Protecting California Homes From Extreme Heat

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Our mission: Unite scholars with civic leaders to solve environmental challenges confronting California communities, the nation, and world.
1. Why focus on heat and its governance?
2. What can be done to protect people where they live?
Heat is a Leading Climate Hazard

More people die in the United States from heat than all other weather related disasters.

Mortality estimates are likely severely undercounted.
Heat is a Land Management Challenge

**URBAN HEAT ISLAND (UHI)**
Metro-regions are hotter in the late afternoon and evening temperatures caused by built materials and other anthropogenic heat sources.

**SURFACE MATERIALS**
Increasing the amount of high albedo surfaces and vegetation will reduce excess heat from impervious surfaces.

**LOCAL CLIMATE ZONES (LCZ)**
Neighborhood temperature varies depending on materials, spatial arrangement, and height of different urban and natural features.

**COMPREHENSIVE APPROACH**
Shifting to cooler LCZs requires increasing neighborhood vegetation and reconfiguring the built features to be more conducive to shade and airflow.

**HEAT STRESS**
The temperature people experience when design creates conditions of full sun exposure to bodies and hot surface materials with little air circulation.

**SHADE**
Protecting people from direct sun exposure and radiant heat from surfaces is the most effective way to cool the human body outdoors.

Figure 1: Local climate zone types (Stewart & Oke 2012).
Heat is a Climate Justice Issue

Redlined neighborhoods in U.S. cities are 2.6°C hotter on average and up to 7°C hotter than non-redlined neighborhoods.

*Land Surface Temperature

Hoffman et al. 2020 *Climate*
Heat Governance is in its Infancy

90% plans mention trees

30% plans mention equity

Three Distinct Siloes:
(1) Extreme Heat
(2) Urban Heat Island
(3) Disparity
Focus on New Ideas and Evaluation

Evaluate new strategies and that experiment with novel approaches to addressing heat.

<table>
<thead>
<tr>
<th>Category</th>
<th>Wind Speed (mph)</th>
<th>Damage at Landfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>74-95</td>
<td>Minimal</td>
</tr>
<tr>
<td>2</td>
<td>96-110</td>
<td>Extensive</td>
</tr>
<tr>
<td>3</td>
<td>111-129</td>
<td>Devastating</td>
</tr>
<tr>
<td>4</td>
<td>130-156</td>
<td>Catastrophic</td>
</tr>
<tr>
<td>5</td>
<td>157+</td>
<td>Catastrophic</td>
</tr>
</tbody>
</table>

Some suggest naming and ranking extreme heat events like Hurricanes could save lives.

(Peter Kuper/Extreme Heat Resilience Alliance)
Improving Heat Literacy

A form of energy transferred between systems, existing only in the process of transfer.

Heat, used as a noun, is confusing and controversial in its scientific meaning…in this glossary, heat is avoided as a noun or adjective except where required by established use.

-American Meteorological Society Glossary
What’s the temperature?

(Near) Land Surface Temperature – Estimate of the Earth’s skin temperature taken by satellites

Surface Temperature – Direct measurement of surface material temperature

(Ambient) Air Temperature – The temperature of the air that surrounds us

Mean Radiant Temperature – A composite indicator for the net thermal exchange between a ‘body’ and its surrounding environment
Multi-part research initiative on the impacts of extreme heat on vulnerable population groups and communities, as well as equitable strategies to reduce impact in key settings:

- **Workers** - accidents and injury rates
- **Pregnant mothers** - risk of early delivery
- **Low-income households** - energy use, bill costs, disconnection risk
- **Residents of subsidized and manufactured housing** - exposure to heat and wildfire risks
- **Healthy Places Index, Extreme Heat Edition** - spatial tool that can complement Climate Change & Health Vulnerability Indicators for California (CCHVIs)
- **California Heat Policy Gap Analysis** - review of existing regulations and funding opportunities
- **Local planning and urban design** - built environment interventions

Funded by the Strategic Growth Council (SGC) Climate Change Research Program.
Vulnerability based on Exposure and Sensitivity to Heat

**Exposure**

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Hours Spent per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent’s home or yard (or sleeping, grooming, someone else’s home)</td>
<td>17.51</td>
</tr>
<tr>
<td>Respondent’s workplace</td>
<td>3.05</td>
</tr>
<tr>
<td>Transportation</td>
<td>1.22</td>
</tr>
<tr>
<td>Restaurant; bar; grocery store; other store/mall</td>
<td>0.67</td>
</tr>
<tr>
<td>School</td>
<td>0.38</td>
</tr>
<tr>
<td>Outdoors away from home</td>
<td>0.2</td>
</tr>
<tr>
<td>Other place</td>
<td>0.64</td>
</tr>
</tbody>
</table>

**Sensitivity**

**Heat Sensitive Populations**
- Older adults
- Youth and infants
- Environmentally exposed workers
- Low-income households
- Incarcerated
- Inadequately or unhoused
- Pregnant mothers
- People with disabilities & pre-existing health conditions

Respondents: Ages 15+
## Settings where Heat Exposure Is Particularly Consequential

<table>
<thead>
<tr>
<th>Residential homes</th>
<th>Workplaces</th>
<th>Schools and Day Care Centers</th>
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<tr>
<td>Senior Living Facilities</td>
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</table>
Findings: Residential Setting

- Majority of time is spent in homes.
- Older adults, infants, and those with limited mobility are particularly at risk.
- No statewide requirement exists for maintaining indoor temperatures at sufficiently cool levels.
- Air conditioning is not considered a mandatory provision from landlords to tenants (unlike heating).
- CalGreenCode measures related to heat reduction (cool roof, shade) are voluntary, not mandatory. They also only apply to new construction or additions/expansions.
Summary of Recommendations

- Update habitability standards and residential building codes for a hotter future
- Bolster funding for the installation and use of home cooling strategies
- Address policy and programming gaps to protect the most heat-vulnerable populations
Figure 1. Overview of State Law Affecting Residential Cooling Requirements

State Legislature

- CA Civil Code
  - Section 1941.1: Implied Warranty of Habitability
  - Courts System

- CA Health and Safety Code
  - Division 13, Part 1.5: State Housing Law
    - Section 17920.3: Substandard Conditions
    - Section 18941.11: Implementation
    - Building Code: Title 24 (New and Remodeled)
    - Code of Regulations: Title 25 (Existing)

- State Housing Law Program

Legend:
- Statutory Law
- Regulatory agency (Housing and Community Development)
- Building codes
- Courts system
1.0 Update habitability standards and residential building codes for a hotter future

- California Civil Code requires rental units to have heating facilities “maintained in good working order”
- California Health and Safety Code deems rental units that lack adequate heating facilities to be substandard housing
- Missing from these definitions of uninhabitable and substandard is a lack of cooling facilities to prevent homes from becoming too hot
1.0 Update habitability standards and residential building codes for a hotter future

- Title 24 of the *California Building Standards Code* mandates that new and remodeled residential buildings be equipped with active or passive heating strategies capable of maintaining minimum interior temperatures of 68 degrees Fahrenheit.

- Title 25 mandates that existing rental units be capable of maintaining a minimum indoor temperature of 70 degrees Fahrenheit.

- But no parallel requirement exists for maximum indoor temperatures in any homes.
1.1 Update the definition of “habitability” to require active and/or passive cooling in rental units

- Amend Title 25 of the **California Code of Regulations** to require landlords provide cooling installations to protect tenants (AB 2597 Bloom)

- **California’s Extreme Heat Action Plan** recommends exploring “feasibility of residential air requirements”

- Learn from municipal programs, see: Palm Springs, California, Phoenix, Arizona, and Clark County, Nevada

- Draw from California’s model for licensed **Residential Care Facilities for the Elderly (RCFEs)** to maintain temperatures at *no higher than 85°F indoors*. In areas of extreme heat, the state requires elder care facilities to maintain indoor temperatures *at least 30°F below outdoor temperatures*
1.2 Update building codes to set maximum temperature limits for new and remodeled housing, and existing rental housing

- Revising Title 24 of the California Building Standards Code to create an indoor temperature limit for new and remodeled homes

- This limit should be based on public health criteria and account for the interaction between heat and humidity

- The state can also encourage and support local municipalities to set their own maximum temperature requirements

- Once a statewide temperature limit is set, any local regulations should need to meet or exceed state codes.
2.0 Bolster funding for the installation and use of home cooling strategies

- Home retrofit programs, including the Low-Income Weatherization Program (LIWP), could be expanded to include more options for cooling.

- LIWP currently provides funding for low-income households to replace their old air conditioners with more energy-efficient options, but not to install air conditioners in homes that do not already have one.

- In fact, there is no state program that provides new, non-replacement air conditioners or energy-efficient heat pumps to vulnerable households at no cost.
2.1 Robustly fund programs to retrofit homes against heat

- Across dwelling types: single family homes, multi-family dwellings and mobile homes

- Expand existing weatherization and energy efficiency home retrofit programs to explicitly include cooling strategies, such as cool roofs, solar reflective walls, shade structures, and — perhaps most importantly — heat pumps (an energy-efficient air conditioner)

- Establish a new home retrofit program explicitly designed to subsidize cooling installations in low income and heat-vulnerable households
2.2 Help Californians afford to use cooling strategies at home

- Revise electricity rate structures to better help low income ratepayers afford to use air conditioners and heat pumps
- Increase funding for and expand access to energy rate assistance programs, such as California Alternate Rates for Energy
- Increase funding for and expand access to utility debt relief programs for low-income households
2.3 Focus on program access for frontline residents

- Recruit and fund community organizations to conduct targeted outreach to heat vulnerable populations, with a focus on culturally responsive, multilingual and direct enrollment support.

- When relevant, designing and updating application platforms to streamline eligibility verification and enrollment for statewide home retrofit and energy assistance programs.

- Proven outreach models could be replicated and scaled, including the emPOWER program in Los Angeles County and the Valley Clean Air Now program in the San Joaquin Valley.
3.0 Address policy and programming gaps to protect the most heat vulnerable residents

- Without reliable shelter conditions, unhoused residents are exposed to dangerously hot conditions, among other outdoor climate hazards.

- Residents of manufactured and mobile homes, who tend to be older and lower-income, are particularly vulnerable to extreme indoor heat due their disproportionate concentration in high-heat zones and lack of insulation and cooling.

- Farmworkers residing in labor camps are exposed to outdoor heat during the day and often return to homes that lack adequate cooling at night.
Closing Gaps Example: Mobile Homes in ECV Too Hot by Palm Springs Law

Peak Outdoor Temperature 44°C

Palm Springs Threshold 27°C

Funded by the Strategic Growth Council (SGC) Climate Change Research Program.
3.1 Research and develop interventions for vulnerable housing types

- Assess how heat affects residents living in under regulated housing types, such as mobile homes and farmworker housing.

- To prevent the most vulnerable from falling through the cracks, greater care and attention to the needs of these frontline communities will be important as the state implements and updates the Extreme Heat Action Plan.
3.2 Expand community resilience centers to protect unhoused residents and other community members

- 2021-2022 State Climate Budget package → $100 million over 2 years to the Strategic Growth Council has received $100 to launch a new Community Resilience Centers (CRCs) Program
  - Facility choice should be community-driven
  - Joint effort between neighborhood residents, community-based organizations and/or local governments, ensure community members are involved in the decision-making
  - Invest in evaluation, learn from early pilots, identify best practices, and opportunities for effective scaling
In conclusion, a public health and equity-focused approach to heat management in California would protect all residents with heat-resilient housing and access to community resources.
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Residential homes
Workplaces
Schools and Day Care Centers
Residential homes
Public Transit Stops
Public Transit Stops
For more info, see:

Innovation.luskin.ucla.edu

Protecting Californians with Heat Resilient Homes: Guidance for an Equitable and Effective State Strategy

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