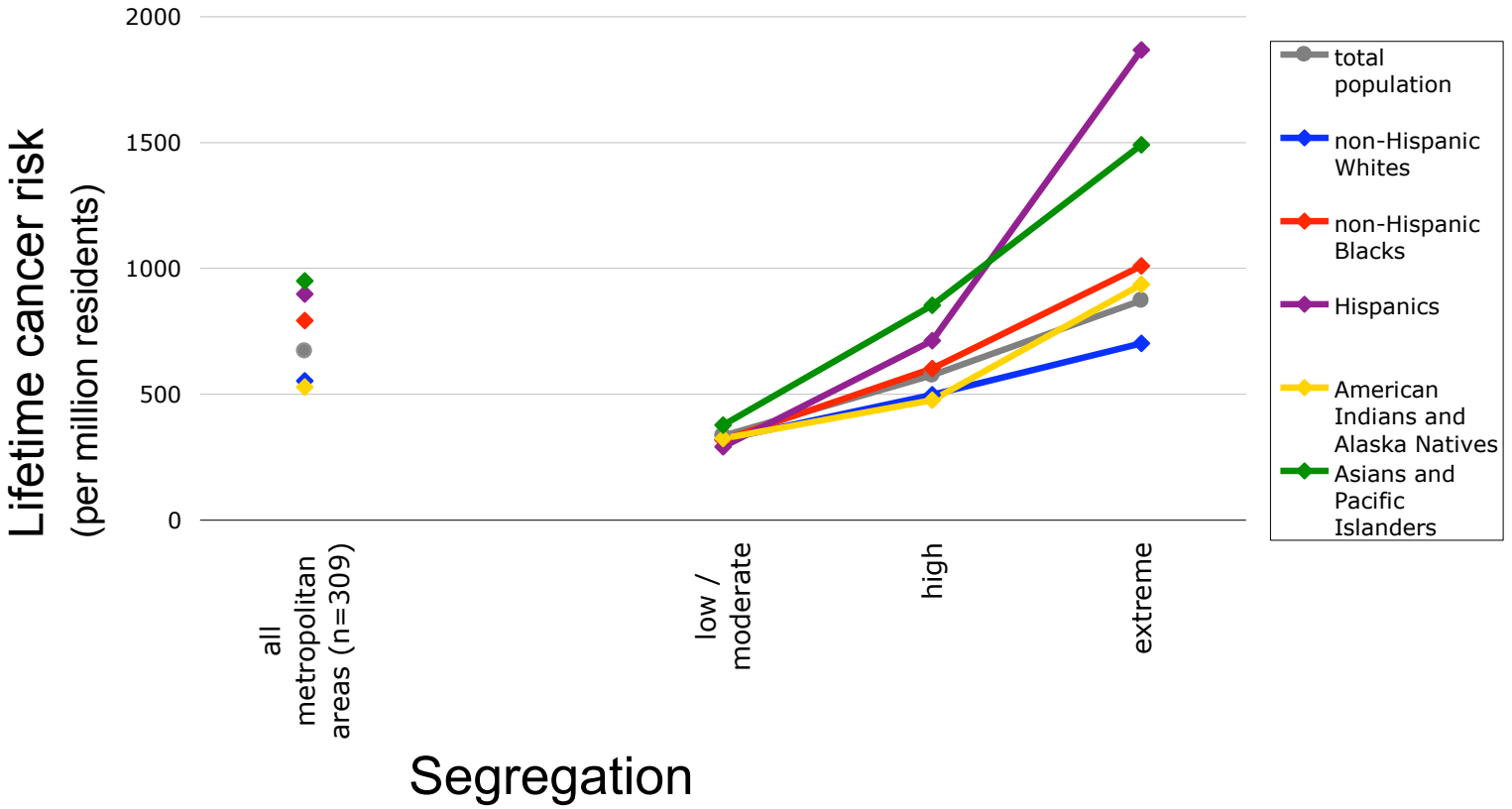


FIGURE 3. Estimated percent change associated with a 10°F (4.7°C) increase in mean daily apparent temperature and nonaccidental mortality by race/ethnic group in nine counties, California, May through September, 1999–2003. CI, confidence interval.

Basu R, Ostro BD (2008) A Multicounty Analysis Identifying the Populations Vulnerable to Mortality Associated with High Ambient Temperature in California, AJE 168(6): 632-637.

Dirtier Air: Segregation and Air Toxics

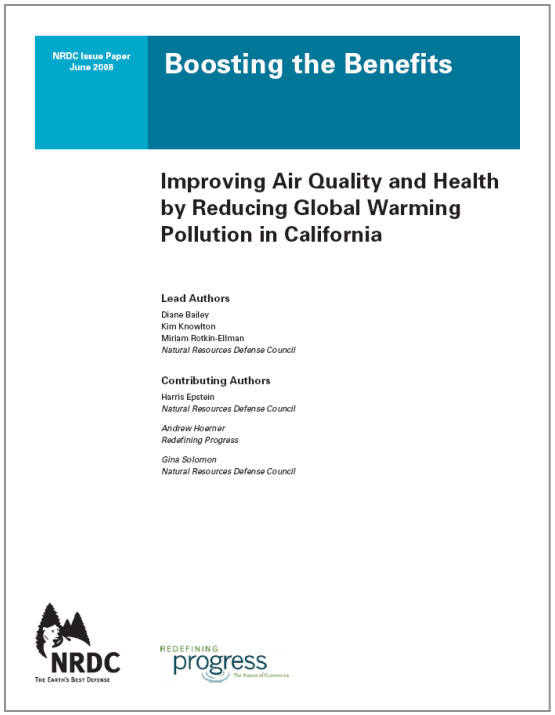
Estimated cancer risk associated with ambient air toxics by race/ethnicity and racial/ethnic residential segregation, continental United States metropolitan areas



(Morello-Frosch & Jesdale 2006)

CALIFORNIA'S CLIMATE LAW: OPPORTUNITIES AND CHALLENGES

The Clean Air Opportunities of AB 32



1. Large GHG-emitting facilities tend to be in urban areas

2. Reductions could also lead to cleaner air in the neighborhoods most affected by local-source pollution

The Challenges

- Previous efforts to overturn AB32
- Ongoing environmental equity concerns about market-based approach

SFGate.com

Calif. cap-and-trade plan suffers legal setback

Bob Egelko, Chronicle Staff Writer
03/22/11

California's attempt to implement its landmark global warming law with a market-oriented "cap-and-trade" system of pollution credits hit a snag Monday with a judge's ruling that the state had not looked hard enough at alternatives.

KEY FINDINGS

Climate Justice Benefits of GHG Reductions

- Communities of color and the poor could directly benefit from greenhouse gas reduction strategies
  - indirect reduction in co-pollutants, such as air toxics, NOx, PM, and others.
- Many targeted GHG emission sources disproportionately affect low income communities of color
  - Mobile source emissions (Morello-Frosch et al. 2006)
  - Stationary sources (Morello-Frosch et at. 2001, Pastor, Sadd et a. 2003)

Opportunities and Concerns

- "Co-pollutant intensity" varies across regions, neighborhoods, sectors and polluters
- Market systems could perpetuate or amplify disparities in pollutant burdens because of failure to address co-pollutants
- How to ensure that GHG reductions occur in communities that would benefit most from co-pollutant reductions.
  - Getting the "biggest bang for our carbon reduction buck"

Under current cap and trade approach, there is little certainty of where emissions reductions would take place

Oil refinery in a densely populated area in Southern California

Power plant in a sparsely populated area of California

Understanding the Opportunities

California Dataset – 146 Major GHG-Emitting Facilities

Facilities (most phase I C&T facilities)

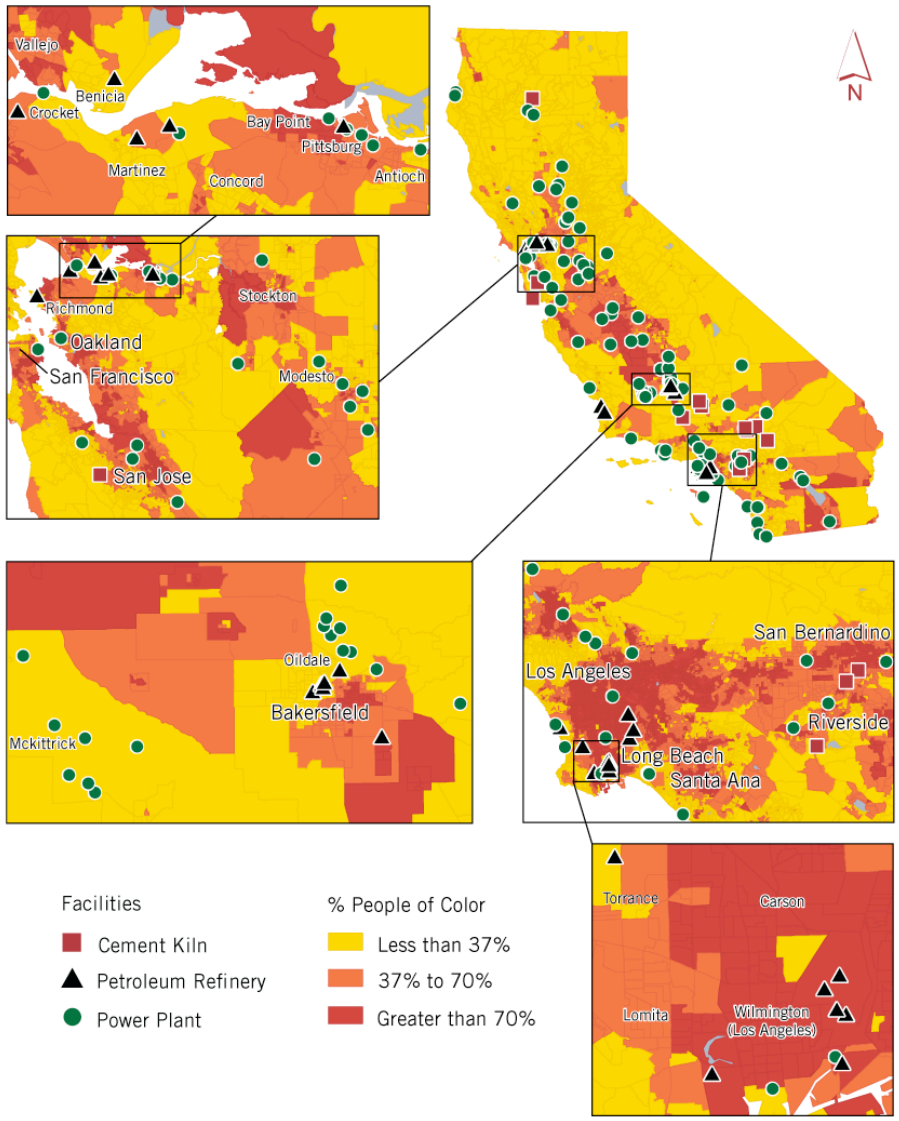
- Large or "Dirty" Power Plants
- Petroleum Refineries
- Cement Plants

Emissions

- PM10 (2006)

Methods:

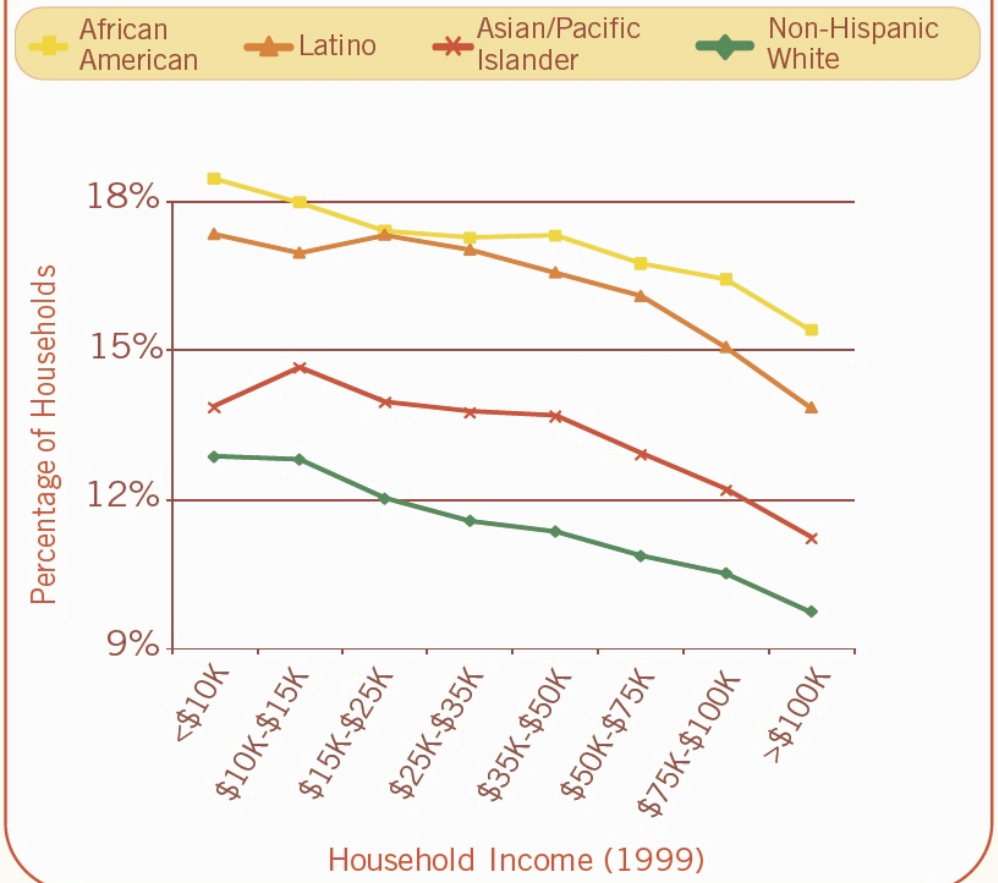
- Located facilities geographically
- Linked neighbor-hood characteristics from the Census to facilities
- Developed a "pollution disparity index" and calculated a health impacts index that was used in Bailey et al. 2008



Findings:

- People of color and people living in poverty are disproportionately near major GHG-emitting facilities
- Disparities exist at all income levels

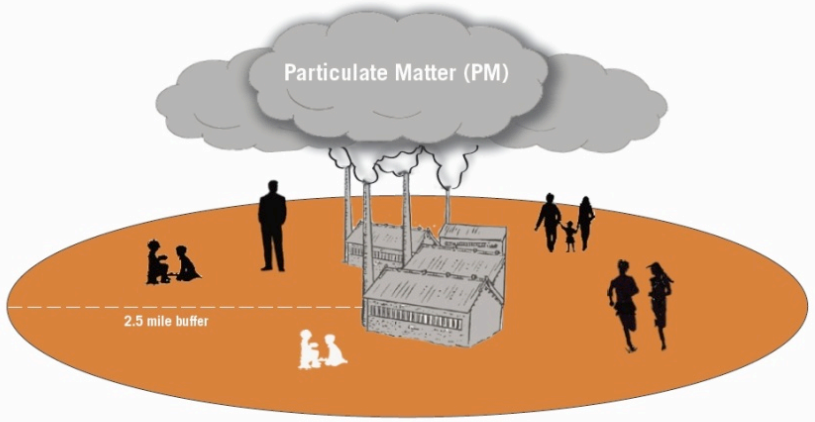
Figure 2: Percentage Households Within 2.5 Miles of any Facility by Income and Race/Ethnicity in California



Findings:

- To quantify the gap more exactly in terms of sectors and facilities, we created a "pollution disparity index" for each facility
- The index measures racial disparity in PM_{10} emissions at the facility level by combining particulate emissions with an analysis of the population living within certain distances of each facility

Calculation of the Pollution Disparity Index



The pollution disparity index measures the extent to which a facility disproportionately pollutes people of color as compared to non-Hispanic whites. It is calculated by considering total pollutants produced by the facility (tons of particulate matter), the number of people within a certain distance of the facility, and the demographics of that population. The resulting disparity index can be added up across all facilities to get the state-wide disparity score – or gap – in pollution burden by race/ethnicity.

Pollution Disparity Index

$$Total\ CA\ Gap_{(POC-NHW)d} =$$

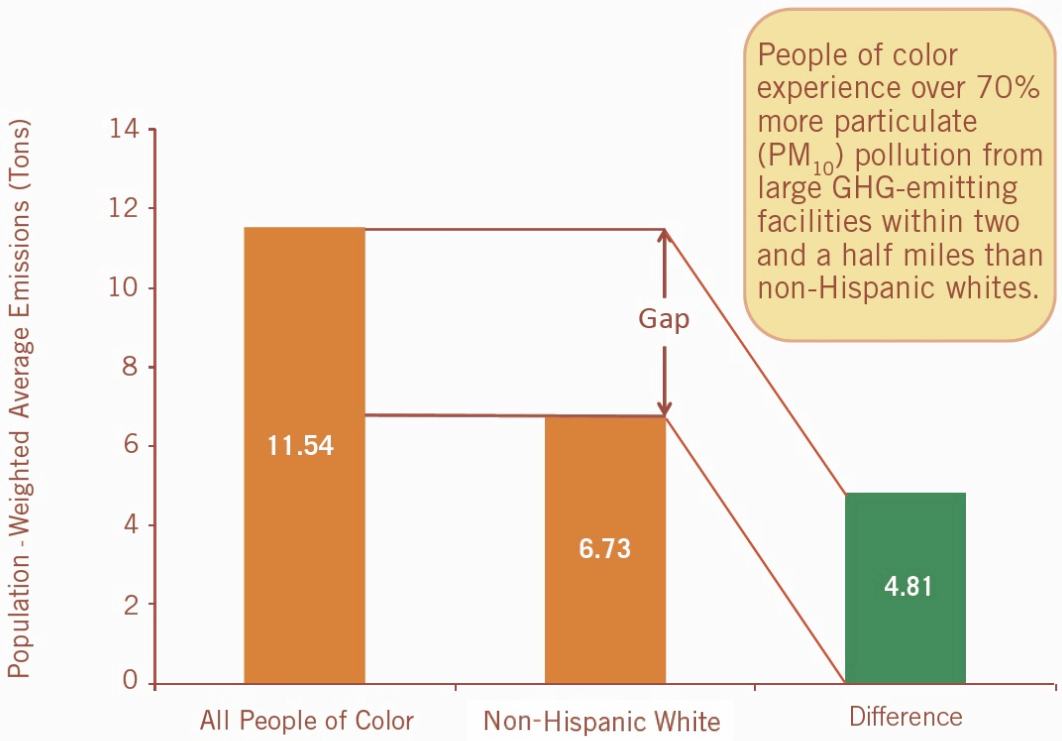
$$[average\ POC\ PM10\ exposure_d] - [average\ NHW\ PM10\ exposure_d]$$

$$= \left[\frac{\sum_{i=1}^{n} POC_i \times PM10_{i,d}}{POC_{CA}}\right] - \left[\frac{\sum_{i=1}^{n} NHW_i \times PM10_{i,d}}{NHW_{CA}}\right]$$

Findings:

- On average, people of color experience over 70 percent more PM_{10} pollution from the high GHG-emitters

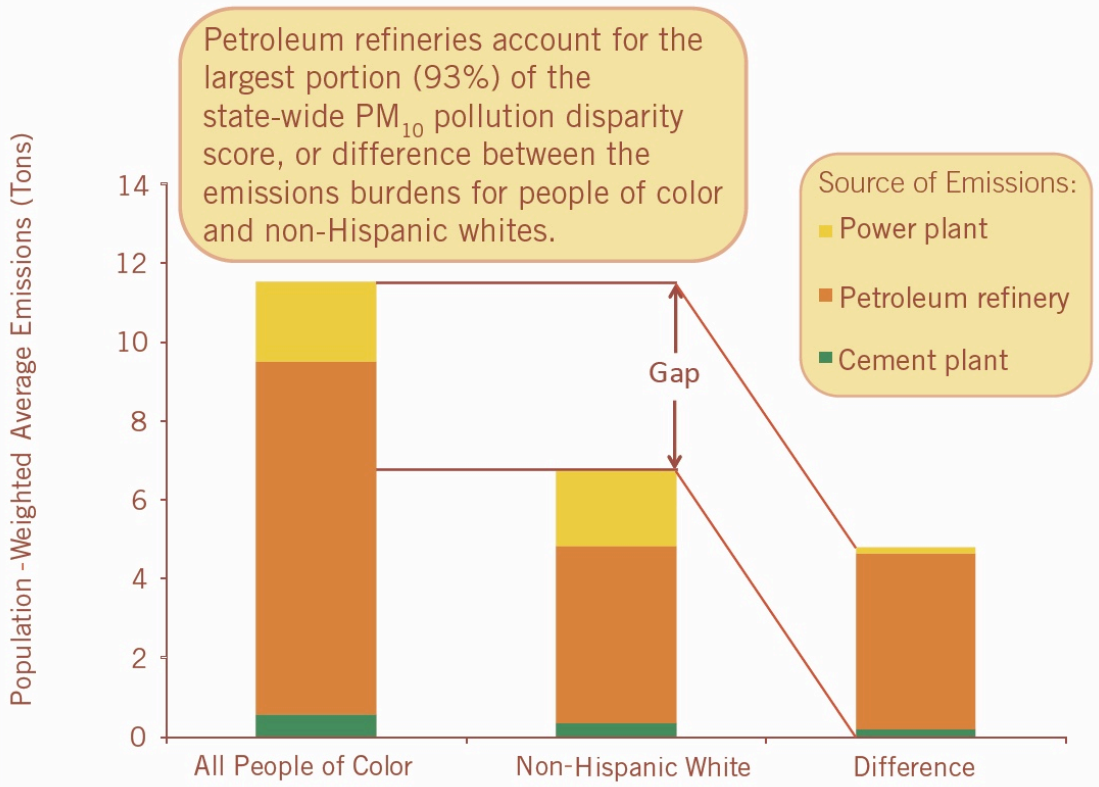
Figure 3: Population-Weighted Average Annual Particulate (PM_{10}) Emissions Burden (Tons) by Race/Ethnicity for Facilities within 2.5 Miles



Findings:

- Petroleum refineries account for a large share of the pollution burden faced by all people
- They contribute even more to the racial disparity

Figure 4: Population-Weighted Average Annual Particulate (PM_{10}) Emissions Burden (Tons) by Facility Category and Race/Ethnicity for Facilities within 2.5 Miles



Findings: Top Ten Facilities by Pollution Disparity Index

Rank	Facility Name	City	Pollution Disparity Index
1	BP Carson Refinery	Carson	1.44
2	Tesoro Wilmington Refinery	Wilmington (Los Angeles)	1.01
3	Paramount Refinery	Paramount	0.62
4	ConocoPhillips Wilmington Refinery	Wilmington (Los Angeles)	0.52
5	ExxonMobil Torrance Refinery	Torrance	0.40
6	Chevron Richmond Refinery	Richmond	0.32
7	Malburg Generating Station (Vernon Power Plant)	Vernon	0.31
8	ConocoPhillips Carson Refinery	Carson	0.29
9	Valero Wilmington Refinery	Wilmington (Los Angeles)	0.24
10	California Portland Cement Company Colton Plant	Colton	0.16

Findings: Top Ten Percent of Facilities by Health Impacts Index

- Disparity and overall health impacts are inextricably linked:

eight of the **ten** most disparate facilities by race/ethnicity also rank highly in terms of relative potential health impacts

Table 4: Top Ten Percent of California's Major Greenhouse Gas-Emitting Facilities Ranked by the Health Impacts Index

Rank	Facility Name	City	Health Impacts Index
1	ExxonMobil Torrance Refinery	Torrance	54.4
2	Tesoro Wilmington Refinery	Wilmington (Los Angeles)	50.0
3	BP Carson Refinery	Carson	46.3
4	Chevron El Segundo Refinery	El Segundo	41.2
5	ConocoPhillips Wilmington Refinery	Wilmington (Los Angeles)	30.3
6	Shell Martinez Refinery	Martinez	27.1
7	Valero Benicia Refinery	Benicia	19.1
8	Mountainview Power Plant	San Bernardino	17.5
9	Chevron Richmond Refinery	Richmond	17.3
10	California Portland Cement Company Colton Plant	Colton	14.1
11	Paramount Refinery	Paramount	13.8
12	Valero Wilmington Refinery	Wilmington (Los Angeles)	13.0
13	Cemex Victorville/White Mountain Quarry	Apple Valley	12.5
14	Tesoro Golden Eagle Refinery	Martinez	12.1
15	Etiwanda Generating Station	Rancho Cucamonga	11.1

Ways to address climate justice concerns

Focus reductions from worst offenders by restricting allowance allocation or trading and incentivizing deeper reductions

Screen for climate gap neighborhoods

Create a “Climate Gap Neighborhood Protection Fund”

Identifying Climate Gap Neighborhoods to Target Regulatory Mitigation and Investment of Community Benefits Fund

Translating Science into Tools for Action: Environmental Justice and Climate Vulnerability Screening

- Develop screening approach that:
  - Reflects research on climate change, air pollution, environmental justice, and health
  - Is transparent and relevant to policy-makers and communities
- Apply method to multiple uses:
  - Local land use planning
    - (e.g. Los Angeles, SF Bay Area, Central Valley, San Diego)
  - Regulatory decision-making and enforcement
  - Community outreach and advocacy

Four Categories of Screening

Proximity to hazards & sensitive land uses

- Air Resources Board land use guidelines (sensitive receptors)
- State data on environmental hazards

Health risk & exposure

- Available state and national data
- Modeling from emissions inventories

Social & health vulnerability

- Based on epidemiological literature on social determinants of health
- ACS 2005-2009 and state-level data

Climate change vulnerability

- Based on climate change and health literature
- Heat islands, temperature, social isolation

Category 1:

Proximity to Hazards & Sensitive Land Uses

Sensitive Land Use-Data Source Examples

- Sensitive land uses as defined by CA Air Resources Board Air Quality and Land Use Handbook, 2005
  - Childcare facilities (SCAG/ABAG 2005, parcel code 2009, Lic Div 2009 geocoded)
  - Healthcare & senior housing facilities (SCAG/ABAG 2005, ARB/CaSIL 2009/SCAG 2005)
  - Schools (SCAG/ABAG 2005, geocoded from CA DOE)
  - Urban Playgrounds & Parks (SCAG 2005)
  - Residential neighborhoods – (SCAG 2005 polygons)

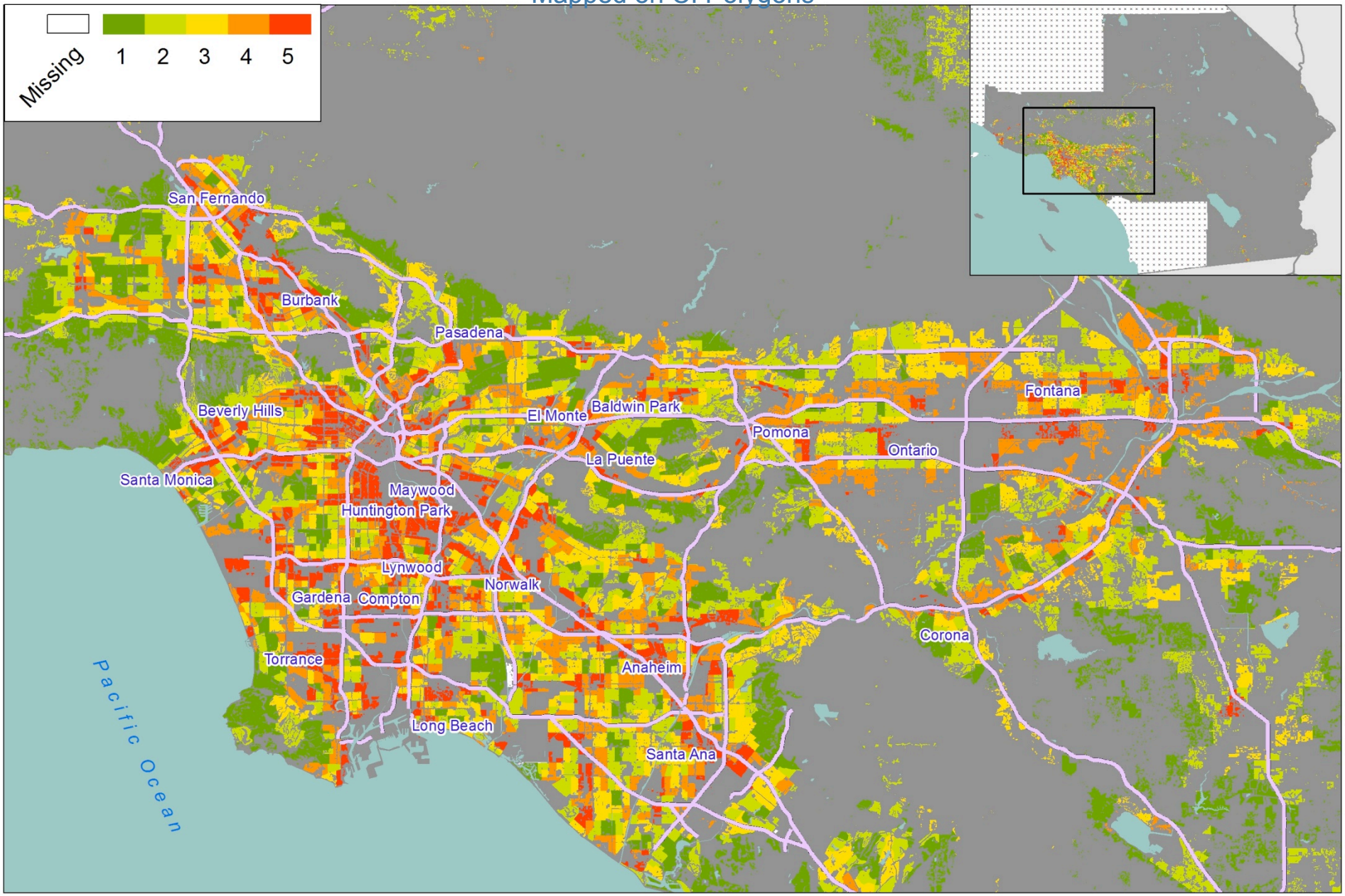
Hazardous Land Uses

- Area facilities (CARB)
- Chrome Platers (CARB)
- Hazardous Waste TSDs (DTSC)
  - Federal Response (includes Superfund)
  - State response
  - Voluntary cleanup
  - Military evaluation
  - School investigations and cleanup
- Rail
- Traffic Volume
- Ports
- Airports
- Refinery
- Intermodal distribution facilities

- *Number of sites within buffers of polygon edge is derived for each CI polygon*
  - ➢ *distance weighted approach*

Figure 9a: Hazard proximity and sensitive land use quintile scores at the tract level-- Southern California 6-County Area

Mapped on CI Polygons



Category 2:

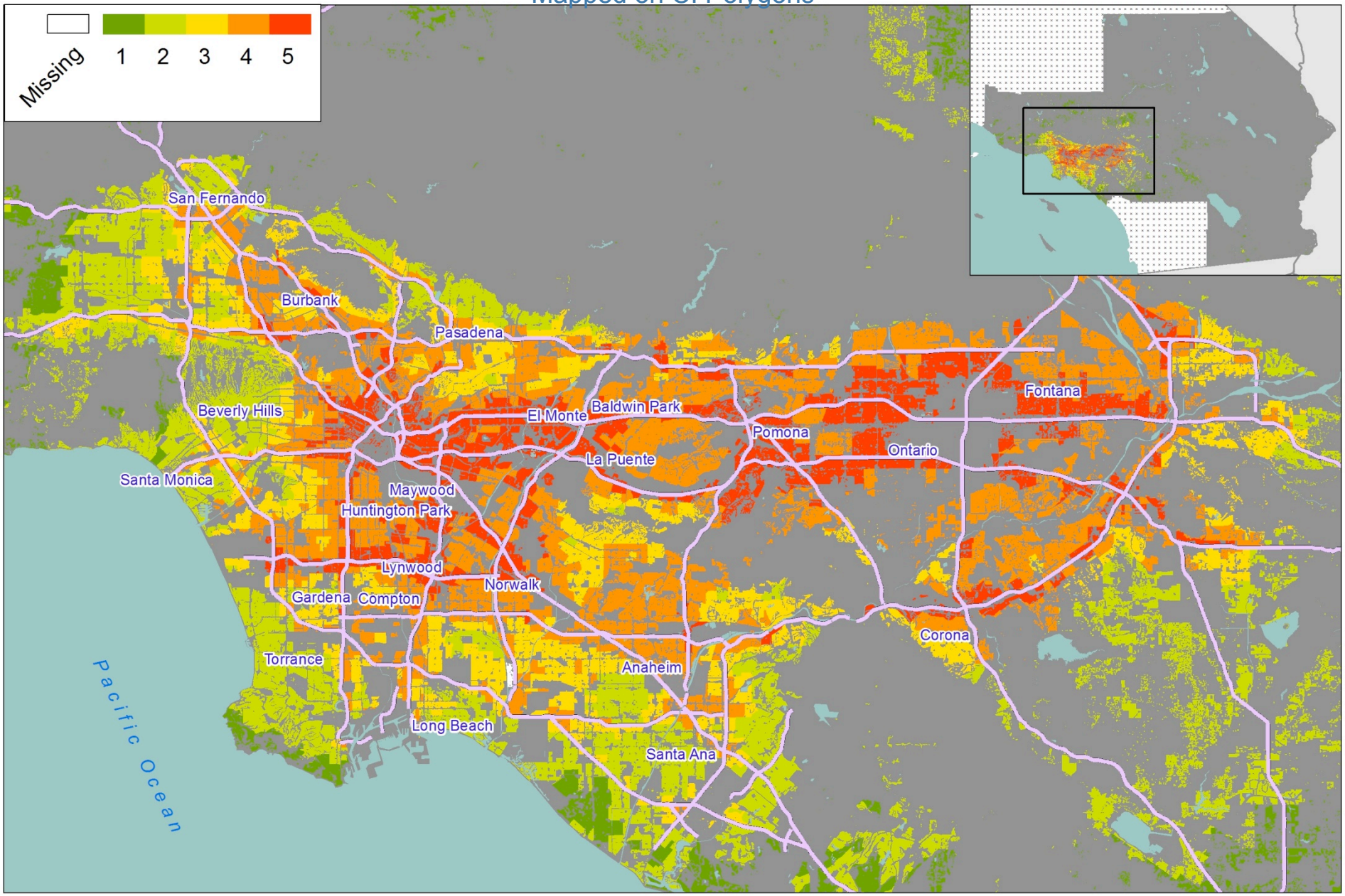
Health Risk and Exposure

Health Risk & Exposure Indicators - Tracts

- RSEI (Risk Screening Environmental Indicators)
  - (2007) toxic conc. hazard scores from TRI facilities
- NATA 2005 (National Air Toxics Assessment)
  - Respiratory hazard from mobile & stationary sources
  - Calculated from modeled air toxics concentrations
- NATA 2005
  - Estimated Inhalation Cancer Risk
- CARB estimated $PM_{2.5}$ concentration (2004-06)
- CARB estimated Ozone concentration (2004-06)

Figure 9b: Air pollution exposure and health risk quintile score at the tract level-- Southern California 6-County Area

Mapped on CI Polygons



Category 3:

Social and Health Vulnerability

Social & Health Vulnerability Indicators

Census Tract Level Metrics (ACS 2005-09)

SES

- % residents of color
- % residents below twice national poverty level
- Home ownership - % living in rented households
- Housing value – median housing value
- Educational attainment – % population > age 24 with less than high school education

Biological Vulnerability

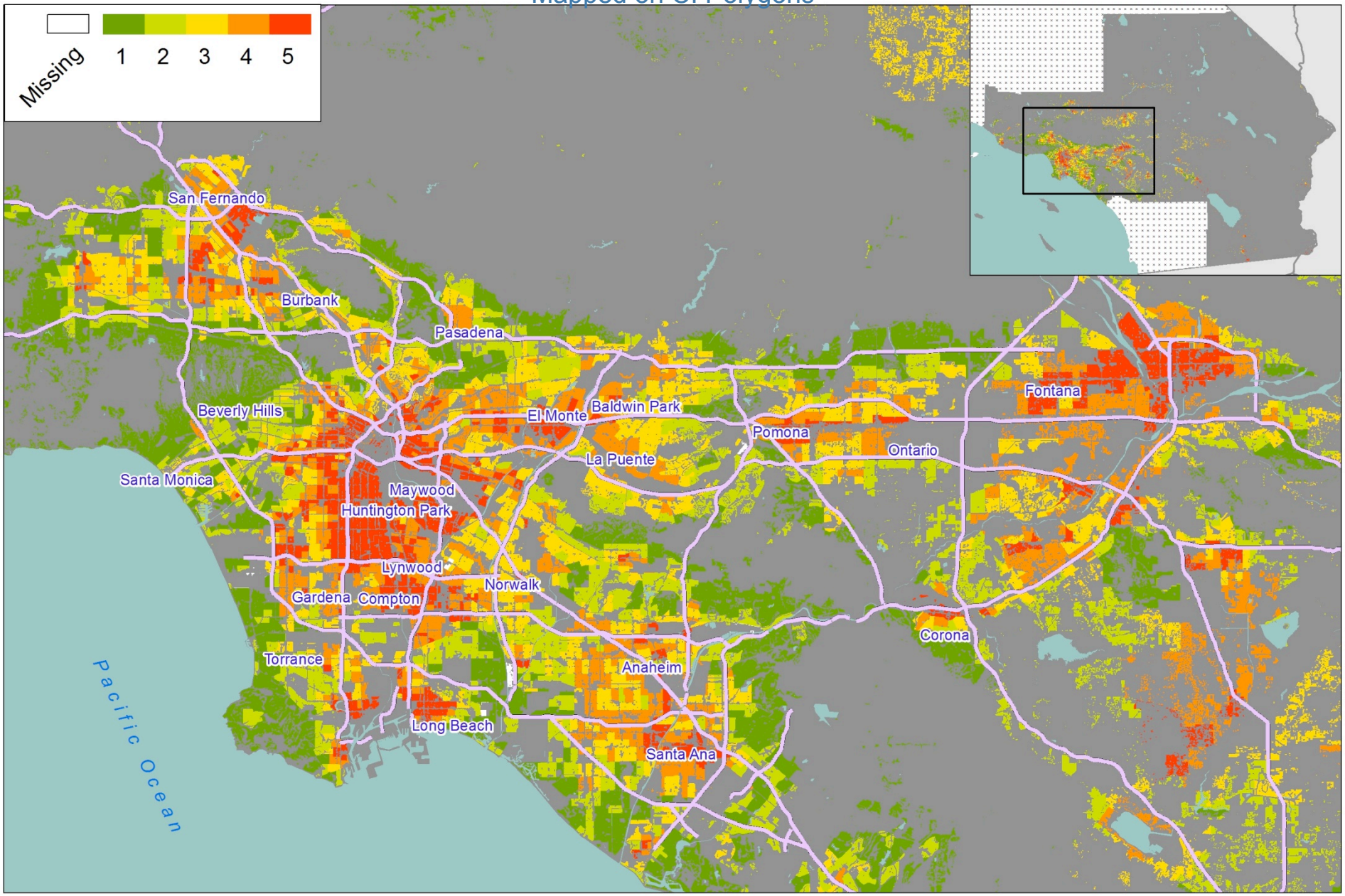
- Age of residents (% <5)
- Age of residents (% >60)
- Birth outcomes – % preterm or SGA infants 2001-2006

Civic Engagement

- Linguistic isolation - % pop. >age 4 in households where no one >age 15 speaks English well
- Voter turnout - % votes cast among all registered voters averaged for 2000 and 2008 general election

Figure 9c: Social and health vulnerability quintile scores at the tract level-- Southern California 6-County Area

Mapped on CI Polygons



Category 4:

Climate Change Vulnerability

Climate Change Vulnerability Metrics

Heat Island Risk

- % tree canopy coverage
- % impervious surface

(National Land Cover Dataset, 2001)

Temperature

- Projected mean temperature – 2050-2059

  Change in projected mean temperature – (2050-2059) – (2000-2009)

(National Center for Atmospheric Research, downscaled Community Climate System Model, scenario B1, ensemble average)

Mobility/ Social Isolation

- % elderly living alone
- % car ownership

(American Community Survey Summary Data (ACS) 2005-2009)

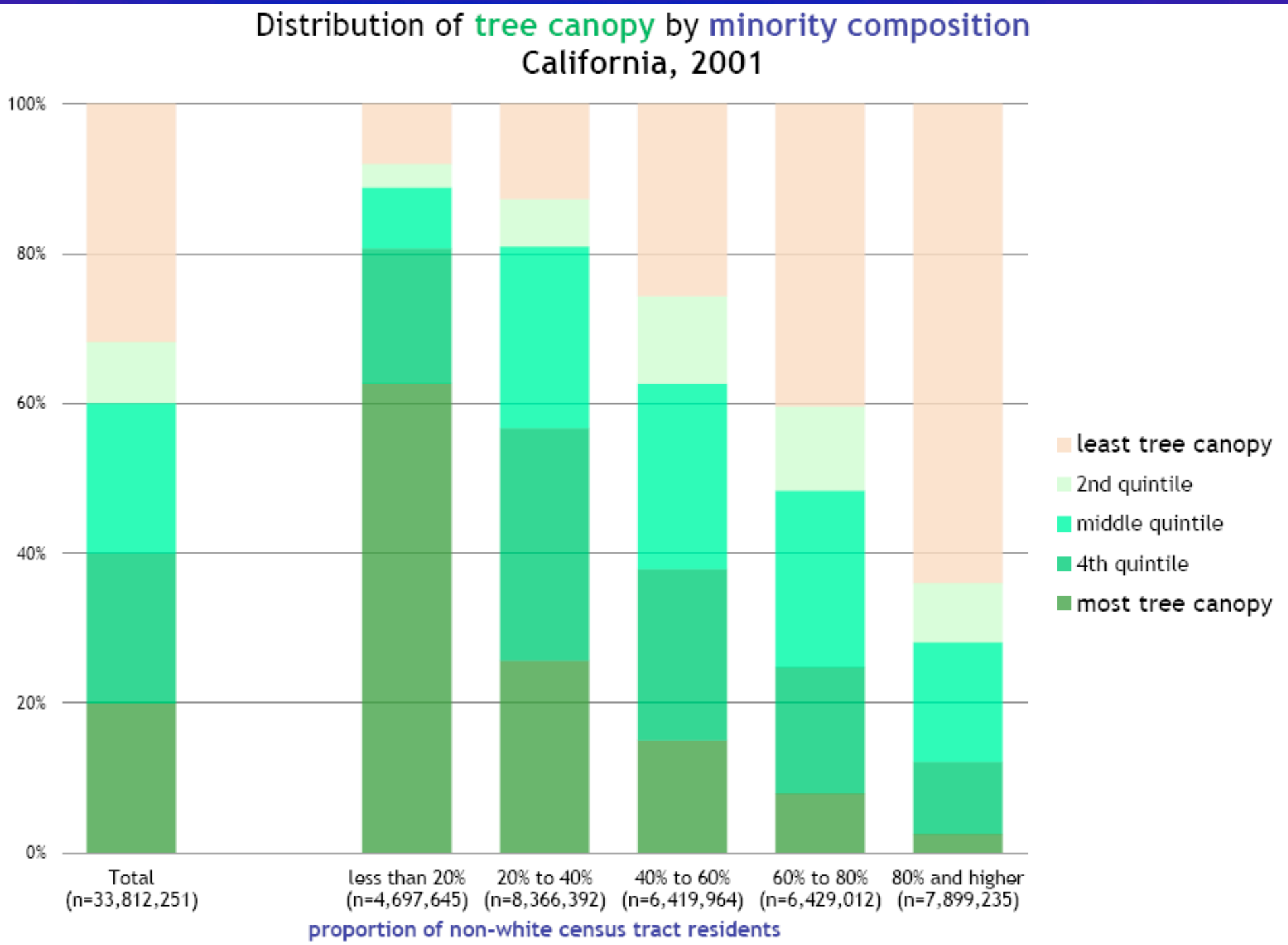
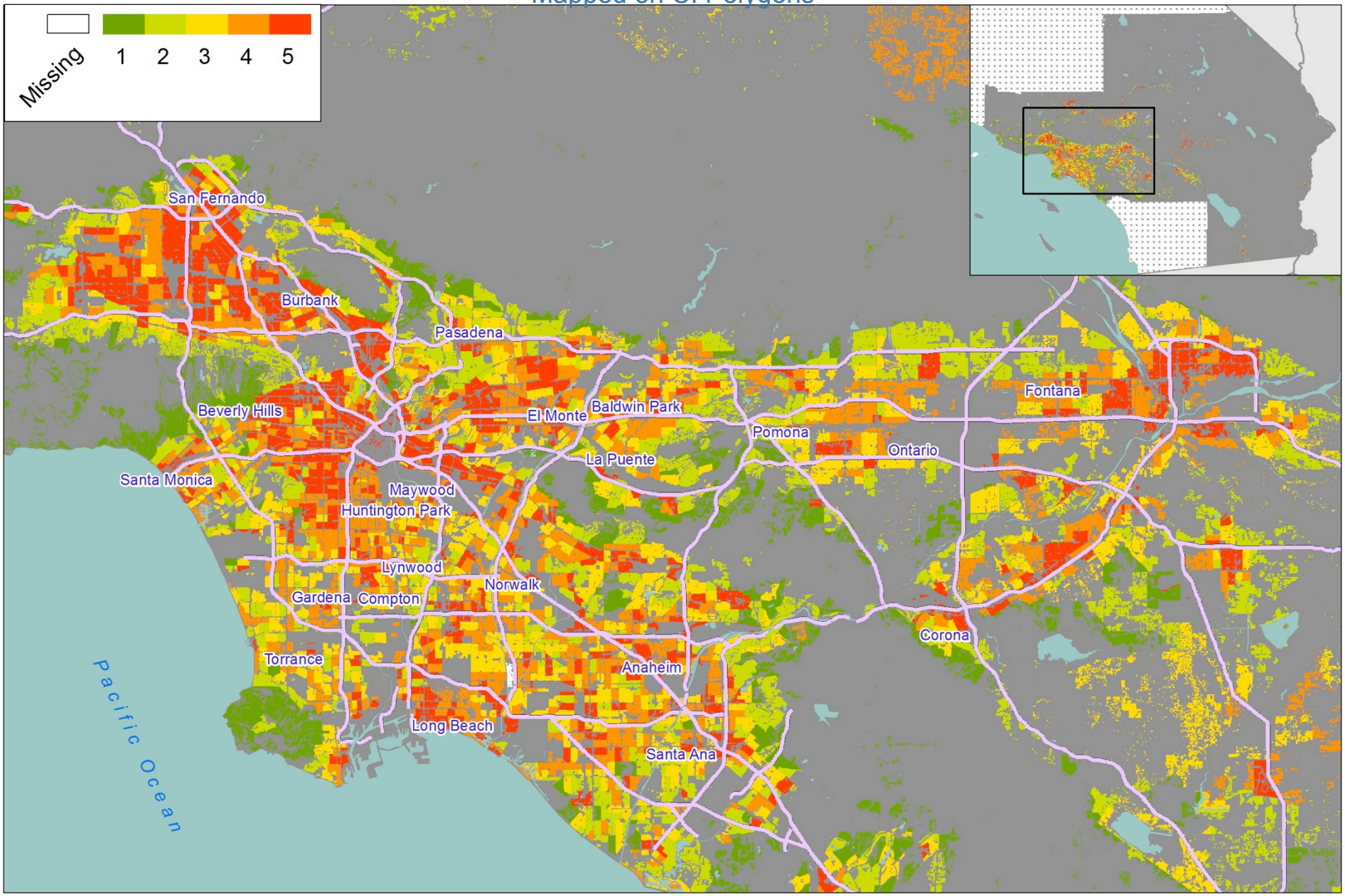

Distribution of tree canopy by minority composition
California, 2001
100%
80%
60%
40%
20%
0%
Total (n=33,812,251)
less than 20% (n=4,697,645)
20% to 40% (n=8,366,392)
40% to 60% (n=6,419,964)
60% to 80% (n=6,429,012)
80% and higher (n=7,899,235)
proportion of non-white census tract residents
least tree canopy
2nd quintile
middle quintile
4th quintile
most tree canopy

Figure 9d: Climate change vulnerability quintile scores at the tract level-- Southern California 6-County Area

Mapped on CI Polygons



Bringing it all together:

Cumulative Impact (CI) Scores

Cumulative Impact Scores at the Tract Level

Combine three categories of tract level impact and vulnerability to get Cumulative Impact Score

Cumulative Impact Score =

Hazard Proximity and Sensitive Land Use Score (1-5) +

Health Risk and Exposure Score (1-5) +

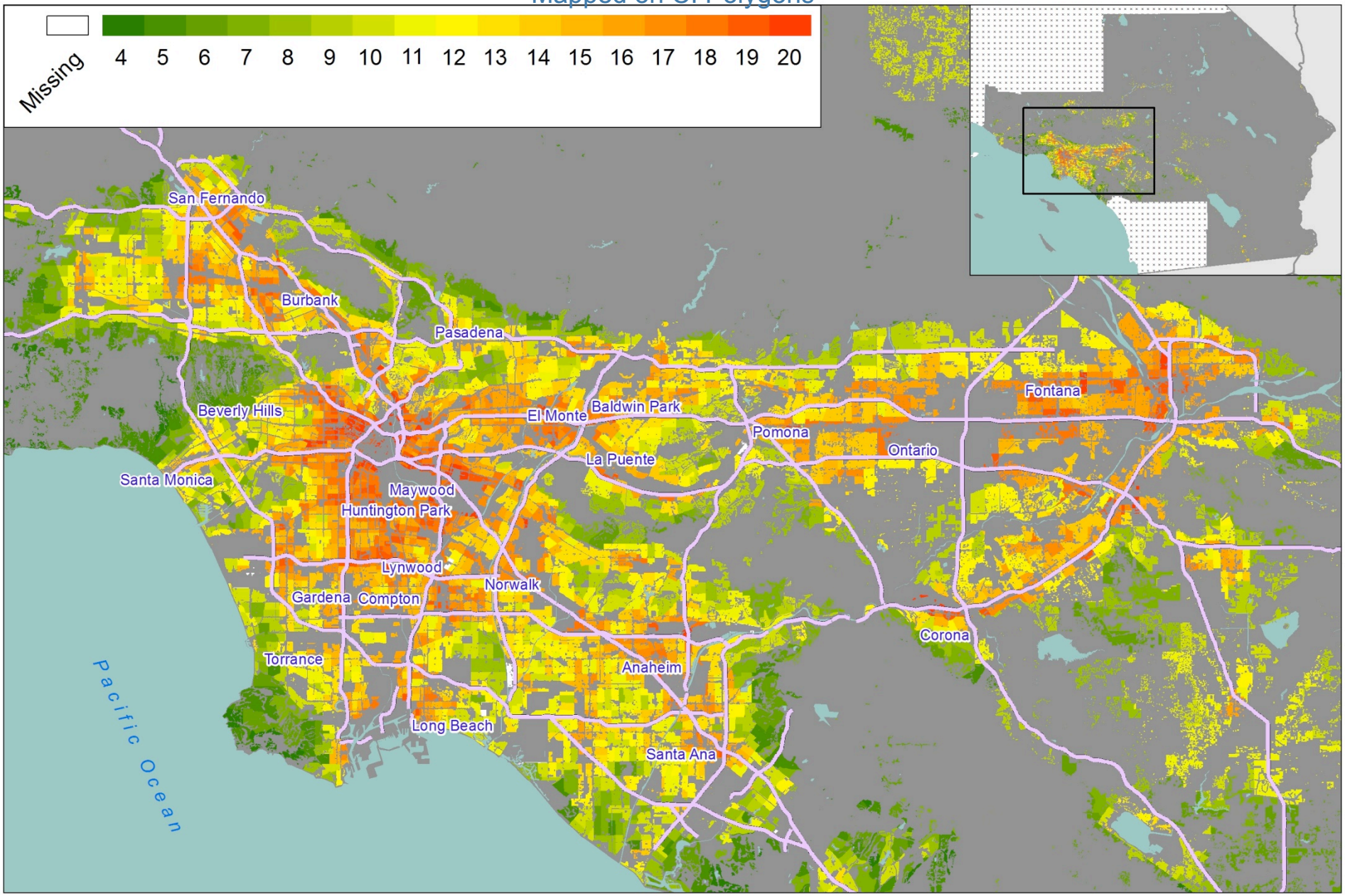
Social and Health Vulnerability Score (1-5) +

Climate Change Vulnerability Score (1-5)

- *Final Cumulative Impact Score Ranges from 4-20*

Figure 9e: Total Cumulative Impact (CI) Score
Southern California 6-County Area

Mapped on CI Polygons



Purpose of Climate Gap Screening

- Highlight areas of concern/opportunity in terms of:
  - Cumulative impacts from major emission sources
  - Community climate change adaptation capacity
  - Economic and social vulnerability

- Apply screening for:
  - Regulatory decision-making and enhanced enforcement of mitigation efforts
  - Community outreach and engagement for adaptation
  - Investment of community benefits resources
    - Incentivize reductions
    - Promote more green economic development

Thank you

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- Manuel Pastor, USC
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- Justin Scoggins, USC
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- Paul English, CA Dept Public Health
- California EJ Alliance
- Liberty Hill Foundation

Funders:

- California Air Resources Board
- California Energy Commission
- Cal-EPA
- The California Endowment
- Hewlett Foundation
- US EPA, Region 9

Minding the Climate Gap

What's at Stake if California's Climate Law isn't Done Right and Right Away

Report Available at: http://climategap.org