

Equity-Focused Heat Adaptation Strategies for Los Angeles County

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DISCLAIMER

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EXECUTIVE SUMMARY

LOS ANGELES COUNTY will face significant harms due to climate change. One of the area's most consequential will be extreme heat, where Angelenos throughout the County will face different damages as the climate changes and temperatures continue to warm. County departments have historically provided Cooling Center services to ensure residents find respite on days that exceed high-heat thresholds, though residents do not widely use these services. In this context, the Los Angeles County Office of Emergency Management is interested in understanding what alternatives to Cooling Centers exist to best serve communities most impacted by extreme heat.

This research leverages existing literature on alternatives to Cooling Centers, spatial analysis, and expert interviews to inform which alternatives would best serve the County's residents most impacted by extreme heat. Given heat adaptation's complexity, it is difficult to compare interventions that have dissimilar aims and impact heat adaptation at different timescales. Thus, this report highlights the need for policies that address different aspects of adaptation planning to address extreme heat in a holistic manner.

Through literature review and expert interviews, this report determined four primary barriers in existing heat planning: Communications & Information, Planning Infrastructure, Social Capacity, and Utility-Based Support, collectively deemed Policy Classification Areas. Policy implementation can be strengthened in each of these four areas to address existing gaps. In addition to these four key policy areas, this report

recommends implementing policies at three timescales: immediate, short, and medium-term. Immediate-term solutions are those that can be implemented in the upcoming heat season. Short and medium-term solutions align with the Countywide Sustainability Plan timeline and reflect policies which can be implemented by 2025 and 2035, respectively.

This report analyzed 26 policies based on these four main Policy Classification Areas and on their timeline for effectuating change. Policies were analyzed based on their alignment with the Los Angeles Countywide Sustainability Plan, Feasibility, and Efficacy. Based on these considerations, the research recommends seven primary policies. In Communications & Information, this report recommends Emergency Alerts. In Planning Infrastructure, this report recommends Shade Hubs, Urban Greening, and Water Features. In Social Capacity, this report recommends Resilience Hubs and Be a Buddy programs. Finally, in Utility-Based Support, this report recommends A/C Rebates and Funding. The policymaker may select which of these primary recommendations to implement based on issue area and timeline for implementation. This report proposes this flexible structure to offer versatility to policymakers and address the numerous variables needed to tackle the complicated issue of extreme heat. In addition, the research also posits ways for Los Angeles County to consider evaluation and metrics that better align with existing funding streams and outlines the benefits the County could enjoy in forming an Extreme Heat Working Group.

KEY TERMS & ACRONYMS

Some of the report’s key definitions and acronyms are listed below:

TERM	DEFINITION
AHSC	Affordable Housing and Sustainable Communities: a program that the State of California runs that provides residents with grants or loans to support affordable housing to lower GHG emissions, prioritize serving designated disadvantaged communities (DACs), and improve transportation.
BaB	Be a Buddy: program that ensures hard-to-reach individuals are connected to others during extreme heat emergencies and, at a larger scale, improves community cohesion.
BRACE	Building Resilience Against Climate Effects: program that supports public health departments in organizing, deploying, and assessing climate resilience programs.
BRIC	Building Resilient Infrastructure and Communities: Federal Emergency Management Agency (FEMA) program that supports communities in disaster mitigation planning.
CARE	California Alternate Rates for Energy: 30-35% electric bill discount and 20% natural gas discount on utility bills for customers who meet the state-defined thresholds for being considered low-income. ¹
CalBRACE	California Building Resilience Against Climate Effects: CDC-funded project supporting local health departments in California to mitigate climate change health risks.
CBO	Community-Based Organization: groups that work directly with localities to better understand and provide assistance for their needs.
CCA	Community Choice Aggregation: programs that enable local governments to procure power for residents and business within a given service territory.
CCRP	Climate Change Research Program: program of the California Strategic Growth Council (SGC) that seeks to advance statewide climate goals by investing in applied, community-driven research. Funding comes from the California Climate Investments Program.
CDC	Centers for Disease Control and Prevention: federal government’s national public health agency that manages health-based information, outreach, and programming.
CCHVIs	Climate Change & Health Vulnerability Indicators: developed by the California Building Resilience Against Climate Effects (CalBRACE) program to better understand who is most impacted by extreme heat.
DSW	Disaster Service Worker: public employees who aid residents during emergencies, and importantly, staff Cooling Centers.
FEMA	Federal Emergency Management Agency: federal department organizing preparation for and response to disasters and distributes resources for emergency management purposes.

Continues next page.

¹ “CARE/FERA Programs,” California Public Utilities Commission, accessed April 2021, <https://www.cpuc.ca.gov/lowincomes/>

TERM	DEFINITION
FERA	Family Electric Rate Assistance Program: utility payment program offered to households who do not meet CARE qualifications and provides an 18% discount on electricity bills. ²
GGRF	Greenhouse Gas Reduction Fund: statewide fund that supports measures to reduce greenhouse gas emissions (GHG) across the state.
ICARP	Integrated Climate Adaptation and Resilience Program: program within California’s Office of Planning and Research (OPR) charged with establishing the state’s overarching strategy for responding to climate change.
LIHEAP	Low Income Energy Assistance for Bills and Associated Costs Program: federally funded utility-assistance program aimed at alleviating energy costs for low-income households.
NMTC	New Markets Tax Credit: tax credits to private companies to incentivize them to invest in underserved communities.
NIH	National Institutes of Health: federal agency that conducts public health-related research.
NSF	National Science Foundation: federal agency that supports and funds research in fields such as education, science, and engineering.
NWS	National Weather Service: national government agency that provides weather, hydrologic, and climate forecasts.
PSPS	Public Safety Power Shutoff: when utilities cut power to reduce the risk of electric infrastructure causing a wildfire, thus leaving residents without power during especially precarious times.
SCE	Southern California Edison: the investor-owned utility (IOU) that serves as the primary electric provider for Southern California.
SGC	Strategic Growth Council: operates within the California Governor’s cabinet to coordinate equity, resilience, public health, economic development, and community building, among other goals, across state agencies.
TCC	Transformative Climate Communities: equity-focused climate program overseen by the SGC that provides technical assistance and promotes CBO engagement with underserved communities.
UHI	Urban Heat Island: the phenomenon where urban cores have a higher ambient temperature than nearby rural localities.
USDN	Urban Sustainability Directors Network: a national peer-to-peer network composed of regional and municipal government representatives that pioneered Resilience Hub development and implementation.
WAP	Weatherization Assistance Program: targets low-income communities through infrastructure upgrades that improve energy efficiency.

² Ibid.

INTRODUCTION

Policy Setting

Los Angeles County (LAC) faces multi-faceted threats from climate change, especially rising temperatures and increasing frequency of extreme heat events. These changes to ambient temperatures are especially deleterious for County residents most susceptible to extreme heat. The County's departments are then tasked with providing residents the mechanisms to not only endure but develop resilience to extreme weather events.³

Extreme heat already adversely harms LAC in many ways and will increasingly impact Angelenos as temperatures rise.^{4,5} By mid-century, Los Angeles will have an average temperature that is three to five degrees Fahrenheit higher than current average temperatures with a corresponding five to six-fold increase in extreme heat days.⁶ Aside from intensifying and more frequent heat waves, extreme heat will contribute to more damaging and deadly wildfires and potentially more frequent public safety power shutoff (PSPS) events. PSPS events occur when the state's investor owned utilities (IOUs)

proactively cut electric power to customers in locations where energized infrastructure could potentially start a wildfire, thus leaving residents without power during especially precarious times.⁷ High heat events correlated with wildfire conditions may require utilities to increasingly resort to PSPS events or, at the state level, the state's independent system operator (CAISO) may necessitate rolling blackouts to protect from more significant grid failure. In both instances, the elderly and residents with pre-existing health conditions face more risks of heat-related illness or death.⁸ High heat, changing weather patterns, and other factors also contribute to an increased likelihood of deadly wildfires, and California is already suffering the effects, with 2020 being the worst fire season on record in terms of acres burned.⁹ Exacerbating these rising temperatures is the urban heat island (UHI) effect, wherein urban areas are typically warmer than nearby rural areas due to the prevalence of built infrastructure that absorbs and emits heat coupled with limited greenspace.¹⁰ Further, marginalized and historically redlined communities are generally hotter than affluent and historically privileged communities.^{11, 12}

³ Los Angeles County Department of Public Health, "Extreme Heat and Climate Change," Extreme Heat and Climate Change, Los Angeles County Department of Public Health - Environmental Health, accessed January 2021, <http://publichealth.lacounty.gov/eh/climatechange/ExtremeHeatClimateChange.htm#:~:text=Scientists%20predict%20that%20climate%20change,even%20more%20extremely%20hot%20weather>.

⁴ Cowan, Tim, Sabine Undorf, Gabriele C. Hegerl, Luke J. Harrington, and Friederike EL Otto. "Present-day greenhouse gases could cause more frequent and longer Dust Bowl heatwaves." *Nature Climate Change* 10, no. 6 (2020): 505-510.

⁵ "Climate Change and Extreme Heat Events." (n.d.). Centers for Disease Control and Prevention. Retrieved from <https://www.cdc.gov/climateandhealth/pubs/climatechangeandextremeheatevents.pdf>

⁶ Stephanie Pincetl et al., "Climate Change in Los Angeles County: Grid Vulnerability to Extreme Heat," August 2018, <https://www.ioes.ucla.edu/project/climate-change-in-los-angeles-county-grid-vulnerability-to-extreme-heat/>.

⁷ "Public Safety Power Shutoff (PSPS) / De-Energization," Public Safety Power Shutoff (PSPS) / De-Energization, 2020, <https://www.cpuc.ca.gov/psps/>.

⁸ "Heat-Related Health Dangers for Older Adults Soar during the Summer," June 27, 2018, <https://www.nih.gov/news-events/news-releases/heat-related-health-dangers-older-adults-soar-during-summer>.

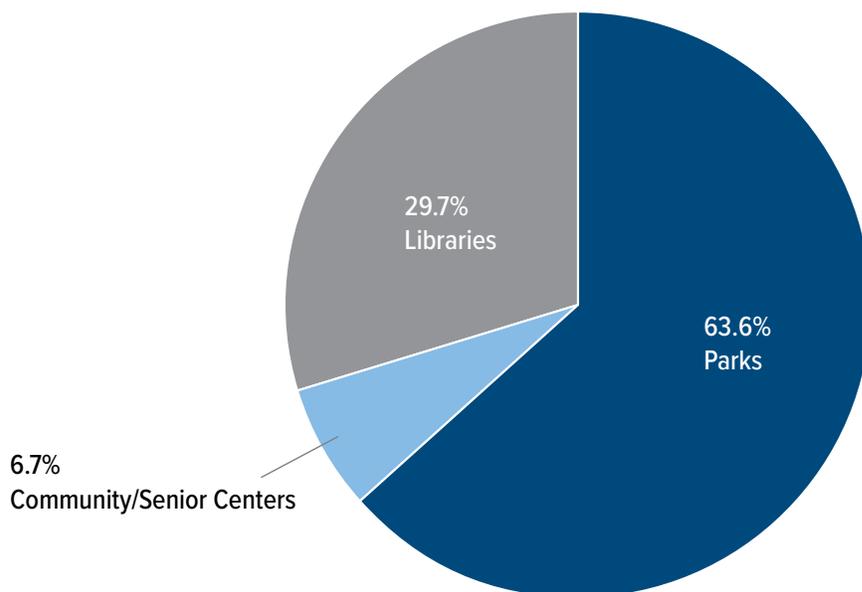
⁹ Priya Krishnakumar and Swetha Kannan. "The worst fire season ever. Again." *The LA Times*, 2020. Retrieved from <https://www.latimes.com/projects/california-fires-damage-climate-change-analysis/>

¹⁰ "Heat Island Effect," US Environmental Protection Agency retrieved April 2021, <https://www.epa.gov/heatislands>

¹¹ C. J. Gabbe and Gregory Pierce, "Extreme Heat Vulnerability of Subsidized Housing Residents in California," *Housing Policy Debate* 30, no. 5 (2020): pp. 843-860, <https://doi.org/10.1080/10511482.2020.1768574>.

¹² Hoffman, Jeremy S., Vivek Shandas, and Nicholas Pendleton. "The effects of historical housing policies on resident exposure to intra-urban heat: A study of 108 US urban areas." *Climate* 8, no. 1 (2020): 12.

FIGURE 1: Breakdown of Most Commonly Utilized Cooling Location Types as a Percentage of Total 2020 Cooling Center Population



In response to these changing conditions, LAC operates Cooling Centers, defined as air-conditioned locations that are free and open to the public to ensure that residents keep cool during extreme heat conditions.¹³ LAC utilizes public buildings such as libraries and recreation centers for these services. For a breakdown of spaces commonly visited as Cooling Centers, see **Figure 1**. LAC activates Cooling Centers when high heat persists, typically when temperatures are at or above 95°F for two or more successive days within the Los Angeles basin and at or above 104°F in inland parts of the County.¹⁴

Problem Identification

Cooling Centers aim to keep residents cool during extreme heat events, but they face numerous difficulties. The Centers offer instant benefits for

those with health conditions, limited access to in-home cooling services, or both. However, LAC faces immediate concerns operating Cooling Centers during the ongoing COVID-19 pandemic and long-term concerns related to the capacity of these services. In the immediate-term, COVID-19 makes these Centers more laborious to operate. Difficulties arise in ensuring the Centers comply with LAC’s “Safer at Home” requirements, as well as additional safety measures, including physical distancing and sanitation needs, which all necessitate increased staff time and cleaning and disinfection inputs.^{15,16} Second, Cooling Centers are costly to operate. Disaster service workers (DSWs), which are County employees, operate these facilities.¹⁷ The County department that owns the respective Cooling facility funds all Cooling Center operations, such as utility costs and DSW

¹³ “Extreme Heat,” Ready LA County, November 10, 2020, <https://ready.lacounty.gov/heat/>.

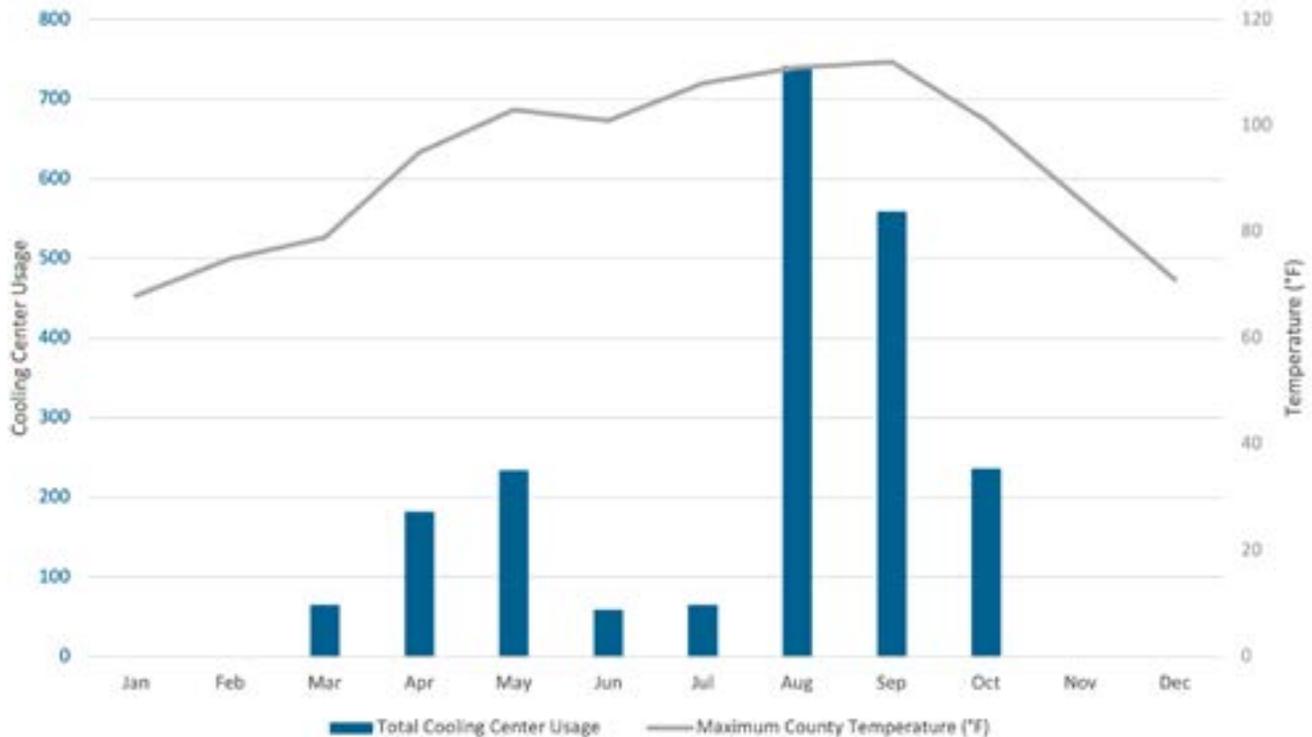
¹⁴ Ibid.

¹⁵ Emily Montanez (Senior Program Manager at the Los Angeles County Office of Emergency Management), in discussion with authors, November 18, 2020

¹⁶ Ramon Bernal (Senior Recreation Director II, Los Angeles County Department of Parks and Recreation), in discussion with authors, February 10, 2020.

¹⁷ Emily Montanez, in discussion with authors, November 18, 2020.

FIGURE 2: Total Los Angeles County Cooling Center Usage in 2020



salary, including overtime and expenses related to extended hours of operation.^{18,19} Departments run with limited funding during normal times and, thus, Cooling Centers place an undue burden on their already constrained resources. This burden will only increase as extreme heat events intensify. Third, and finally, residents do not widely use Cooling Centers, with total usage during the 2020 heat season only reaching 2,058 Angelenos, and these numbers are similar in non-COVID times. Even during record-shattering temperatures in September 2020, which resulted in at least three immediate heat-related deaths, Cooling Centers

remained largely empty.²⁰ This underutilization could be due to several reasons including, acclimatizing towards high heat, inaccessibility of Centers, unwillingness to leave homes or pets, or marginalized residents’ limited trust in government spaces.^{21,22,23,24}

Figure 2 shows the maximum monthly temperature and cumulatively monthly Cooling Center usage in 2020.

Therefore, keeping Angelenos cool during emergencies, especially as temperatures continue to increase, presents a unique challenge.

¹⁸ Ramon Bernal, in discussion with authors, February 10, 2020.

¹⁹ Emily Montanez, in discussion with conversation with authors, November 18, 2020.

²⁰ “L.A. Suffered Deadly Heat, Yet Chairs Sat Empty at Its Cooling Centers,” September 19, 2020. <https://www.latimes.com/california/story/2020-09-19/la-deadly-heat-empty-cooling-centers>.

²¹ Gary Singer, MEP (Emergency Management Coordinator, City of Los Angeles Emergency Management Department), in discussion with authors, February 19, 2021.

²² Ellie Wolfe and Billy Yeung (Program Manager and Administrative Services Manager II, Los Angeles County (LAC) Department of Workforce Development, Aging and Community Services (WDACS)), in discussion with authors, February 9, 2021.

²³ Aaron Gross and Craig Tranby (Chief Resilience Officer, City of Los Angeles, based out of the office of Mayor Eric Garcetti and Environmental Affairs Officer, Los Angeles Department of Water and Power (LADWP)), in discussion with authors, February 17, 2021.

²⁴ Kristin Baja, CFM (Climate Resilience Officer, Urban Sustainability Directors Network (USDN)), in discussion with authors, February 2, 2021.

Accordingly, LAC’s Board of Supervisors, spearheaded by Supervisor Hilda L. Solis, initiated a Motion to create a Heat Emergency Response Plan for the County.²⁵ This Motion comes just after the County published the OurCounty Los Angeles Countywide Sustainability Plan, which includes 12 goals for the County to address in resilience, infrastructure, equity, sustainability, and inclusion.²⁶

Broadly, in the realm of heat, the County is interested in understanding what alternatives to Cooling Centers can keep Angelenos cool and is specifically interested in equipping those at greatest risk for heat-related impacts with services.²⁷ The topic of at-risk populations is complex and will be further discussed in the “Background” section.

Policy Question

To help LAC’s Office of Emergency Management (OEM) meet the requirement of Supervisor Solis’ motion, while also considering the complexity of heat adaptation, County sustainability goals, and existing inequities, this report aims to answer the following policy question:

What combination of immediate-, short-, and medium-term strategies should Los Angeles County’s Office of Emergency Management and affiliated partners adopt in unincorporated Los Angeles County to best equip key groups to remain resilient to heat exposure?

²⁵ CORONAVIRUS (COVID-19) – CREATING A HEAT EMERGENCY RESPONSE PLAN FOR LOS ANGELES COUNTY (ITEM NO. 23, AGENDA OF AUGUST 4, 2020). County of Los Angeles Chief Executive Office. (September 30, 2020)

²⁶ “Our County: Los Angeles Countywide Sustainability Plan,” (LA County Chief Sustainability Office), accessed March 2021, <https://ourcountyla.lacounty.gov/plan>.

²⁷ CORONAVIRUS (COVID-19) – CREATING A HEAT EMERGENCY RESPONSE PLAN FOR LOS ANGELES COUNTY (ITEM NO. 23, AGENDA OF AUGUST 4, 2020). County of Los Angeles Chief Executive Office. (September 30, 2020)

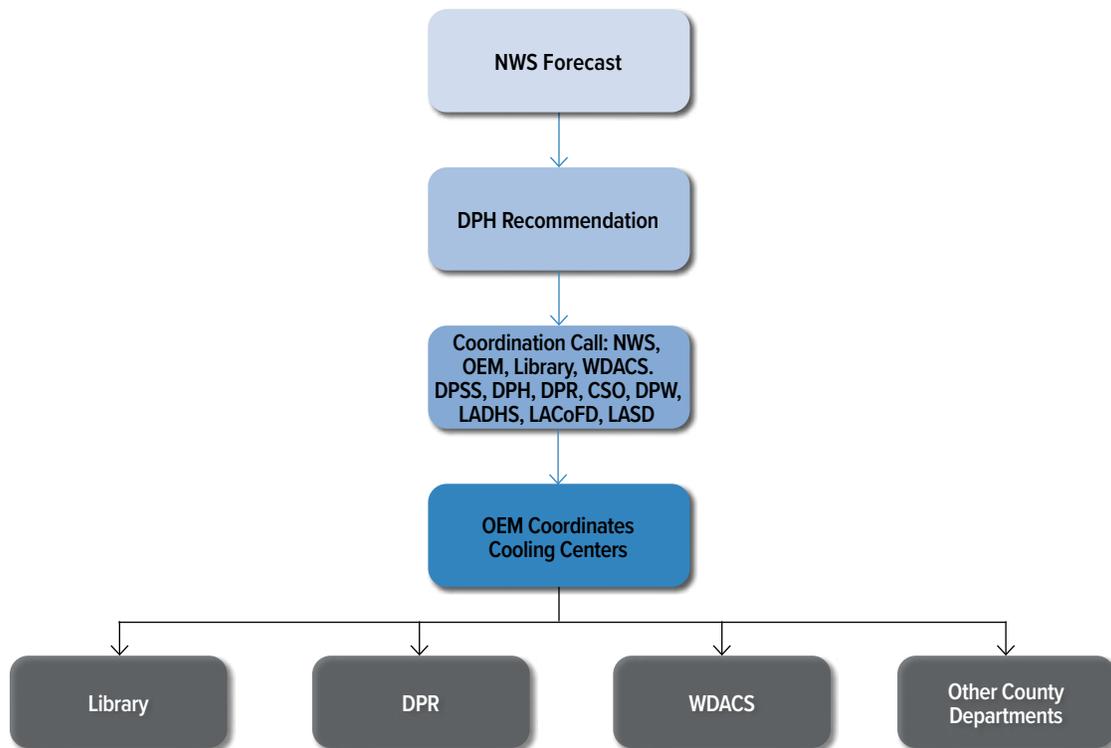
BACKGROUND

Los Angeles County Office of Emergency Management (OEM)

OEM is dedicated to leading comprehensive planning, response, and recovery from emergencies and disasters.²⁸ These emergencies include extreme heat, where OEM works with sister agencies to operate Cooling Centers. Los Angeles’s heat mitigation programs require high levels of coordination because it is the nation’s most populous and diverse County. Specifically, for Cooling Centers, the County requires coordination among the following stakeholders (See **Figure 3**):²⁹

- » Los Angeles County Office of Emergency Management (OEM)
- » Los Angeles County Library
- » Workforce Development, Aging, and Community Services (WDACS)
- » Department of Public Social Services (DPSS)
- » Department of Public Health (DPH)
- » Department of Parks and Recreation (DPR)
- » Los Angeles County Chief Sustainability Office (CSO)
- » National Weather Service (NWS)
- » Department of Public Works (DPW)
- » Los Angeles County Department of Health Services (LADHS)
- » Los Angeles County Fire Department (LACoFD)
- » Los Angeles County Sheriff’s Department (LASD)

FIGURE 3: County-Level High-Heat Coordination



²⁸ “Emergency Management,” Los Angeles County (Chief Executive Office, County of Los Angeles, December 1, 2020), <https://ceo.lacounty.gov/emergency-management/>

²⁹ Emily Montanez, discussion with authors, February 18, 2021

Policy Context

This section establishes the report's working definition of key groups and provides an overview of extreme heat planning and funding across various sectors.

Defining Key Groups³⁰

There are harmful connotations in classifying groups as “vulnerable.” This categorization minimizes agency and perpetuates harmful stereotypes, thus reducing entire subpopulations solely based on the effects of prolonged, systemic oppression. Moreover, identifying people as vulnerable can abstract the causes of these vulnerabilities, including, but not limited to, redlining.³¹ This report recognizes the problematic nature of this classification and understands that groups defined as “vulnerable” are not and should not be limited to the effect oppressive systems have wrought upon their quality of life, agency, livelihoods, representation, and visibility within society. Instead, this report uses vulnerable groups simply to identify the existing inequities that are pervasive in the County and uses the term in recognition of this broader context that renders people vulnerable. For these reasons, this report avoids labeling groups as “vulnerable” and will instead refer to groups at higher risk of heat exposure or illness as “key groups.”

Given the County's focus on developing programs to serve key groups, establishing a standardized

definition is crucial. LAC utilizes the Climate Change and Health Vulnerability Indicators (CCHVIs) developed by the California Building Resilience Against Climate Effects (CalBRACE) program in order to understand who is most affected by extreme heat.³² To align with the County's definition, this report also utilizes CCHVIs as criterion for key groups. The indicators contain a population sensitivity domain, indicating the physiological and socio-economic factors that exacerbate heat harms on individuals.³³ Those factors include age, income, education, race and ethnicity, vehicle ownership, linguistic challenges, physical and mental health histories, etc.³⁴ Second, the adaptive capacity domain defines factors that affect a broad range of the population's resilience capabilities, including Air Conditioning (A/C), tree and greenery coverage, nonporous surfaces, and access to mass transit options.³⁵ Please see a detailed definition of each factor in Appendix I.

Federal Considerations and Funding

President Biden highlighted addressing climate change as a central focus of his campaign platform and underscored its importance by rejoining the Paris Climate Agreement during his first week in office. President Biden's climate approach centers around creating green jobs, engaging all levels and sectors of government, and pushing environmental justice and community empowerment to the forefront.^{36,37} His early days in office suggest President Biden will invest in resilient infrastructure (i.e., water, energy, and the

³⁰ We want to acknowledge Kristin Baja, CFM for directing us to rethink the way we classify groups most impacted by extreme heat within this report.

³¹ Kristin Baja, CFM, in discussion with authors, February 2, 2021.

³² “CDPH Climate Change and Health Vulnerability Indicators,” accessed March 2021, <https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx>.

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid.

³⁶ “Fact Sheet: President Biden Takes Executive Actions to Tackle the Climate Crisis at Home and Abroad, Create Jobs, and Restore Scientific Integrity Across Federal Government,” The White House (The United States Government, January 27, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/>.

³⁷ “Biden Administration Rapidly Advances Climate Change Agenda,” The National Law Review, accessed March 12, 2021, <https://www.nat-lawreview.com/article/biden-administration-rapidly-advances-climate-change-agenda>.

built environment) during his tenure.³⁸ Therefore, federal funding could focus on projects that update and modify existing infrastructure.

Aside from the President's climate aspirations, federal guidance and funding streams already exist for heat adaptation by means of the Federal Emergency Management Agency (FEMA), the Centers for Disease Control and Prevention (CDC), the US Department of Health and Human Services (HHS), the US Department of Energy (DOE), and the US Environmental Protection Agency (EPA). Sometimes, competitive grant programs get written into bills, then states and localities across the country apply for those opportunities.³⁹ FEMA offers Building Resilient Infrastructure and Communities (BRIC) funding for mitigating disasters before they strike through improved community capacity building, innovation, infrastructure, and partnerships.^{40,41} FEMA also funds installation of generators at certain "critical facilities," which may include fire departments, hospitals, and water treatment plants.⁴² Further, the CDC offers two key funding programs: Building Resilience Against Climate Effects (BRACE) and the Environmental Public Health Tracking Grant. BRACE supports

regional public health departments in organizing, deploying, and assessing climate resilience programs (California receives these federal funds via CalBRACE).^{43,44} The latter program improves information and data channels for environmental health issues.⁴⁵ Notably, Arizona used CDC funds to conduct a survey of their existing Cooling Center effectiveness and to direct extreme heat surveillance.⁴⁶ Both the HHS and the DOE offer programs that improve thermal comfort of low-income households. HHS funds the Low Income Energy Assistance for Bills and Associated Costs (LIHEAP) program, and the DOE funds the Weatherization Assistance Program (WAP); both programs target disadvantaged communities through utility bill assistance and improved home infrastructure.^{47,48} Finally, the EPA offers webinars, information materials, and technical support to state and local governments with the Heat Island Reduction Program.⁴⁹

In the research realm, both the National Science Foundation (NSF) and the National Institutes of Health (NIH) offer grants for various research projects related to environment, climate, education, and health outcomes.^{50,51}

³⁸ "Plan for Climate Change and Environmental Justice: Joe Biden," Joe Biden for President: Official Campaign Website, October 29, 2020, <https://joebiden.com/climate-plan/>.

³⁹ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

⁴⁰ "Building Resilient Infrastructure and Communities (BRIC)," Building Resilient Infrastructure and Communities (BRIC) | FEMA.gov, accessed March 2021, <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>

⁴¹ "Building Resilient Infrastructure and Communities (BRIC) Grant Program," Building Resilient Infrastructure and Communities (BRIC) grant program § (n.d.), p. 1.

⁴² "Eligibility of Generators as a Fundable Project by the Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program," Eligibility of Generators as a Fundable Project by the Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program § (n.d.), pp. 1-7.

⁴³ "Climate and Health - CDC's Building Resilience Against Climate Effects (BRACE) Framework," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, September 9, 2019), <https://www.cdc.gov/climateandhealth/brace.htm>.

⁴⁴ "CalBRACE," CalBRACE, accessed March 2021, <https://www.cdph.ca.gov/Programs/OHE/Pages/CalBRACE.aspx>.

⁴⁵ "CDC Tracking Fellowships," Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, February 2, 2018), <https://www.cdc.gov/nceh/tracking/trackingfellows.htm>.

⁴⁶ Matthew Roach (Epidemiology Program Manager, Arizona Department of Health Services), in discussion with authors, February 1, 2021.

⁴⁷ "Low Income Home Energy Assistance Program (LIHEAP)," The Administration for Children and Families, November 1, 2019, <https://www.acf.hhs.gov/ocs/low-income-home-energy-assistance-program-liheap>.

⁴⁸ "About the Weatherization Assistance Program," Energy.gov, 2020, <https://www.energy.gov/eere/wap/about-weatherization-assistance-program>.

⁴⁹ Victoria Ludwig, MEM (National Program Manager, Heat Island Reduction Program, United States Environmental Protection Agency (EPA)), in discussion with authors, March 15, 2021.

⁵⁰ "Funding," US NSF - About Funding (National Science Foundation), accessed March 2021, <https://www.nsf.gov/funding/aboutfunding.jsp>.

⁵¹ "Types of Grant Programs," National Institutes of Health (U.S. Department of Health and Human Services), accessed March 2021, https://grants.nih.gov/grants/funding/funding_program.htm.

State Considerations and Funding

At the state-level, legislative and coordination efforts exist for heat-related programs. In Sacramento, there are often efforts to write competitive grants opportunities for cities into legislation.⁵² The Land Use Planning Bill (SB-379) requires the state's municipalities and counties to incorporate climate adaptation groundwork into the safety element of their general plans, including: vulnerability assessments, developing resilience goals, and implementing feasible measures.⁵³ There are also statewide climate adaptation coordinating efforts, such as the Integrated Climate Adaptation and Resilience Program (ICARP) within the Office of Planning and Research (OPR), which serves as a coordination hub for climate resilience.⁵⁴ ICARP is composed of a Technical Advisory Committee that meets quarterly, bringing together state and county governments and nonprofits, and a Climate Adaptation Clearinghouse that serves as a repository of all state-level adaptation work.⁵⁵

Bonds also serve as a source of heat adaptation funding. Proposition 68: Parks and Water Bond Act of 2018 was a \$4 billion bond measure designed to safeguard natural resources and parks through climate resilience and social equity.⁵⁶ The measure also requires that the State allocate 15-20% of

all bond funds toward projects in lower income communities.⁵⁷

Cap-and-Trade (CAT) funds further support heat programs, wherein the State obtains capital by charging private businesses for their excess carbon emissions. These programs promote accountability for California's largest polluters, and also finance the California Greenhouse Gas Reduction Fund (GGRF), which furthers measures that reduce GHGs.⁵⁸ This fund was established in AB 32: California Global Warming Solutions Act, 2006.⁵⁹ These CAT funds provide monetary support for two key statewide programs: The Affordable Housing and Sustainable Communities Program (AHSC) and The Transformative Climate Communities (TCC) Program. The Strategic Growth Council (SGC) administers the AHSC, and the California Department of Housing and Community Development (DHCD) manages operations. The AHSC allocates 50% of funds for affordable housing development and 50% for disadvantaged community (DAC) assistance projects.⁶⁰ The SGC oversees TCC and equips underserved communities by streamlining the grant application process and requiring partnerships with community-based organizations (CBOs), who provide the technical assistance to ensure all plans are community-owned.^{61,62} Leading advocacy

⁵² Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

⁵³ "SB 379 Fact Sheet: Climate Adaptation and Resiliency Strategies." SB 379 Fact Sheet: Climate Adaptation and Resiliency Strategies | Adaptation Clearinghouse. Accessed March 20, 2021. <https://www.adaptationclearinghouse.org/resources/sb-379-fact-sheet-climate-adaptation-and-resiliency-strategies.html>.

⁵⁴ Dr. Juliette Finzi Hart (Program Manager, Integrated Climate Adaptation and Resilience Program (ICARP), Governor's Office of Planning and Research), in discussion with authors, February 16, 2021.

⁵⁵ Ibid.

⁵⁶ "California Proposition 68 - Parks, Environment, and Water Bond." California Proposition 68 - Parks, Environment, and Water Bond | Adaptation Clearinghouse. Accessed March 20, 2021. <https://www.adaptationclearinghouse.org/resources/california-proposition-68-parks-environment-and-water-bond.html?preview=true>.

⁵⁷ Ibid.

⁵⁸ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

⁵⁹ "About California Climate Investments," California Climate Investments, accessed March 2021, <http://www.cacclimateinvestments.ca.gov/about-cci>.

⁶⁰ "Affordable Housing and Sustainable Communities Program (AHSC)," California Department of Housing and Community Development, accessed March 25, 2021, <https://www.hcd.ca.gov/grants-funding/active-funding/ahsc.shtml>.

⁶¹ "Transformative Climate Communities," Transformative Climate Communities (California Strategic Growth Council), accessed March 2021, <https://sgc.ca.gov/programs/tcc/vision/>

⁶² Sona Mohnot, J.D. (Environmental Equity Senior Program Manager & Policy Analyst, The Greenlining Institute), in discussion with authors, March 5, 2021.

and policy groups, like the Greenlining Institute, highlight TCC as a gold standard in providing neighborhood-level support.⁶³

Finally, the Climate Change Research Program (CCRP) and the California Department of Forestry and Fire Protection (Cal Fire) grants provide monetary support. The former, CCRP, is funded by the California Climate Investments Program and supports research that advances statewide climate aims.^{64,65} Second, Cal Fire grants support programs that focus on improving forest health, encouraging urban forestry, and preventing wildfires, all of which are related to addressing extreme heat.⁶⁶

City and County Considerations and Funding

Utilities provide funding for a variety of citywide heat adaptation projects. In the City of LA, the LA Department of Water and Power (LADWP) utilizes ratepayer funds for heat-related projects focused on improving energy efficiency.⁶⁷ Through a competitive process, LADWP funds over \$1 million annually in Community Partnership Outreach Grants, which enhance local nonprofits' capacity while helping customers reduce energy and water use.⁶⁸ These grants were originally funded through the American

Recovery and Reinvestment Act (ARRA) in the Great Recession, and have since continued funding through ratepayer funds.⁶⁹

Cities also tax constituents to fund certain programs. The Safe Clean Water Program (SCWP), or Measure W, requires a \$0.25 parcel tax by square foot of impermeable surface, which then pays for stormwater management projects.^{70,71,72} Elsewhere, Tucson Water charges its ratepayers \$0.30 per centum cubic feet (CCF) of water or \$2.40 per month to supply Tucson Water's Conservation Funds.⁷³ The City uses \$350,000 of these funds for green infrastructure project development, such as tree planting.⁷⁴

New York (NYC) has invested its city funds toward heat and climate adaptation projects. The "Get Cool NYC" program provided \$70 million in cooling subsidies to offer low-income seniors A/C installation and fans.^{75,76} In total, the program – funded by the city's general fund – sought to supply nearly 74,000 A/C units.⁷⁷ The New York State Public Service Commission supported these efforts and provided customers discounts on their energy bills so they could freely use A/C during high heat days.^{78,79} NYC also used general fund

⁶³ Ibid.

⁶⁴ Leah Fisher and Dr. Nicole Hernandez (Senior Advisor, Research & Innovation, California Strategic Growth Council (SGC) and Science Policy Fellow at the California Council on Science and Technology (CCST)), in discussion with authors February 4, 2021.

⁶⁵ "Climate Change Research Program," California Strategic Growth Council, accessed March 2021, <https://sgc.ca.gov/programs/climate-research/vision/>.

⁶⁶ "CAL FIRE Grant Program," Cal Fire Department of Forestry and Fire Protection, 2021, <https://www.fire.ca.gov/grants/>.

⁶⁷ Nancy Sutley and Steve Baule (Chief Sustainability Officer & Senior Assistant General Manager of External and Regulatory Affairs and Director of Special Projects for Sustainability and Economic Development, LADWP), in discussion with authors, February 2, 2021.

⁶⁸ Craig Tranby (Environmental Affairs Officer, Los Angeles Department of Water and Power (LADWP)), in discussion with authors, February 5, 2021.

⁶⁹ Ibid.

⁷⁰ Kristen Torres Pawling, Alison Frazzini, and Rebecca Ferdman (Sustainability Program Director, Sustainability Policy Advisor, and Sustainability Policy Advisor, Los Angeles County (LAC) Chief Sustainability Office (CSO)), in discussion with authors, February 2, 2021.

⁷¹ "Safe Clean Water Program," Safe Clean Water Program (County of Los Angeles), accessed March 2021, <https://safecleanwaterla.org/>.

⁷² Bianca Barragan, "Measure W: LA's Parcel Tax for Stormwater Recycling, Explained," *Curbed LA*, November 5, 2018, <https://la.curbed.com/2018/10/18/17930972/measure-w-los-angeles-ballot-measure>.

⁷³ Irene Ogata (Urban Landscape Manager, City of Tucson), in discussion with authors, January 27, 2021.

⁷⁴ Ibid.

⁷⁵ "Get Cool NYC: Mayor De Blasio Updates New Yorkers on COVID-19 Summer Heat Plan," City of New York, June 12, 2020, <https://www1.nyc.gov/office-of-the-mayor/news/433-20/get-cool-nyc-mayor-de-blasio-new-yorkers-covid-19-summer-heat-plan>.

⁷⁶ Daphne Lundi (Deputy Director for Social Resiliency, New York City Mayor's Office of Resiliency), in discussion with authors, February 11, 2021.

⁷⁷ "Get Cool NYC: Mayor De Blasio Updates New Yorkers on COVID-19 Summer Heat Plan"

⁷⁸ Daphne Lundi, in discussion with authors, February 11, 2021.

⁷⁹ "Get Cool NYC: Mayor De Blasio Updates New Yorkers on COVID-19 Summer Heat Plan"

dollars to support its Be a Buddy (BaB) Program (nearly \$1 million), tree planting (\$82 million), forest restoration (\$7 million), green roof tax credits (\$4 million), targeted programming (\$2.6 million), and neighborhood-level heat research and modeling (\$300,000).⁸⁰

Finally, LAC recently codified the OurCounty Los Angeles Countywide Sustainability Plan, a comprehensive outline for promoting sustainability and resilience throughout the County and across local governments, sectors, and stakeholders. The Plan also focuses on providing equitable solutions for historically marginalized groups that stand to suffer the most from climate change and pollution.⁸¹ The Plan outlines 12 goals to ensure equity, resilience, infrastructure, anti-displacement, economic growth, biodiversity, access to public spaces, clean energy, improved transportation, food systems, improved governance and transparency, and improved stakeholder partnerships. The Plan is lengthy, and does not solely focus on heat, but offers an overarching framework to improve the lives of Angelenos by addressing climate change and pollution.⁸² For these reasons, this report incorporates those 12

goals into the policy evaluation framework to better align heat coordination with the County's stated ambitions in the near and far future. For a full list of these goals, please see Appendix II.

Nonprofit Considerations and Funding

Nonprofit organizations also play a key role in financing heat programming, with different regional nonprofits offering myriad programs. Communities Responding to Extreme Weather (CREW), a nonprofit based in Massachusetts, utilizes grant money and donations to fund heat planning workshops, community outreach, and free A/C installation in underserved communities.⁸³ California ReLEAF offers grants to community groups engaging in tree planting and urban forestry projects.⁸⁴ ReLEAF also partners with private businesses that fund forestry projects.⁸⁵ In LA, Tree People researched urban forestry and the UHI effect with funding from the United States Department of Agriculture and Forest Service.⁸⁶ Climate Resolve, one of the leading LA nonprofits tackling heat adaptation, funds its programs largely through donations and consulting.⁸⁷

⁸⁰ "Cool Neighborhoods NYC: A Comprehensive Approach to Keep Communities Safe in Extreme Heat," *Cool Neighborhoods NYC: A Comprehensive Approach to Keep Communities Safe in Extreme Heat* (New York City, NY, 2019).

⁸¹ "OurCounty: Los Angeles Countywide Sustainability Plan," (LA County Chief Sustainability Office), accessed March 2021, <https://ourcounty-la.lacounty.gov/plan>.

⁸² *Ibid.*

⁸³ Interview with Rev. Vernon K. Walker.

⁸⁴ "Grants," California ReLeaf, March 10, 2021, <https://californiareleaf.org/programs/grants/>.

⁸⁵ *Ibid.*

⁸⁶ Edith de Guzman (UCLA Institute for the Environment and Sustainability; Former Director of Research at Tree People), in discussion with authors, February 3, 2021.

⁸⁷ "Climate Resolve Impact Report 2019," *Climate Resolve Impact Report 2019* (Los Angeles, CA, 2019).

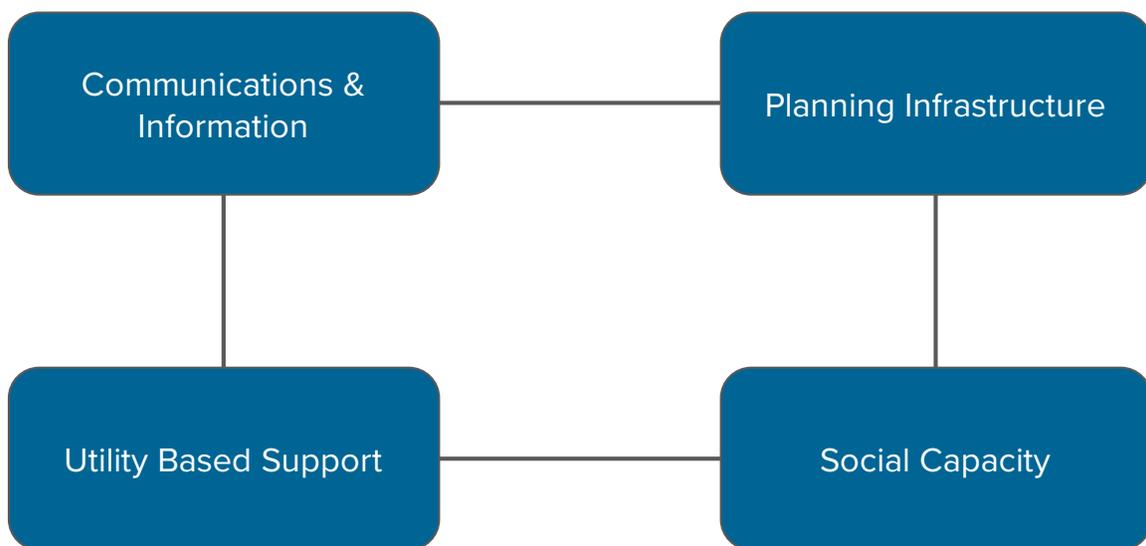
Literature Review: Policy Options

This report focuses on existing heat adaptation initiatives in NYC, Tucson, Phoenix, and the City of Los Angeles (LA) due to their respective leadership efforts in addressing extreme heat. Despite apparent differences between NYC and LAC, the comparable size and diversity of New York, as well as its shared vulnerability to a changing climate, make it a useful case study. Moreover, following Hurricane Sandy, NYC began intentionally funding climate change adaptation.⁸⁸ Tucson and Phoenix also serve as useful case studies due to their evident extreme heat exposure. Both cities have some of the most well-developed heat adaptation plans in the country, which proves instructive as LAC deploys additional programming. Lastly, LA serves as an additional area of comparison, both for its location and its essential role in coordinating with LAC in future planning. Notably, while international cities like Paris, France and much of India have directly addressed extreme heat,⁸⁹ this report is limited to US-based heat adaptation efforts for parsimony.

Given how acutely heat harms LAC, adaptive solutions must be multifaceted and holistically address the concerns outlined in this report. Importantly, heat adaptation strategies must address short-term emergency situations, while simultaneously aiding the County in building long-term resilience to manage future events. Thus, heat strategies must focus on both adaptation and mitigation.⁹⁰ The numerous heat impacts on LAC and the undue burden intensifying heat already places on marginalized groups underscores four target areas heat planning should address to improve resilience and equity: Communications & Information, Planning Infrastructure, Social Capacity, and Utility-Based Support, overall referred to as Policy Classification Areas (See **Figure 4, below**). Literature review and expert interviews, further discussed in “Methodology & Data,” determined these Policy Classification Areas.

Currently, Arizona, California, and New York address extreme heat in myriad ways. Below is a discussion of current heat adaptation programs, divided into the four Policy Classification Areas.

FIGURE 4: Policy Classification Areas



⁸⁸ Daphne Lundi, in discussion with authors, February 11, 2021.

⁸⁹ Kathryn Phillips (Former Director, Sierra Club California), in discussion with authors, January 28, 2021.

⁹⁰ Victoria Ludwig, MEM, in discussion with authors, March 15, 2021.

Communications & Information Policies

Communication & Information policies convey data and knowledge on extreme events or climate changes. These policies include public, cross-sector, and government-wide communications related to climate data and cooling strategies.

Climate & Heat Modeling The underlying models that drive decisions around heat planning and adaptation and provide policymakers with tools to better understand climate and heat variations on different timescales.⁹¹ The state and County already integrate Climate & Heat Modelling into their decisions, which can help them identify geographic areas, economic sectors, and communities prone to adverse outcomes in varied climate scenarios. These models change frequently, and, without constant modifications, policymakers can quickly use outdated information.

Emergency Alerts Broadly encompasses push cell notifications, media alerts, social media warnings, radio and TV public service announcements (PSAs), and other mass communications that alert Angelenos to prevailing emergency conditions. Emergency Alerts provide critical and near-instantaneous information to a wide swath of the population; however, these alerts are not currently tailored to different communities and may not reach those technologically disconnected.

Heat Awareness & Participation Provide education services to community members about extreme heat so they can understand the health implications for exposure and plan accordingly.⁹² Residents may be underprepared or lack knowledge regarding the link between heat and health.⁹³ Empowering and engaging with communities improves residents' knowledge and agency while providing them with health benefits. While effective, these trainings take time to launch and require engaged citizenry.

Identifying Key Groups Use of community-specific data to map where prevailing resource availability and demographics render people most susceptible to heat's impacts. With an increased understanding and awareness of key groups, government and CBOs can better deploy resources and reduce risk. This process requires significant data and partnerships with key groups to yield fruitful results.

Signage at Cooling Centers Public markings that indicate buildings acting as Cooling Centers, which may be otherwise nondescript. These indicators can alert residents that their local library or community center has cooling services, but the signs themselves do not address underlying technical, infrastructural, and participatory issues that render Cooling Centers ineffective.

Surveying Cooling Center Target Populations Help the County understand which services are most needed using available resources. Surveys better engage local populations, improve communications and dialogue with the public, and allow Centers to better tailor programming to local communities. However, surveys do not address larger technical and infrastructural issues plaguing these Centers.

⁹¹ "Climate Modeling," Geophysical Fluid Dynamics Laboratory, accessed March 2021, <https://www.gfdl.noaa.gov/climate-modeling/>.

⁹² Rev. Vernon K. Walkelr (Program Manager, Climate Communities Responding to Extreme Weather (CREW)), in discussion with authors, February 16, 2021.

⁹³ Carol Brown (Program Development & Advocacy Manager, Western Arizona Council of Governments (WACOG)), in discussion with authors, February 9, 2021.

Planning Infrastructure

Generally, these policies address weaknesses in built resources and public spaces that often exacerbate urban heat effects. The availability of these resources can vary greatly across communities, often depending on demographic and socio-economic factors.^{94,95}

Cool Pavements, Streets	Paving and streets that can lower the UHI effect by utilizing reflective materials that increase water evaporation. ⁹⁶ Cool pavements provide multifaceted benefits, including enhanced safety, improved local comfort, reduced stormwater runoff, and enhanced water quality. ⁹⁷ However, their public health benefits are uncertain, and reflected thermal radiation could increase pedestrians' overall heat load when walking on the surfaces. ⁹⁸
Cool Roofs, Walls	Added features to existing buildings that help increase surface albedo and, subsequently, lower local temperatures. ⁹⁹ Cool Roof programs keep homes cooler inside and allow residents to save energy by reducing the need for them to run A/C. ¹⁰⁰ LA City and LAC both mandate the use of cool roofs, with the former granting rebates for installing these features. ^{101,102}
Cooling Center Infrastructure Improvements	Address building deficiencies in existing Cooling Centers, such as broken A/C units and failing air filtration systems. Since some buildings operating as Cooling Centers lack working A/C, ¹⁰³ resolving these issues may make the Centers more appealing. However, these fixes will not change participatory and community dynamics that limit Cooling Center utilization.
Shade Hubs	Built structures that increase shade coverage, such as bus shelters. ¹⁰⁴ Shade Hubs can be tailored to meet community needs and newer structures may provide Communications benefits, such as Emergency Alerts or community-specific announcements. ¹⁰⁵ Like other built environment upgrades, these Hubs can prove costly and, to truly help reduce heat impacts, must be built <i>en masse</i> .

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⁹⁴ C. J. Gabbe and Gregory Pierce, "Extreme Heat Vulnerability of Subsidized Housing Residents in California," *Housing Policy Debate* 30, no. 5 (2020): pp. 843-860, <https://doi.org/10.1080/10511482.2020.1768574>.

⁹⁵ Dr. Jeremy Hess (Director at Center for Health and the Global Environment, University of Washington), in discussion with authors, March 3, 2021.

⁹⁶ "Using Cool Pavements to Reduce Heat Islands." EPA. Environmental Protection Agency, November 13, 2020. <https://www.epa.gov/heat-islands/using-cool-pavements-reduce-heat-islands>.

⁹⁷ "Using Cool Pavements to Reduce Heat Islands." EPA. Environmental Protection Agency, November 13, 2020. <https://www.epa.gov/heat-islands/using-cool-pavements-reduce-heat-islands>.

⁹⁸ Middel, A. et al., "Solar reflective pavements - A policy panacea to heat mitigation?" *Environmental Research Letters* 15, (2020). Accessed 25 January 2021. <https://iopscience.iop.org/article/10.1088/1748-9326/ab87d4>

⁹⁹ Shickman, Kurt, and Rogers, Martha. "Capturing the True Value of Trees, Cool Roofs, and Other Urban Heat Island Mitigation Strategies for Utilities." *Energy Efficiency* 13, no. 3 (2020): 407-18.

¹⁰⁰ Ibid.

¹⁰¹ Kristen Torres Pawling, Alison Frazzini, and Rebecca Ferdman, in discussion with authors, February 2, 2021.

¹⁰² Nancy Sutley and Steve Baule, in discussion with authors, February 2, 2021.

¹⁰³ Ramon Bernal, in discussion with authors, February 10, 2020.

¹⁰⁴ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

¹⁰⁵ Ibid.

Urban Greening Programs that aim to increase tree coverings in urban areas in order to expand shade covering, reduce the UHI effect, curtail energy demand, and provide additional, ancillary benefits for cities.¹⁰⁶ These programs' capacity can depend on tree selection and maintenance.^{107,108}

Water Features Includes public pools, water fountains, and spray caps.¹⁰⁹ Access to and readiness of water resources can serve as an indicator of high community-level heat risk. Availability of water features offers immediate hydration and cooling benefits and provides long-term value and resilience for communities.¹¹⁰

Social Capacity

These interventions enhance a community's capacity to respond to immediate extreme events while promoting long-term community cohesion and resilience.

Be a Buddy (BaB) Bolsters existing community connections.¹¹¹ Working with CBOs that have existing relationships with local residents, BaB programs count on volunteers to check on neighbors during extreme heat events.¹¹² NYC is currently piloting these programs in neighborhoods most impacted by extreme weather events.¹¹³

Business Preparedness, Support Provides resources for businesses to support nearby residents during extreme heat events¹¹⁴ and facilitates business-level disaster planning.^{115,116} In both cases, businesses improve local resilience by increasing the availability of community-level heat resources while preventing business closure and job losses due to inadequate preparation.¹¹⁷ The business landscape is complex, and these efforts require relationships with entities like the LA Area Chamber of Commerce and, for companies that could provide cooling services, requires an understanding of what businesses can legally provide residents.

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¹⁰⁶ De Guzman, E., Kalkstein, L. S., Sailor, D., Eisenman, D., Sheridan, S., Kirner, K., Maas, R., Shickman, K., Fink, D., Parfrey, J., Chen, Y., Rx for Hot Cities: Climate Resilience Through Urban Greening and Cooling in Los Angeles, 2020, TreePeople and Los Angeles Urban Cooling Collaborative.

¹⁰⁷ "City Plants (Free Tree Programs) LADWP, January 2021. https://www.ladwp.com/ladwp/faces/ladwp/residential/r-savemoney/r-sm-rebateandprograms/r-sm-rp-treesforgreenla?_afLoop=250409389637491&_afWindowMode=0&_afWindowId=null#%40%3F_afWindowId%3Dnull%26_afLoop%3D250409389637491%26_afWindowMode%3D0%26_adf.ctrl-state%3Dexx2iw7f7_4

¹⁰⁸ Richardson, GRA, Otero J, Lebedeva J and Chan CF (2009). Developing climate change adaptation strategies: A risk assessment and planning tool for urban heat islands in Montreal. *Canadian Journal of Urban Research*, 18(1): 74–93

¹⁰⁹ "Mayor De Blasio Expands Cool It! NYC to Keep New Yorkers Cool and Safe This Summer," City of New York (Office of the Mayor, June 24, 2020), <https://www1.nyc.gov/office-of-the-mayor/news/466-20/mayor-de-blasio-expands-cool-it-nyc-keep-new-yorkers-cool-safe-this-summer>.

¹¹⁰ Dr. Jeremy Hess, in discussion with authors, March 3, 2021.

¹¹¹ Paul J. Schramm et al., "Climate Change and Health: Local Solutions to Local Challenges," *Global Environmental Health and Sustainability*, (October 28, 2020): pp. 363-370, <https://doi.org/https://doi.org/10.1007>.

¹¹² Ibid.

¹¹³ Daphne Lundi, in discussion with authors, February 11, 2021.

¹¹⁴ Carol Brown, in discussion with authors, February 9, 2021.

¹¹⁵ Dr. Alessandra Jerolleman, MPA, CFM (Assistant Professor of Emergency Management, Jacksonville State University; Federal Emergency Management Agency (FEMA) Reservist; Analyst at Lowlander Center), in discussion with authors, February 3, 2021.

¹¹⁶ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

¹¹⁷ Ibid.

Resilience Hubs Tailor existing facilities to serve community needs and enhance local capacity and cohesion.¹¹⁸ The Urban Sustainability Directors Network (USDN) pioneered Resilience Hub development and implementation.¹¹⁹ Resilience Hubs cannot be narrowly defined but are generally locations that exceed cooling services and provide community-specific resources that local residents can use in non-emergencies, disruptions, and recovery and are centered on the holistic sense of resilience.¹²⁰

Social Programs at Cooling Centers Offerings at Cooling Centers that promote a sense of community and relationship-building. Cooling Centers currently offer the bare minimum: typically, a room with chairs and A/C. Social programs range from classes to wireless internet and games and might increase a Center’s appeal to a wider swath of the population. Without additional, dedicated funding and resources set aside specifically for Cooling Centers, programming efforts at these locations could be hindered, and the programs themselves will be ineffective if Cooling Centers remain underutilized.

Staff Training Offerings to help Cooling Center staff overcome knowledge gaps and empower DSWs to better serve residents. DSWs come from numerous County departments and may lack the training to appropriately interact with those experiencing homelessness, those with a mental health history,¹²¹ and others who may benefit from workers with specialized training.¹²² Training fills these gaps and avoids the need for law enforcement, which only further dissuades Cooling Center use.¹²³

Utility-Based Support

Electric utilities offer different programs and incentives for customer heat adaptation and consumption mitigation. These programs also provide health benefits to customers.

A/C Rebates, Funding Either directly purchases, replaces, or otherwise funds customers in obtaining A/C units. More than any other policy mentioned, A/C offers a direct and potential life-saving benefit. However, these units increase total energy demand, thus running contrary to County and state goals to reduce consumption, especially during peak hours.¹²⁴

Bill Support Programs aimed at helping customers pay their utility bills. The federal LIHEAP program and the state’s California Alternate Rates for Energy (CARE) and Family Electric Rate Assistance Program (FERA) rates are three examples of existing programs that offer low-income customers discounted utility rates. These programs do not directly offer tools to cope with extreme heat, but they can minimize the financial burden of increased A/C use when high heat conditions persist.

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¹¹⁸ Kristin Baja (Urban Sustainability Directors Network (USDN), (2018), <https://www.usdn.org/resilience-hubs.html>.

¹¹⁹ “Resilience Hubs” (Urban Sustainability Directors Network, (2021), <https://www.usdn.org/resilience-hubs.html>.

¹²⁰ Ibid.

¹²¹ “Disability Language Style Guide,” National Center on Disability and Journalism. (2018), Retrieved April 2021, <https://ncdj.org/style-guide/#-mentallyretardeddisabled>

¹²² Ramon Bernal, in discussion with authors, February 10, 2020.

¹²³ Ibid.

¹²⁴ Nancy Sutley and Steve Baule, in discussion with authors, February 2, 2021.

Community Infrastructure	Microgrids and other energy assets that safeguard reliability during extreme events. These interventions are costly to implement but promote long-term resilience and ensure buildings maintain power during emergency weather events or grid instability.
Cooling Centers	Please see the assessment in the “Problem Identification” section.
Demand Response (DR)	Provides customers a signal to cut consumption during peak demand hours when the grid faces strain, such as during extreme heat events, and relies on communication from a utility or a third-party aggregator. ¹²⁵ While not a direct extreme heat measure, DR helps customers avoid consumption during the highest price hours and protects customers from high utility bills during extreme events.
Fan Giveaway	Cooperation between utilities and targeted groups to offer personal fans. ¹²⁶ Fans provide a low-cost alternative to A/C units, and people may be more willing to run fans because they are less costly than A/C. ¹²⁷ However, fans are notably less effective than A/C, and they do not offer the same level of life-saving thermoregulatory support. ^{128,129}
HVAC Upgrades	Utility-supported purchase of more energy-efficient appliances, especially A/C. In LADWP’s service territory, the utility offers programs to support energy efficiency, which, in turn, helps customers minimize energy use even as temperatures increase. ¹³⁰ These programs additionally help the City reduce the utility’s peak demand.
Individual Programs	Provides customers on-site energy solutions, namely solar and storage. These programs offer a multi-tiered benefit: lowering utility bills and keeping power on during extreme events. State-level programs can help fund these offerings, as can existing utility funding streams.
Weatherization	Offers infrastructure upgrades to qualifying low-income homes to improve thermal comfort and energy efficiency. These programs offer direct benefit to residents by offering improvements such as insulation, window replacements, or other appliance upgrades. Moreover, Weatherization programs also offer health benefits, providing residents protection against outdoor wildfire smoke and other ambient air pollutants. While these programs improve thermal comfort at the source, the application process can be difficult to layer with other programs that could provide multiple co-benefits, such as combining Weatherization with state solar programs, and there are not clear pathways for renters to communicate their concerns with the program or its impacts. ¹³¹

¹²⁵ Dr. Monique Edwards-Greer, DBA and Tyler Aguirre (Director of Technology, Data, and People and Account Services Manager, Clean Power Alliance (CPA)), in discussion with authors, December 10, 2020.

¹²⁶ Nancy Sutley and Steve Baule, in discussion with authors, February 2, 2021.

¹²⁷ Ibid.

¹²⁸ Edith de Guzman, in discussion with authors, February 3, 2021.

¹²⁹ Dr. Elizabeth Rhoades (Program Director, Climate Change and Sustainability, Los Angeles County Department of Public Health), in discussion with authors, February 17, 2021.

¹³⁰ Nancy Sutley and Steve Baule, in discussion with authors, February 2, 2021.

¹³¹ Shina Robinson (Policy Coordinator, Asian Pacific Environmental Network (APEN)), in discussion with authors, March 2, 2021.

METHODOLOGY & DATA

Methods Overview

This report relies on a comprehensive literature review, extensive interviews with heat-resiliency experts, spatial analysis, and a structured quantitative scoring method to determine heat resiliency policies the County should prioritize. See Table 1, below, for more detail on each method listed.

TABLE 1: Summary of Analysis Methods

Method	Sources	Description	Applicability
Literature Review	Reports on current Cooling Center operations and existing alternatives	Analyze current programs and funding streams locally, at the state level, and federally. The literature review covers Cooling Center alternatives with supplemental food desert literature.	Informs direction of service recommendation and Cooling Center desert analysis
Expert Interviews	Recorded interviews with heat resiliency experts across the country	35 interviews » 9 academics » 20 federal, state, and local government Employees » 6 nonprofits	To understand existing governance structures for Cooling Centers, alternatives implemented elsewhere, and to inform the report’s evaluation criteria and policy recommendations
Spatial Analysis	Cooling Center Locations	Locations and usage data for LAC’s existing Cooling Centers	To determine where existing Cooling Center deserts exist to help elucidate where services are lagging
Scoring & Policy Evaluation	Interviewee responses and literature on best evaluation practices	Based on the themes identified from interviews and literature analysis, this report evaluates the policy options and scores each policy	Scores provide a way to rank different programs based on their alignment with County Sustainability goals, Efficacy, and Feasibility

Literature Review

The literature review analyzed government documents from federal, state, and local projects and academic research on the capacity of programs. State and local projects were limited to the City of LA, LAC, Phoenix, Tucson, and NYC due to their comprehensive heat adaptation program offerings. The literature review established an understanding of Cooling Centers and the broader heat adaptation policy landscape, as well as existing funding streams and evaluative criteria for analyzing programs.

Expert Interviews

Structured interviews with stakeholders working in the nonprofit, private, and public sectors provided an interdisciplinary understanding of the varied programs, policies, and efforts utilized to address extreme heat. Interviewees spanned both the greater Los Angeles area and nationwide. Participants were obtained through literature review and snowball sampling. For a detailed explanation of the interview process, questions asked, the coding process, and interview participants, please see Appendix III.

Spatial Analysis

OEM provided comprehensive data on the locations and utilization rates for the Cooling Centers operating in unincorporated LAC from April through October 2020, which informed this spatial accessibility analysis. This analysis located areas where residents lack adequate access to Cooling Centers by transit modes, termed Cooling Center deserts. Food desert thresholds were used as a proxy for determining Cooling Center deserts.¹³² Food deserts are defined as localities

that lack accessibility to nourishing, reasonably priced food.¹³³ The ease with which Centers can be accessed by car as opposed to other transit means is considered based on food desert literature.¹³⁴ This analysis considers three travel modes: driving, public transit, and walking. Travel thresholds for Cooling Center deserts were set at 10 miles for driving, two miles for public transportation, and one mile for walking, as established by the United States Department of Agriculture for identifying food desert locations.¹³⁵

This spatial analysis focused on unincorporated LAC populations without A/C access. A/C and demographic metadata was obtained through The California Healthy Places Index: Extreme Heat Edition, an online tracking tool developed at the UCLA Luskin Center for Innovation. Summary statistics for each Supervisorial District were calculated for total population without A/C access and select key groups without A/C, including:

- » American Indian/Alaskan Native population (AIAN),
- » Black or African American population (Black),
- » Hispanic or Latino population (Latino),
- » population aged under five (Age < 5),
- » population aged 65 or older (Age > 65),
- » population earning 200% less than the federal poverty level (Poverty),
- » population 65 years and older with income below poverty level (Age > 65 in poverty), and
- » households without access to a vehicle (Carless).

Methods for Generating Summary Statistics

Cooling Center desert calculations for each population of interest follow three steps:

¹³² "Food Access Research Atlas." Economic Research Service US Department of Agriculture. Retrieved March 2021 <https://www.ers.usda.gov/data-products/food-access-research-atlas/>.

¹³³ Dutko, Paula, Michele Ver Ploeg, and Tracey Farrigan. "Characteristics and Influential Factors of Food Deserts," Economic Research Service US Department of Agriculture. (August 2012). Retrieved March 2021 https://www.ers.usda.gov/webdocs/publications/45014/30940_err140.pdf.

¹³⁴ "Food Access Research Atlas." Economic Research Service US Department of Agriculture. Retrieved March 2021. <https://www.ers.usda.gov/data-products/food-access-research-atlas/>.

¹³⁵ Ibid.

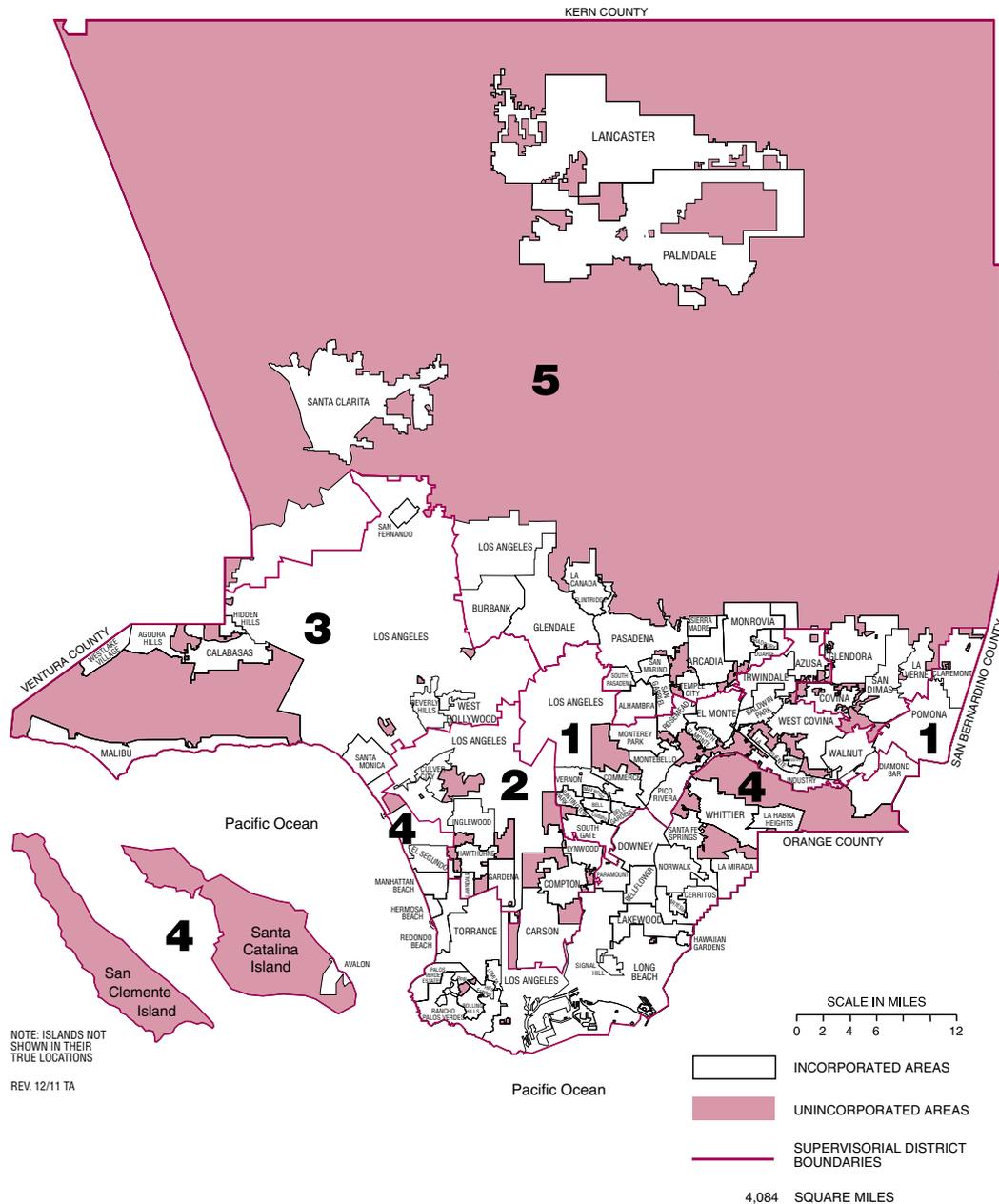
1. Calculating the Supervisorial District area, which is the sum of all census tracts within the District
2. Calculating the proportion of each Supervisorial District in a Cooling Center desert, which includes analyzing each mode of transportation
3. Identifying where Cooling Centers are not

accessible in each Supervisorial District by each mode of travel

Generating the percentage of the population in Cooling Center deserts for each aforementioned key group follows similar steps as above.

Figure 5 shows Supervisorial District borders, produced by LAC.¹³⁶

FIGURE 5: LAC Supervisorial Districts



¹³⁶ Note this figure was taken directly from the Los Angeles County website. See: “Maps,” County of Los Angeles, Retrieved April 2021, <https://lacounty.gov/government/geography-statistics/maps/>

Scoring Methods & Evaluative Criteria

This report utilizes a tri-component evaluation to score each disparate policy: Alignment with the Los Angeles Countywide Sustainability Plan (See Appendix II for a list of stated County goals),¹³⁷ (Alignment), a Feasibility score (Feasibility), and a policy Efficacy score (Efficacy). The individual components and their elements are listed below:

1. **Alignment** (1-5 Score)
2. **Feasibility** = (0.4*Communication Requirements) + (0.3*Funding) + (0.3*Technical Inputs)
3. **Efficacy** = (0.4*Targetability) + (0.2*Public Health) + (0.15*Accessibility) + (0.15*Durability During Extreme Event) + (0.1*Population Reach)

The total of the three provides the overall score for the given policy, represented by **Equation 1**, below:

$$\text{Policy Score} = (0.5 * \text{Alignment}) + \text{Feasibility} + \text{Efficacy} (1)$$

The individual elements of each scoring component are weighted to reflect their relative impact on the overarching component to which they belong. The weighting prioritizes Effective and Feasible policies while also recognizing the importance of policies that assist the County in achieving its sustainability goals. Feasibility and

Efficacy have a corresponding full weight to ensure that the scoring incorporates these different but equally important components. The following section provides further explanation on each component and its elements.

ALIGNMENT (TOTAL WEIGHT = 0.5): a 1-5 scale ranking based on the criteria in **Table 2**.

FEASIBILITY (TOTAL WEIGHT = 1.0): The analysis adopts a multi-element Feasibility definition distinct from traditional binary conceptions of viability to account for the fact that each scored policy is already implemented and, thus, operational.¹³⁸ Policies with higher Feasibility scores are those that have lower communications needs, funding requirements, and input demands in terms of staffing, materials, and data. Below are the different Feasibility elements.

Communication Requirements (weight = 0.4):

Represents the numerous communication channels needed to plan for extreme heat: among County departments, between the County and general public, and among the County and other entities, like Southern California Edison (SCE), nonprofits, and private businesses. Because interviewees cited communications as a common barrier for policy implementation, this component has the heaviest weight within the Feasibility category.

TABLE 2: Scoring Descriptions for Alignment with LAC’s Sustainability Plan

Score	Description
1	A policy that provides cooling benefits and aligns with 0-2 of the Plan’s goals
2	A policy that provides cooling benefits and aligns with 2-4 of the Plan’s goals
3	A policy that provides cooling benefits and aligns with 5-6 of the Plan’s goals
4	A policy that provides cooling benefits and aligns with 7-9 of the Plan’s goals
5	A policy that provides cooling benefits and aligns with 10-12 of the Plan’s goals

¹³⁷ “OurCounty: Los Angeles Countywide Sustainability Plan,” (LA County Chief Sustainability Office), accessed March 2021, <https://ourcounty-la.lacounty.gov/plan>.

¹³⁸ Chandni Singh et al., “Assessing the Feasibility of Adaptation Options: Methodological Advancements and Directions for Climate Adaptation Research and Practice,” *Climatic Change* 162, no. 2 (2020): pp. 255-277, <https://doi.org/10.1007/s10584-020-02762-x>.

FUNDING & TECHNICAL INPUTS (WEIGHT = 0.3 EACH): Funding represents the needed capital requirements for a given policy while technical inputs encompass the required data, materials, and staffing. Funding is generalized to account for relative financial needs without assigning specific costs to programs. This reasoning is two-fold. First, interviewees come from different regions with budgets of different magnitudes. Comparing dissimilar locations with singular cost estimates is difficult and does not take into account discrepancies in the number of people served, available funding streams, and varying budgets. Second, much of the data are not readily available. Thus, financial needs are classified on a relative scale, indicating that some policies have higher financial requirements than others but do so without using specific values for comparative ease and accuracy.

Funding and Technical Inputs are separated, with policies garnering a distinct score for each element. Individually, each element is weighted less than communications, but combined are weighted higher. This weighting aligns with input from interviewees, while accounting for funding's importance and realistically weighing policy applicability based on the necessary inputs.

EFFICACY (TOTAL WEIGHT = 1.0): The analysis prioritizes policies that best serve key groups during extreme events. The Efficacy measure comprises five elements: a policy's directability to specific subpopulations (Targetability), a policy's impact on quality of life and well-being (Public Health), how well residents can use a given policy (Accessibility), how well a policy serves people during extreme events (Durability), and how many people the policy impacts (Population Reach). Each of these components is summed for a cumulative Effectiveness score. Below is a description of each element and their respective weights.

Targetability (weight = 0.4): The capacity of a

particular program to directly serve specified populations. Given the County's desire to prioritize services to key groups, targetability is weighted highest. Policies that can more readily be tailored at the individual, rather than the community-level, are scored higher because of LAC's desire to help individuals. Programs that benefit large portions of the population benefit with the "Population Reach" score described below.

Public Health (weight = 0.2): Addresses the lifesaving or health-improving factors of each scored program. Numerous interviewees cited the importance of studying a policy's impact on overall human health, which informed this element's weight. Given that health data is often difficult to obtain, the scoring system utilized relative comparisons on both positive physical and mental health impacts.

Accessibility (weight = 0.15): Refers to the ease in which all can use a given heat intervention. Accessibility can refer to how short or far one must travel to access an intervention, the presence or lack of financial support, or other related barriers to program utilization. This category is weighted to emphasize and favor programs that most easily serve residents.

Durability During Extreme Event (weight = 0.15): Policies and programs that can continue to serve residents during extreme events, like wildfires and extreme heat. This element is weighted as an important factor but is less so than Targetability given OEM's stated needs.

Population Reach (weight = 0.1): Has the lowest weight to ensure that highly specific programs, like life-saving interventions, are not unduly penalized. There is a benefit to programs that serve a significant swath of the population, but the County should also consider programs that offer more targeted benefits to best account for accessibility concerns and best serve marginalized groups.

The following scoring scales outline which weighted inputs are necessary for a given policy option to qualify for a certain Feasibility or Efficacy score. As mentioned, the scores are relative given data limitations for all evaluated policies.

TABLE 3: Scoring Descriptions for Feasibility & Effectiveness Scores

Score	Feasibility	Efficacy
1	Least Feasible, requiring the most funding, data, materials, staffing, and communications	Has lowest reach to populations, least ability to tailor to specified subgroups, is not durable during extreme events, negligible public health benefits, and is largely inaccessible
2	Requires slightly fewer inputs, but still more than could make the program widespread	Limited in reach, very little tailorability, not durable, minimal positive health impacts, and is inaccessible to many
3	Requires moderate funding, data, materials, staffing, and communications	Is moderate in its reach, can be tailored within reason for subpopulations, has some ability to endure extreme events, some positive health impacts, and is moderately accessible
4	Requires fewer inputs to implement the given policy, but still necessitates some level of support	Has a wide reach, can be targeted moderately, is decently resilient to extreme events, has more widespread positive health impacts, and is accessible to many
5	Most Feasible, requiring the least amount of funding, data, materials, staffing, and communications	Reaches the greatest number of people, is highly targetable, can endure during extreme events, has numerous public health impacts, and is highly accessible

POLICY EVALUATION & KEY FINDINGS

Interview Findings

Barriers

Barriers were the most commonly discussed aspect of heat policy within the interviews, where respondents discussed these issues 183 times. Interviewees highlighted barriers in Communications & Coordination, Reaching Key Groups, and Funding. These three areas were the most mentioned barriers, displayed in **Figure 6**, below, with Communications & Coordination far eclipsing any other barrier. Each barrier poses different problems in heat policy implementation. As such, this report utilized these three major barriers in its analysis and recommendations.

Communications & Coordination are grouped together due to their frequent skill-use overlap,

meaning that policymakers utilize a similar skill sets and channels to organize, plan, and communicate within departments, across departments, across sectors, and to the public (for a breakdown of Communication & Coordination-types, see **Figure 7**, next page). Communications & Coordination barriers centered on issues communicating with the public, issues linking heat to negative health impacts, communications between government and advocacy groups and academics. Due to its prevalence, the report incorporates Communications & Coordination into the policy scoring. This report further includes Communications & Information as a necessary area, underscoring the importance of implementing policies that directly convey information to the public, across sectors, and across departments.

FIGURE 6: Barrier Type

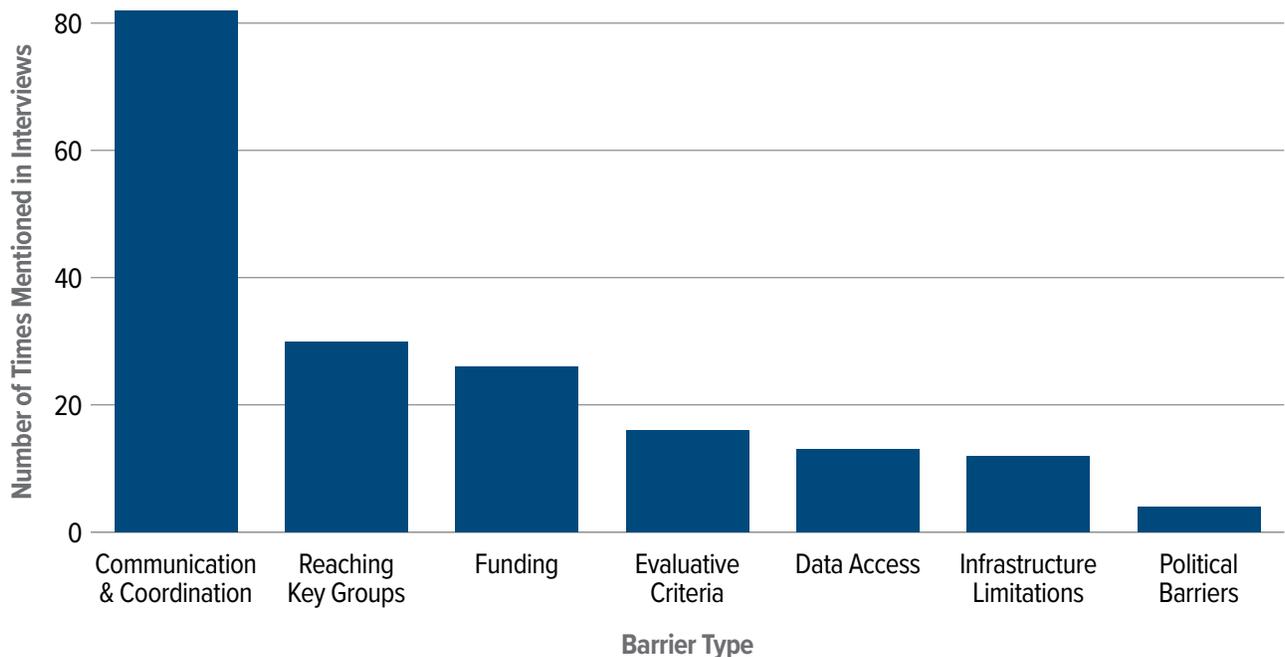
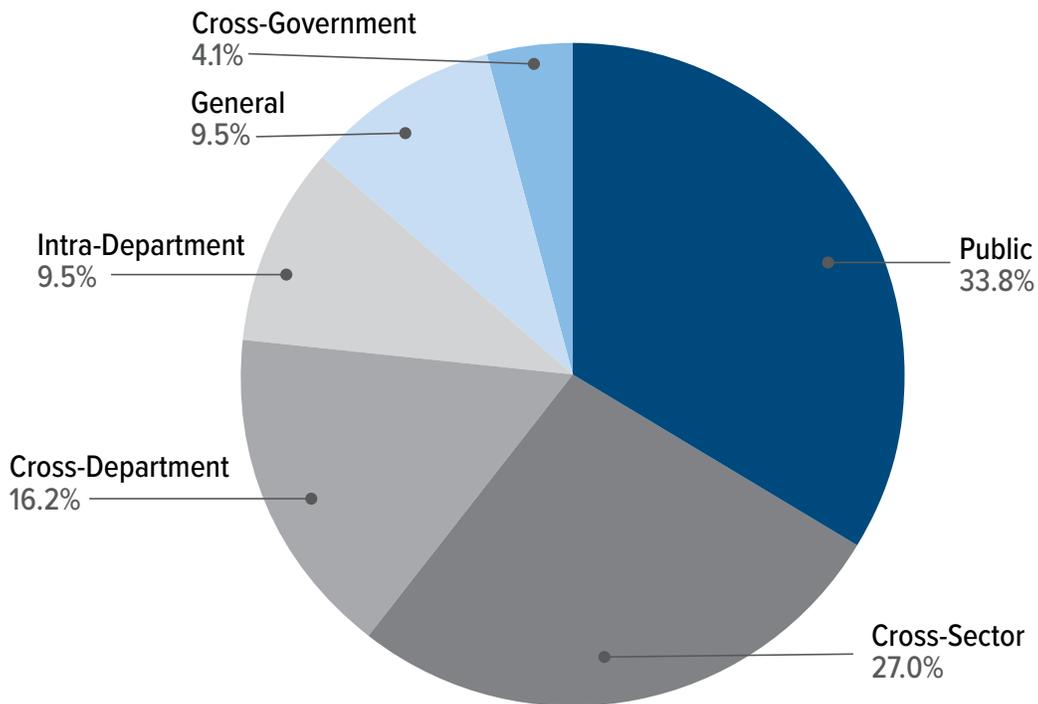


FIGURE 7: Communication & Coordination Barrier Types



The next most-cited barrier was Reaching Key Groups, highlighting the importance of developing equity-centric policies to overcome this barrier. Barriers related to Reaching Key Groups centered on inadequate translation of heat-related materials, reaching communities without internet or smartphones, displacement due to green gentrification, limited trust between marginalized communities and government agencies, limited resource access for key groups, such as limited tree canopy coverage, and others. Based on these interview findings, this report adds two additional policy areas. First, Planning Infrastructure was deemed an important area of focus due to key groups' historical and current restricted resource access. Subsequently, this report analyzes policy recommendations that intentionally target resources at key groups and improve infrastructure resilience. Second, and related, this report sought to bolster community-based resilience of key

groups, and thus focused its third policy area on Social Capacity to strengthen communities and improve resilience. These two policy areas' importance were underscored by the Reaching Key Groups barrier, which highlights both the need for and timeliness of this research. As such, equity is a central theme in this report, due to OEM's stated needs and the interview results, and permeates every aspect of the overall policy analysis and recommendations.

Finally, funding is an important barrier, which interviewees mentioned over 20 times. Funding barriers focused on the unpredictability of federal funding, mismatch between grant timelines and evaluations, limited departmental funding, and competitiveness of funding. To address this barrier, recommendations for better aligning program evaluation with funding are addressed in the "Discussion" of this report.

Funding Type and Sector

Interviewees commonly mentioned heat planning’s financial intricacies, which was also cited as a barrier. Interview results highlighted both the issues in obtaining funding as well as sources frequently tapped. Given the prevalence of utility-based funding, the numerous utility-based program offerings, and the increased prevalence of equity-focused utility efforts uncovered in the interviews, this area was deemed a particularly fruitful domain to focus future policy. As such, Utility-Based Support was identified as the fourth and final area of policy implementation recommended within this report. See **Figure 8**, below, for a breakdown of funding types mentioned in the interviews.

Policy Options and Outcomes

Based on the interview coding and analysis,

this report identifies four overall areas of heat adaptation policy response: Communications & Information, Planning Infrastructure, Social Capacity, and Utility-Based Support. These areas work in tandem to offer holistic heat adaptation solutions that target key groups. **Figure 9**, next page, shows a breakdown of each heat adaptation policy mentioned in the interviews, divided into these four areas of necessary response, highlighting the varied heat programs implemented across the country. The prevalence of Communications & Information as well as Planning Infrastructure interventions is noteworthy, likely due to the abundance of heat research (Information) as well as programs such as Cool Roofs, Walls, Cool Pavements, Streets, and Urban Forests within the interview sample.

FIGURE 8: Funding Type by Sector

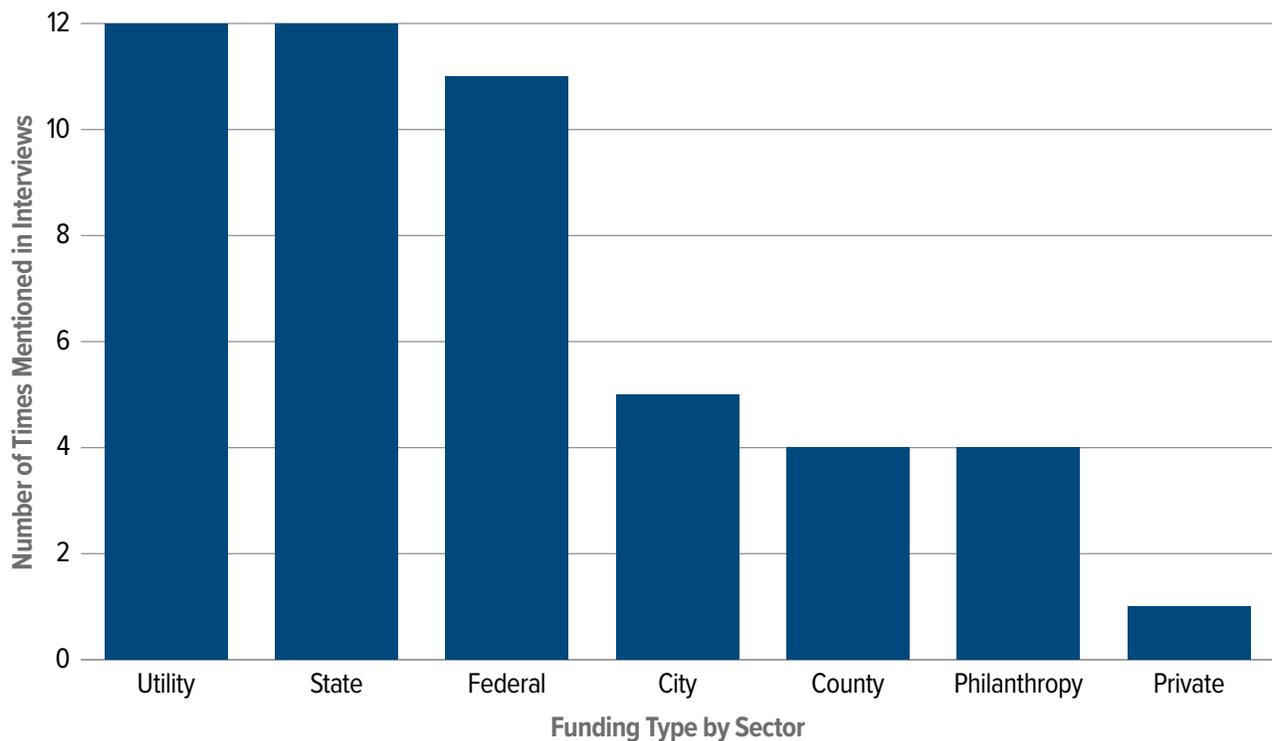


FIGURE 9: Policy Interventions by Key Area

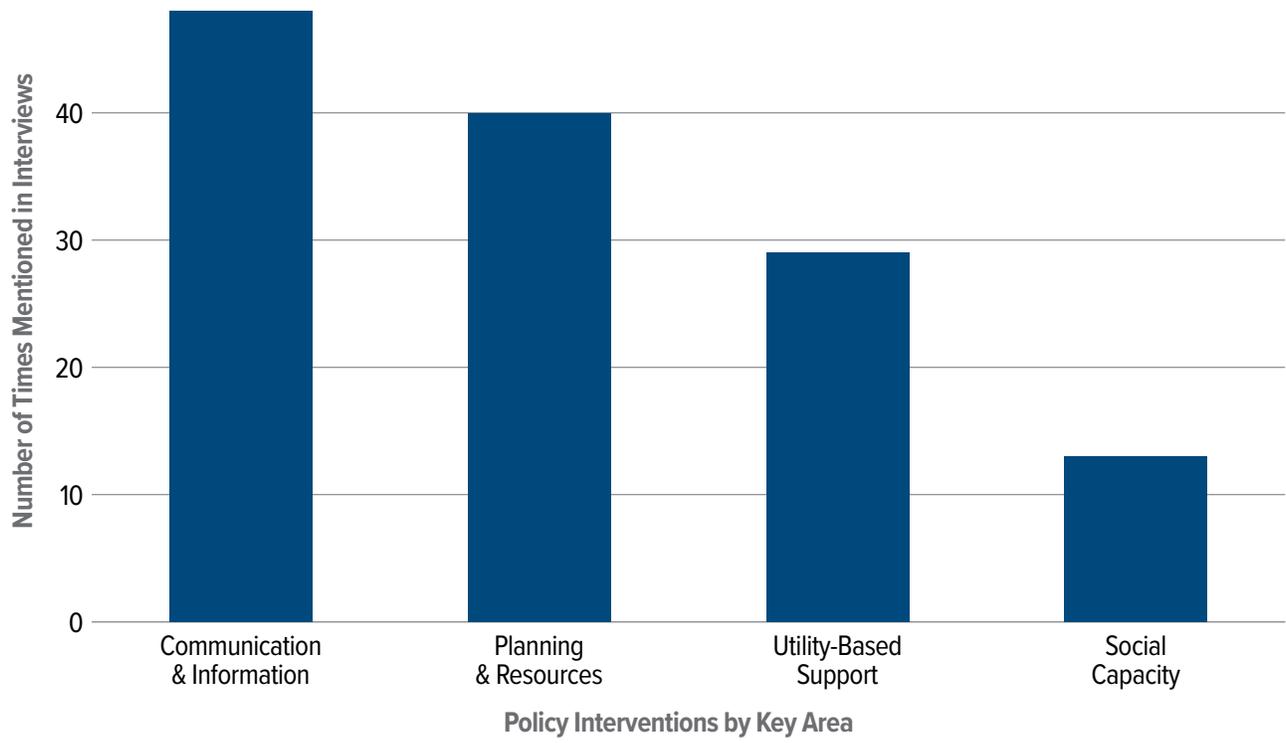
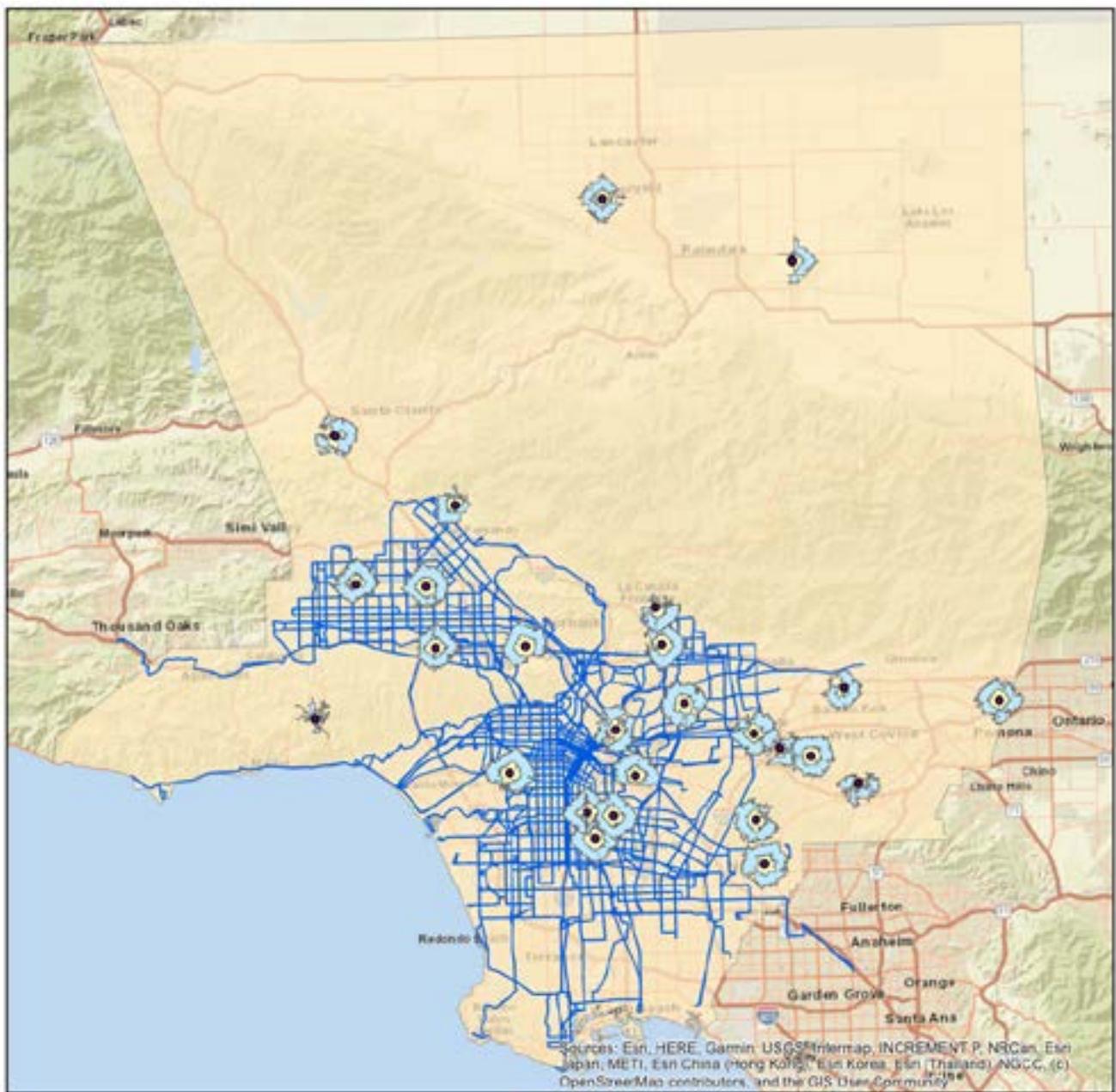


FIGURE 11: Accessibility Analysis Map for Public Transit



Legend

-  Cooling Center
-  Public Transit Accessibility Area (2 mile)
-  Public Transit Accessibility Area (1 mile)
-  LA County Boundary
-  Public Transit Line

TABLE 4: Cooling Center Deserts for Total Population

Supervisory district	Cooling Center Deserts			
	Percent of area inaccessible to driving	Percent of area inaccessible to transit	Percent of area inaccessible to walking	Percent of area inaccessible to all modes of modes
1	<0.1%	81.2%	94.7%	0.0%
2	6.1%	88.7%	96.6%	2.4%
3	30.1%	94.8%	98.5%	24.3%
4	56.7%	96.4%	99.0%	50.7%
5	71.1%	98.6%	99.6%	6.2%
Total	58.3%	96.5%	99.0%	12.0%

TABLE 5: Driving Cooling Center Deserts for Key Groups

Supervisory district	Percent of population out of driving service area						
	AIAN	Black	Latino	Age < 5	Age > 65	Poverty	Age > 65 in poverty
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	2.3%	1.3%	2.9%	3.0%	5.2%	2.3%	2.8%
3	1.0%	1.7%	0.7%	2.0%	4.1%	1.2%	1.6%
4	57.6%	51.3%	35.8%	47.0%	47.5%	45.8%	45.1%
5	6.5%	8.0%	7.3%	7.7%	5.5%	7.9%	5.8%

At least 79% of those identified as key groups are in a public transit Cooling Center desert for all Supervisory Districts. At least 90% of those identified as being in a key group are in a walking Cooling Center desert throughout all Supervisory Districts. The results of this accessibility analysis highlight the need for more localized Cooling Center alternatives that are accessible via public transportation and walking.

TABLE 6: Public Transit Cooling Center Deserts for Key Groups

Supervisory district	Percent of population out of public transit service area							
	AIAN	Black	Latino	Age < 5	Age > 65	Poverty	Carless	Age > 65 in poverty
1	79.5%	82.7%	70.7%	73.6%	77.0%	71.7%	78.5%	76.4%
2	83.8%	85.9%	80.1%	82.5%	88.9%	80.7%	84.0%	86.3%
3	88.3%	85.9%	80.8%	83.5%	89.9%	83.0%	88.7%	89.0%
4	93.7%	98.3%	90.1%	93.5%	94.3%	93.2%	94.6%	93.1%
5	88.3%	83.7%	85.9%	87.8%	87.1%	86.0%	80.5%	84.4%

TABLE 7: Walking Cooling Center Deserts for Key Groups

Supervisory district	Percent of population out of walking service area							
	AIAN	Black	Latino	Age < 5	Age > 65	Poverty	Carless	Age > 65 in poverty
1	95.3%	95.5%	91.0%	91.9%	92.9%	91.0%	92.3%	92.1%
2	95.9%	96.6%	93.4%	94.7%	96.8%	93.9%	95.6%	96.3%
3	96.2%	95.2%	93.1%	93.8%	97.1%	93.5%	95.6%	96.7%
4	98.2%	99.4%	96.9%	97.9%	98.3%	97.6%	97.3%	97.7%
5	96.1%	94.6%	95.4%	96.0%	96.4%	95.2%	93.8%	95.4%

Policy Evaluation

Heat adaptation requires a multifaceted policy approach to ensure that any intervention addresses extreme heat’s compounding problems.¹³⁹ Relatedly, policies focusing on individual or community adaptive capacity have different efficacies at different timescales, and different policies address different outcomes. As such, this research groups policy recommendations by Policy Classification Area Communications & Information, Planning Infrastructure, Social Capacity, and Utility-Based Support. These areas address four adaptive capacities and regions for improvement most commonly noted in interviews.

Further, the report not only classifies policies based on specific outcomes, but also separates these policies by time horizon to provide a package of policy options that is representative of the complexity needed to address heat adaptation. For consistency, the evaluation uses the timelines LAC established in its Countywide Sustainability Plan. However, this analysis omits long-term — the category for policies that serve the County beyond 2045 — and, in its place, adds an “immediate-term” category to account for the policies that OEM and other departments can utilize to serve

Angelenos in the upcoming 2021 Heat Season.¹⁴⁰ The corresponding horizons are as follows:

- » **Immediate-term:** Policies that provide resources for residents in the upcoming heat season. Some immediate-term solutions may not necessarily address LAC’s future heat adaptation goals, while others may lay important groundwork for future resilience. In both instances, these policies are classified as immediate-term because the benefits accrue instantaneously.
- » **Short-term:** Policies that the County will have implemented, operational, and active by 2025. These solutions may have extended benefits into the medium-term and beyond but represent benefits that accrue for the County in a relatively quick manner.
- » **Medium-term:** Policies that provide heat relief services further in the future by 2035. These interventions can necessitate changes to the built environment and primarily address underlying inequities that exacerbate personal vulnerabilities. These interventions require a longer timeframe to develop infrastructure and for benefits to accrue.

The analysis recommends the top-scoring policy for each of the four Policy Classification Areas (Communications & Information, Planning

¹³⁹ Dr. Jeremy Hess, in discussion with authors, March 3, 2021.

¹⁴⁰ “OurCounty: Los Angeles Countywide Sustainability Plan,” OurCounty (LA County Chief Sustainability Office), accessed March 2021, <https://ourcountyla.lacounty.gov/plan>.

Infrastructure, Social Capacity, and Utility-Based Support) as primary recommendations and the second scoring policy in each of the four classification areas as secondary recommendations. In some instances, within the top-scoring policies, select policies were categorized together for a combination recommendation. The overall policy score used to determine these primary and secondary rankings is the sum of the policy's Alignment, Efficacy, and Feasibility scores (see Equation 1), with Alignment weighted 0.5 of Efficacy and Feasibility. The overall numeric policy scores for each individual policy within each of the four Policy Classification Areas were ranked from highest to lowest, so the scoring was only compared for policies within these meta categories.

Finally, once the primary and secondary recommendations were obtained, their overall numeric scores and the Alignment, Feasibility, and Efficacy components were converted to "high," "medium," and "low" values for ease of interpretation. To obtain these values, the numeric

values for each policy ranking component (overall score, Alignment, Feasibility, and Efficacy) were sorted from highest to lowest, and were grouped by quartiles, with a low score reflecting the 25th percentile, a medium score reflecting the 50th percentile, and a high score reflecting the 75th percentile. The reason we used quartiles instead of raw scores is to more efficiently separate policies within their Classification Areas. Using quartiles instead of overall score ensured ease of intra-category comparisons. Thus, the quartile scores are highlighted within the "Policy Recommendation" section.

Table 8, next page, provides an overview of each of the 26 evaluated policies scored using the evaluative criteria, grouped by Primary and Secondary Recommendation(s), with the remainder of the policies grouped as Tertiary. This report recognizes the value in each scored Primary, Secondary, and Tertiary Policy, as each of the programs listed below are already implemented across the country.

TABLE 8: Overall Rankings for Evaluated Policies

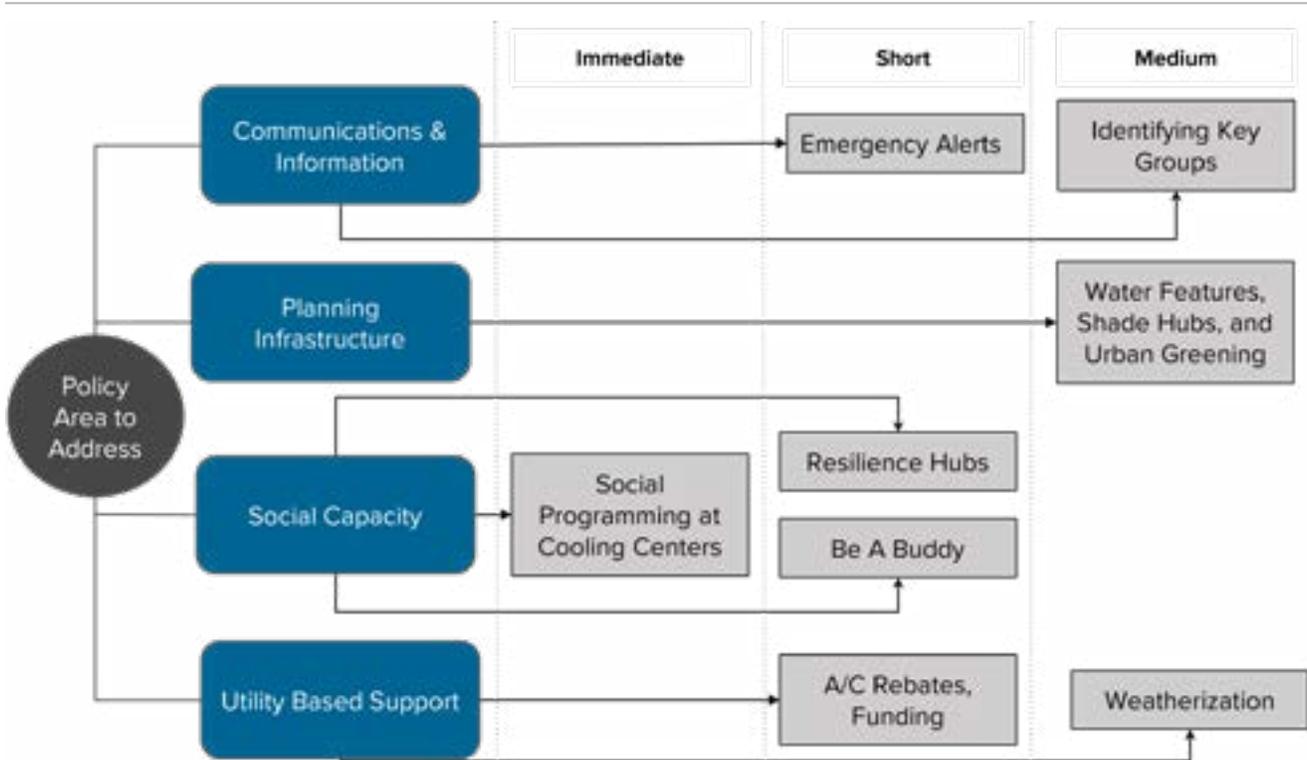
Communications & Information	Time Horizon	Recommendation Tier
Emergency Alerts	Short	Primary
Identifying Key Groups	Medium	Secondary
Climate & Heat Modeling	Short	Tertiary
Heat Awareness & Participation	Medium	Tertiary
Signage at Cooling Centers	Immediate	Tertiary
Surveying Cooling Center Target Populations	Immediate	Tertiary
Planning Infrastructure		
Shade Hubs	Medium	Primary
Urban Forests	Medium	Primary
Water Features	Medium	Primary
Cool Roofs, Walls	Medium	Tertiary
Cooling Center Infrastructure Improvements	Immediate	Tertiary
Cool Pavements, Streets	Medium	Tertiary
Social Capacity		
Be a Buddy (BaB)	Short	Primary
Resilience Hubs	Short	Primary
Social Programming at Cooling Centers	Immediate	Secondary
Business Preparedness, Support	Medium	Tertiary
Staff Training	Immediate	Tertiary
Utility-Based Support		
A/C Rebates, Funding	Short	Primary
Weatherization	Medium	Secondary
Bill Support	Medium	Tertiary
Community Infrastructure	Immediate	Tertiary
Cooling Centers	Short	Tertiary
Demand Response (DR)	Immediate	Tertiary

POLICY RECOMMENDATIONS

Decision Tree

The decision tree visually represents the combination of Primary and Secondary policy recommendations the County can utilize to address equitable heat adaptation planning and policy implementation. The goal of the decision tree is to offer flexible solutions the County can tailor to the policy area to address and the timeline of implementation. The tree begins by asking the policymaker which policy area in heat adaptation planning they want to address. The decision tree outlines three time frames in which the County can adopt these policies, as identified in the “Policy Evaluation” section. From here, the decision tree outlines each policy recommended in this report by respective timeframe and policy area. See Figure 13 below for a visualization of the policy recommendations.

FIGURE 13: Heat Adaptation Decision Tree



Overall Recommendations

The following section outlines each of the seven policy recommendations, separated by their overall Policy Classification Areas. The policies discussed are those with the highest overall scores within each Area.

► Policy Area 1: Communications & Information

Interviews highlighted that communications were one of the most significant barriers across heat adaptation programs. **Table 9** displays the top policy selected to address existing gaps in communications, notably with the general public.

Primary Policy Option: Emergency Alerts

Alignment (Medium): Emergency Alerts moderately align with LAC’s sustainability goals in a few key areas: improving community resilience, advancing infrastructure, and promoting community engagement. Emergency Alerts allow communities to better prepare for catastrophes and build a framework of disaster communication and knowledge. Cumulatively, Alerts foster resilient communication networks while better engaging communities in planning processes.

Efficacy (High): Emergency Alerts have a high Effectiveness score because they can reach a large percentage of the population and are highly accessible, as people can passively read a notification on their phone, hear PSAs on a radio, or see TV announcements. In addition, these Alerts

have significant health benefits because residents can plan appropriately for extreme events with increased knowledge and information. Finally, Emergency Alerts remain highly durable during extreme events, even when high heat persists.

Feasibility (Medium): Emergency Alerts are moderately Feasible, requiring minimal funding and physical or technical inputs, as social media, radio, or TV distribute these Alerts. The Alerts also require a moderate amount of internal and cross-departmental coordination, as well as communications with the National Weather Service at the federal level. See Figure 1 for a visualization of this communication structure. Finally, Emergency Alerts require a high degree of external coordination, as these messages must be widely distributed to the public.

Implementing Agency Partners: Existing Emergency Alerts rely on cross-departmental coordination. OEM might expect to work with agencies, including DPH, NWS, and with entities, like SCE, or nonprofits, such as Climate Resolve to better provide community-specific messaging.

TABLE 9: Primary Communications & Intervention Recommendation & Scoring

Policy Classification	Time Horizon	Alignment	Efficacy	Feasibility	Overall Score
Emergency Alerts	Short	Medium	High	Medium	High

Policy Area 1: Overview & Implementation

Emergency Alerts are already widely used and implemented; some examples include LADWP's outage notification service¹⁴¹ and CPA's significant event alerts.¹⁴² These signals can foster community resilience, engage residents in the coordination process, and improve communications between government and the general public.

While widespread, Emergency Alerts have barriers related to public outreach. First, Emergency Alerts do not reach those lacking a cell phone or internet access.¹⁴³ Second, Alert issuers sometimes do not print or distribute notifications in all necessary languages, creating barriers for non-native English speakers.¹⁴⁴ Third, interviewees highlighted that the type of messaging can be inadequate if not tailored for the community. For example, respondents highlighted how messaging around dying and vulnerability did not motivate seniors to prepare for an upcoming extreme heat event.^{145,146}

Despite their barriers, Emergency Alerts have the potential to be immensely beneficial if they address the highlighted obstacles. The agency in charge of deploying the Alerts should tailor and frame these messages specifically to community needs and use messaging that motivates action.^{147, 148} Most directly, the messages should be action-oriented, providing residents with the resources they need to proactively take steps to minimize their personal exposure to extreme heat. In addition, the County should prioritize multi-language alerts to minimize information access barriers. Emergency Alerts offer ancillary benefits, exemplified by a program in LA's Boyle

Heights neighborhood. One interview noted the community's use of a local PSA system to announce opportunities to access utility bill grants.¹⁴⁹ Boyle Heights highlights the potential for Alerts to directly impact financial resilience, which showcases the potential for Emergency Alert co-benefits. Emergency Alerts can be expanded to improve community resilience by offering tailored notifications that improve overall quality of life. These Alerts also have the potential to improve community cohesion, as community members can notify friends and neighbors of community-relevant opportunities via Alerts and word of mouth, which establishes a form of resilience-based camaraderie. The Alerts can also be used in tandem with other policies, such as BaB mentioned below, to direct residents towards existing resources. In sum, community-specific, tailored messaging has compounding, positive effects that lead to long-term resiliency benefits.

Tailoring notifications requires more funding for research and planning, but the results can ultimately save more lives during an emergency event. LAC should invest in improved community outreach to ensure their Alert messaging is highly targeted and tailored so communities can reap the lifesaving and ancillary benefits. Community voices and involvement should be central to this process. In addition, improving communications and coordination between CBOs and nonprofits, such as Climate Resolve, can help LAC better understand community needs and improve Emergency Alert and public communication channels.

¹⁴¹ Nancy Sutley and Steve Baule, in discussion with authors, February 2, 2021.

¹⁴² Dr. Monique Edwards-Greer, DBA and Tyler Aguirre, in discussion with authors, December 10, 2020.

¹⁴³ Ibid.

¹⁴⁴ Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela (Executive Director, Climate Planning & Resilience Coordinator, and Outreach Program Manager, Climate Resolve), in discussion with authors, January 29, 2021.

¹⁴⁵ Daphne Lundi, in discussion with authors, February 11, 2021.

¹⁴⁶ Carol Brown, in discussion with authors, February 9, 2021.

¹⁴⁷ Daphne Lundi, in discussion with authors, February 11, 2021.

¹⁴⁸ Carol Brown, in discussion with authors, February 9, 2021.

¹⁴⁹ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

► Policy Area 2: Planning Infrastructure

Combining Policy Options: Inequities in planning and resources exacerbate existing heat-risks. Water Features, Shade Hubs, and Urban Greening efforts are different policy options that aim to address a similar phenomenon: inequitable allocations of heat-management resources. The policies in **Table 10** represent those interventions that minimize inequities by bringing renewed resources and investment to areas lacking existing heat mitigation infrastructure. Identifying which neighborhoods lack these different resources serves as a proxy for identifying key groups in the absence of more robust data, again, as traditionally underserved communities face insufficient access water, shade, and urban greening elements. Determining if water access or shade will be more beneficial to a specific community is largely dependent on which of the resources that community lacks. This recommendation considers all three policies as a single category that cumulatively address inequities in resource availability but require location-specific inputs for practical implementation.^{150,151}

Compared to the other three intervention categories, the Planning Infrastructure scores skewed more heavily toward medium and low across all analyzed policies. This is not wholly unsurprising: these policies address larger infrastructure measures and are, accordingly, more expensive, less easily targetable to individuals within key groups, and require high levels of coordination and communication. The three policies listed scored highest within

the category and are combined because their Alignment, Efficacy, and Feasibility scores all fell within the same quartiles. The three policies do score highly for population reach, as they can be targeted toward specific localities and provide communitywide benefits, such as lowering ambient temperatures that residents may feel if LAC deploys these at scale. However, these policies cannot be easily evaluated for their contributions to individual-level thermoregulation services.

Primary Policy Options: Water Features, Shade Hubs, & Urban Greening

Alignment (Medium): these policies align with the County Sustainability Plan to varying degrees by enhancing local ecosystems (Urban Greening) or by indirectly allowing residents to thrive while promoting equitable land use without displacement (Shade Hubs and Water Features). Cumulatively, these policies moderately align with the County’s Plan.

Efficacy (Low): these programs have a low Efficacy score because their distinctive roles and impact can be indirect and limited. However, their Efficacy in providing public resources that help the County address extreme heat make them worth consideration.

Feasibility (Medium): Each of the policies included in this recommendation has different Feasibility scores due to their different input requirements. Shade Hubs and Water Features require significantly fewer resources and funding and can be deployed more rapidly when compared

TABLE 10: Primary Planning Infrastructure Recommendation & Scoring

Policy Classification	Time Horizon	Alignment	Efficacy	Feasibility	Overall Score
Water Features, Shade Hubs, and Urban Greening	Medium	Medium	Low	Medium	Medium

¹⁵⁰ Dr. George Ban-Weiss (Associate Professor, Civil and Environmental Engineering, University of Southern California (USC)), in discussion with authors, February 8, 2021.

¹⁵¹ Dr. Jeremy Hess, in discussion with authors, March 3, 2021.

to Urban Forests. Both Shade Hubs and Water Features also require less continued maintenance than Urban Greening. Across the three, the policies are moderately Feasible.

Implementing Agency Partners: given that all

three require significant changes to existing structures, OEM would likely have to coordinate with a variety of departments, including: Public Works, Department of Regional Planning, the County Chief Sustainability Office, as well as California Department of Transportation, and SCE.

Policy Area 2: Overview & Implementation

At their core, these three programs address spatial resource inequities in LAC.¹⁵² Increasing Shade and Water availability in communities lacking these resources can address some of the long-standing, underlying inequities borne out of redlining and land-use racism.^{153,154,155}

Operational barriers complicate these three programs. The types of plants used for greening have different overall impacts.¹⁵⁶ Some provide daytime shade, but may not reduce nighttime temperatures while others, especially succulents, do not have a direct shade benefit but can lower evening ambient temperatures to ensure nighttime cooling.¹⁵⁷ Urban Greening presents two competing issues: increasing shade while not dramatically increasing water use.¹⁵⁸ Trees, in particular, need regular watering during their first years in order to grow to maturity and maximize their ability to provide ecosystem services.^{159,160,161,162} One interviewer noted that Urban Greening is not a silver bullet in

addressing all of the facets of extreme heat.¹⁶³ More broadly, trees and other plants do provide shade and ambient cooling services but may not provide a direct benefit to limit human morbidity during an extreme heat event. Interviewees also cited budget concerns with government departments that supply Water Features, in particular, which burdens departments because of increased water bills in times of high heat.¹⁶⁴ Importantly, the three policies can only be utilized if they are made available in specific communities, meaning these programs are only as valuable as they are accessible.

Deploying any of these three mitigates heat exposure in many facets and provides many benefits. These interventions provide intermediary resource access when people are not in their own homes.¹⁶⁵ Residents challenged by a day's heat cycle can, at least partially, benefit from appropriate interventions that interrupt sun exposure on their transit routes.¹⁶⁶

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¹⁵² Ibid.

¹⁵³ Ibid.

¹⁵⁴ Kristin Baja, CFM, in discussion with authors, February 2, 2021.

¹⁵⁵ Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela, in discussion with authors, January 29, 2021.

¹⁵⁶ Dr. George Ban-Weiss, in discussion with authors, February 8, 2021.

¹⁵⁷ Ibid.

¹⁵⁸ Ibid.

¹⁵⁹ Edith de Guzman, in discussion with authors, February 3, 2021.

¹⁶⁰ Dr. Hilda Blanco (Project Director, Center for Sustainable Cities, METRANS Transportation Center, Sol Price School of Public Policy, University of Southern California (USC); Professor Emeritus, Dept. of Urban Design and Planning, College of Built Environments, University of Washington), in discussion with authors, January 29, 2021.

¹⁶¹ Irene Ogata, in discussion with authors, January 27, 2021.

¹⁶² Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

¹⁶³ Dr. Ladd Keith (Assistant Professor at University of Arizona; Chair, Sustainable Built Environments Program), in discussion with authors, January 7, 2021.

¹⁶⁴ Irene Ogata, in discussion with authors, January 27, 2021.

¹⁶⁵ Dr. Ladd Keith, in discussion with authors, January 7, 2021.

¹⁶⁶ Ibid.

Policy Area 2: Overview & Implementation (continued)

Creating vibrant, public green spaces also can improve social cohesion, especially when placed in regions where the government has not traditionally offered these provisions.¹⁶⁷ The benefits green spaces provide is especially true in the COVID-19 era, where outdoor, physically distanced places provide a safe place for residents to find respite from the heat.¹⁶⁸ Further, implementing water-related features in marginalized communities addresses existing water inequities and merges conversations about water availability with extreme heat, thus bringing awareness to an intersection previously left out of planning and policymaking conversations.¹⁶⁹

The County must take several steps to ensure long-term success of the different policy options. LAC will need to continually maintain planted trees: without appropriate watering, these plants will not survive.^{170,171} The County can also involve the private sector in some Water

Feature offerings, particularly in allowing stores to provide water to shoppers, which may help ensure program success.¹⁷² Cross-department and cross-sector collaboration can help mitigate budget concerns with Urban Greening and Water Features. For example, Tucson Water provided grants and rate reduction for the City's Park and Recreation Department to address their budgetary limitations.¹⁷³ In the future, LAC could outfit Shade Hubs on bus stops with digital screens that provide community-specific information and announcements, thus improving communications and outreach to the public.¹⁷⁴

In sum, Water Features, Shade Hubs, and Urban Greening each provide community-specific benefits and offer avenues for lasting resilience. These interventions can improve infrastructure and social cohesion, increase communications, and improve thermoregulation offerings built into the community landscape.

¹⁶⁷ Dorette Quintana English, MA (Health Planning and Policy Specialist, Office of Health Equity at California Department of Public Health), in discussion with authors, February 16, 2021.

¹⁶⁸ Daphne Lundi, in discussion with authors, February 11, 2021.

¹⁶⁹ Dr. Gregory Pierce (UCLA Luskin Center for Innovation, Senior Researcher & Associate Director), in discussion with authors, February 5, 2021.

¹⁷⁰ Edith de Guzman, in discussion with authors, February 3, 2021.

¹⁷¹ Dr. Hilda Blanco, in discussion with authors, January 29, 2021.

¹⁷² Carol Brown, in discussion with authors, February 9, 2021.

¹⁷³ Irene Ogata, in discussion with authors, January 27, 2021.

¹⁷⁴ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

► Policy Area 3: Social Capacity

Combining Policy Interventions: BaB and Resilience Hubs are distinct policy options that the County can deploy in tandem to enhance a community’s capacity to respond to extreme heat. These two programs address similar underlying dynamics, with the former tapping into existing social networks to ensure public safety and the latter leveraging existing community trust to provide comprehensive, community-specific services beyond heat assistance.^{175,176} It may prove advantageous for the County to approach these programs simultaneously: deploying Resilience Hubs in specific communities and also building out BaB programs require similar engagement with community groups and, if done together, can help the County reduce implementation redundancies. **Table 11** shows their respective scoring.

Primary Policy Options: Be a Buddy & Resilience Hubs

Alignment (High): both programs align highly with LAC’s Sustainability plan, namely they promote community engagement, build resilient infrastructure, empower local residents, and

leverage partnerships to achieve stated goals.

Efficacy (High and Medium): BaB is highly Effective, owing mainly to its durability during extreme heat events and its tailorability in serving target groups. Resilience Hubs offer similar Effectiveness; however, the Hubs generally rely on more built infrastructure than BaB and, as such, have a slightly lower Efficacy score.

Feasibility (High-Medium): Resilience Hubs are moderately Feasible due to the high communication requirements both between government agencies and CBOs and between CBOs and community members. BaB, by comparison, has lower total costs, even with high communication requirements because the program requires few physical infrastructure inputs. In comparison with Resilience Hubs’ built infrastructure requirements, BaB is more Feasible.

Implementing Agency Partners: most of the coordination would rely heavily on the CBOs, such as Climate Resolve, which would take the lead in coordinating efforts to implement both programs.

TABLE 11: Primary Social Capacity Recommendations & Scoring

Policy Classification	Time Horizon	Alignment	Efficacy	Feasibility	Overall Score
Be a Buddy	Short	High	High	High	High
Resilience Hubs	Short	High	High	Medium	High

¹⁷⁵ Ibid.

¹⁷⁶ Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela, in discussion with authors, January 29, 2021.

Policy Area 3: Overview & Implementation

Resilience Hubs offer the cooling services that existing County Centers currently provide, but far surpass basic A/C provisions. Specifically, these programs rely on trusted CBOs that work to build existing social infrastructure in local communities. These programs aim to create Hubs that shift power dynamics away from often distrusted government agencies, towards more trusted community partners.^{177,178,179} Moreover, these Hubs also provide more holistic wrap-around services – water, ice, wireless internet, health services, and other essential provisions in extreme events and non-extreme events.¹⁸⁰ The Hubs themselves can often be outfitted with resilient energy infrastructure, such as microgrids, to help ensure that they remain powered during emergency events.¹⁸¹ Further, the USDN provides baseline guidance and information for communities interested in implementing Resilience Hubs to help ensure that localities do not need to start from scratch, all of which is based on community needs and done in co-development with the specific community.¹⁸² While Resilience Hubs do not purport to solve underlying climate change causes, they do provide spaces that are reflective of community needs and, in doing so, can avoid the low-usage issues that hinder Cooling Centers.^{183,184,185}

Likewise, BaB programs leverage existing social dynamics to involve residents in localized

resiliency measures and improve social cohesion. BaB works with CBOs to identify which neighborhoods face the most climate risk and establishes a program where community members check on neighbors who potentially face the most harm from extreme events.^{186,187}

Both Resilience Hubs and BaB have similar requisite steps to begin: 1) identifying which communities are in most need of these services and 2) identifying the organizations that will implement the program.¹⁸⁸ These two steps are closely interrelated, with CBOs having a good sense of which communities will be most receptive and understanding which community partners will best deploy the services. Moreover, these shared “start-up costs” underscore why both of these programs may benefit from simultaneous implementation in LAC.

Importantly, both interventions are operational, and the County can turn to best practices from the City of LA and NYC to understand how to best implement these programs for key groups. LA is already working towards implementing a robust Resilience Hub in Boyle Heights. The Hub itself represents a multi-layer partnership with City partners, including LADWP and the Mayor’s Office of Resilience, local nonprofits, including Climate Resolve and Boyle Heights Arts Conservatory, and national organizations, like the American Red Cross and the Urban Sustainability Directors Network.^{189,190,191}

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¹⁷⁷ Ibid.

¹⁷⁸ Kristin Baja, CFM, in discussion with authors, February 2, 2021.

¹⁷⁹ Edith de Guzman, in discussion with authors, February 3, 2021.

¹⁸⁰ Kristin Baja, CFM, in discussion with authors, February 2, 2021.

¹⁸¹ Ibid.

¹⁸² Kristin Baja, CFM, in discussion with authors, February 2, 2021.

¹⁸³ Ibid.

¹⁸⁴ Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela, in discussion with authors, January 29, 2021.

¹⁸⁵ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

¹⁸⁶ Daphne Lundi, in discussion with authors, February 11, 2021.

¹⁸⁷ Edith de Guzman, in discussion with authors, February 3, 2021.

¹⁸⁸ Ibid.

¹⁸⁹ Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

¹⁹⁰ Kristin Baja, CFM, in discussion with authors, February 2, 2021.

¹⁹¹ Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela, in discussion with authors, January 29, 2021.

Policy Area 3: Overview & Implementation (continued)

From the implementation side, while LA is a key funder, their role going forward will become more passive but engaged, providing emergency preparedness education, technical support, and financial backing, but not directly operating the Hub.¹⁹²

In NYC, BaB is already past the proof-of-concept phase, and select communities in the South Bronx, Northern Manhattan, and Central Brooklyn are currently piloting the program. LAC could similarly implement these programs locally, focusing on key groups and locations. Overall, BaB ensures that hard-to-reach individuals are better connected to social networks during extreme heat emergencies and, at a larger scale, further improves community cohesion.

Neither program is a silver bullet and both face challenges. The need for strong community partners challenges both and requires that the County take a more hands-off approach, acting as a funder rather than a direct program

implementer. Choosing specific communities for implementation requires that the County work closely with trusted community partners to appropriately identify which localities will benefit from such programs. In addition, the County may face issues providing sufficient resources to meet potentially strong demands for these programs. Moreover, the programs do not currently have appropriate evaluation metrics. There is an inherent tension with the difficulty in measuring important indicators, such as improved sense of security, and in ensuring that metrics collected align with existing funding streams.¹⁹³

Yet, program evaluation is not a deal-breaker for the County to deploy these programs, and LAC can actively work with CBOs to collect information that ensures that both programs are providing the services residents require. The County can also work with CBOs to develop and track these metrics to align with State and local funding availability.¹⁹⁴

¹⁹² Aaron Gross and Craig Tranby, in discussion with authors, February 17, 2021.

¹⁹³ Kristin Baja, CFM, in discussion with authors, February 2, 2021.

¹⁹⁴ Daphne Lundi, in discussion with authors, February 11, 2021.

Policy Area 4: Utility-Based Support

Utility Programs address home-level thermal comfort or energy assets that undergird utility provisions. **Table 12** shows the policy recommendation.

Primary Policy Option: A/C Rebates, Funding

Alignment (Medium): A/C access corresponds with increased net energy demand, against sustainability goals. However, the policy does meet specific goals of the Plan, namely: providing people with potentially life-saving units without them needing to leave their homes.

Efficacy (High): A/C units provide immediate, life-saving benefits that the other policy interventions do not. In a heat emergency, where key groups can suffer the most, in-home A/C access proves essential in preserving health and comfort. Importantly, residents do not need to leave their homes to reap the cooling benefits, thus

making this intervention highly accessible. A/C scores highly because of its direct life-saving contributions, accessibility, and tailorability to Angelenos most in need. Note the Efficacy score was so high that it outweighed the medium Alignment and Feasibility scores, leading to the overall high policy score.

Feasibility (Medium): new A/C units are expensive, but programs exist help offset the costs of purchasing new systems. Funding availability can help guarantee A/C access, but the overall costs and the communication requirements — to customers and among the public and private firms involved in installing units — makes the program moderately Feasible.

Implementing Agency Partners: these programs are necessarily implemented by electric utilities, including SCE and the County’s other, municipal electricity providers.

TABLE 12: Primary Utility-Based Support Intervention & Scoring

Policy Classification	Time Horizon	Alignment	Efficacy	Feasibility	Overall Score
A/C Rebates, Funding	Short	Medium	High	Medium	High

Policy Area 4: Overview & Implementation

Across interviews, respondents were clear that during an extreme heat event, A/C saves lives.^{195,196,197,198} For people unable to leave their homes, like homebound seniors, or those lacking transit access to reach public Cooling Centers, direct A/C access can provide a dual benefit: immediately lowering internal temperature and ensuring that residents do not have to leave their homes. Programs that provide A/C can be impactful because LA has no codes requiring that buildings be cooled to a specified temperature or requiring homes to have A/C.¹⁹⁹ Further, as climate patterns in LAC change, utilities can begin to target A/C deployment to regions and communities more prone to heat's deleterious impacts.²⁰⁰

A/C programs face barriers in implementation. First, A/C programs are reliant on external funding, which often comes from utilities.²⁰¹ While utility funding is not an inherent barrier, increasing A/C use exacerbates issues that run counter to larger state goals, such as reducing energy consumption, and can increase demand during peak periods when the grid is already strained.²⁰² Therefore, it can be difficult for utilities to justify their support.²⁰³ To remain useful, LAC must ensure that provided A/C units are properly maintained so their overall capacity and efficiency does not diminish.²⁰⁴ However, A/C maintenance requires additional communications with customers and additional

utility resources. Further, A/C programs often need complementary bill support offerings to ensure that people are not discouraged from using A/C for fear of high utility bills.^{205,206}

These barriers are not so insurmountable as to make the policy ineffective and implementing a program to provide A/C to Angelenos could likely happen in a variety of manners. One possibility is a collaboration with SCE, LAC's Community Choice Aggregation program (CCA), Clean Power Alliance (CPA), and other municipal utilities, to identify which customers most need A/C units. SCE and CPA could identify customers by rate class to better isolate which customers rely on electric-powered medical machines within their service territory.²⁰⁷ While imperfect, understanding who uses these specific rates might serve as a proxy for identifying key groups impacted by extreme heat.²⁰⁸ Another, or complementary, avenue could be for utilities and the County to work with local philanthropic and nonprofit groups to secure grant funding to deliver A/C units to key groups.^{209,210}

For this program to be most successful and to provide services to customers without unduly exacerbating climate change, the County will need to explore complementary clean energy programs. CPA's work to increase the proportion of the County's energy generated by clean sources is one such action.²¹¹

¹⁹⁵ Dr. George Ban-Weiss, in discussion with authors, February 8, 2021.

¹⁹⁶ Dr. Jeremy Hess, in discussion with authors, March 3, 2021.

¹⁹⁷ Dorette Quintana English, MA, in discussion with authors, February 16, 2021.

¹⁹⁸ Daphne Lundi, in discussion with authors, February 11, 2021.

¹⁹⁹ Dr. Elizabeth Rhoades, in discussion with authors, February 17, 2021.

²⁰⁰ Edith de Guzman, in discussion with authors, February 3, 2021.

²⁰¹ Nancy Sutley and Steve Baule, in discussion with authors, February 2, 2021.

²⁰² Ibid.

²⁰³ Ibid.

²⁰⁴ Ibid.

²⁰⁵ Ibid.

²⁰⁶ Daphne Lundi, in discussion with authors, February 11, 2021.

²⁰⁷ Dr. Monique Edwards-Greer, DBA and Tyler Aguirre, in discussion with authors, December 10, 2020.

²⁰⁸ Ibid.

²⁰⁹ Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela, in discussion with authors, January 29, 2021.

²¹⁰ Rev. Vernon K. Walker, in discussion with authors, February 16, 2021.

²¹¹ Dr. Monique Edwards-Greer, DBA and Tyler Aguirre, in discussion with authors, December 10, 2020.

DISCUSSION

LAC is and will continue to be challenged by more intense and frequent extreme heat events. Addressing extreme heat is complicated, and solutions to improve the County's response and Angelenos' resilience depends on both the policy area and the timeline for impact. For example, solutions that reduce the UHI effect in the medium-term cannot readily compare to short-term, life-saving programs that provide A/C to key groups. Thus, based on over 35 interviews, an extensive literature review, and a spatial analysis of the County's current Cooling Center services, this research's recommendations aim to address the complexity of heat intervention by offering multiple issue-area solutions that address adaptation and equity in the immediate, short, and medium terms.

Secondary Recommendations

This report analyzed 26 policies and recommended seven Primary interventions, grouped into four categories. Locales throughout the country have successfully implemented each of the policies discussed. To properly highlight the importance of a select group of these interventions, the following sections will briefly highlight some key elements of the Secondary Recommendations.

Secondary Communications & Information Recommendation: Identifying Key Groups

LAC has already highlighted the importance of Identifying Key Groups, who are more likely to face extreme heat's impacts, through their forthcoming Climate Vulnerability Assessment.²¹² The Assessment identifies those who climate change will harm most acutely and those who have been least likely to participate in County planning

initiatives.²¹³ LAC could use the Assessment to better understand where to deploy programs that address the UHI effect through changing urban land cover.²¹⁴ More broadly, LAC can use the information to pilot new programs that address other compounding susceptibilities. Notably, interviewees discussed the need to provide thermoregulation services to specified labor groups and for schools.²¹⁵ The Assessment will also help the County identify where housing, A/C, water availability, and other basic quality of life services are inadequate.²¹⁶ Identifying Key Groups has high research and data requirements, but the results will prove invaluable in developing equity-based solutions for extreme heat mitigation and adaptation.

Secondary Social Capacity Recommendation: Social Programming at Cooling Centers

While the purpose of this report is to identify alternatives to Cooling Centers, this recommendation offers improvements to existing infrastructure beyond Cooling services. This intervention is also the only immediate-term solution proposed among the Primary and Secondary recommendations. Social programming tackles several outlined Cooling Center issues while enhancing overall social cohesion, improving sense of community, and motivating LAC to better engage with nearby communities. Prioritizing social programming makes public spaces more welcoming by serving a community-driven purpose. Improved social cohesion also boosts community resilience, which can empower key groups to collectively withstand heat events. These

²¹² Kristen Torres Pawling, Alison Frazzini, and Rebecca Ferdman, in discussion with authors, February 2, 2021.

²¹³ Ibid.

²¹⁴ Ibid.

²¹⁵ Ibid.

²¹⁶ Dr. Ladd Keith, in discussion with authors, January 7, 2021.

improved sites could offer similar programming as WDACS Senior Centers: support services, Bingo, Zumba Classes, line dancing, or numerous other engagement programs.²¹⁷ However, the County must engage with residents to best determine their needs. In a much broader sense, community engagement requires that the County maintain full transparency to build trust among residents and better understand the personal stories, narratives, and history of community members; both facets will be critical to forge improved relationships between the County and general public and make Cooling Centers more inviting spaces, especially for key groups.²¹⁸ In addition, OEM can collaborate with WDACS to better understand the logistics and technicalities of developing and implementing programs tailored to community needs. This intervention may add financial strain on departments running the Centers, but the potential community benefits are immense.

Secondary Utility-Based Support Recommendation: Weatherization

Weatherization programs offer several financial and health benefits to traditionally underserved households. Weatherized homes are more energy-efficient than those without this modernization, which reduces GHG emissions and lessens energy bills for low-income households.²¹⁹ Advancing home efficiency not only improves residents’

ability to thermoregulate, but also improves health outcomes through updated insulation and air ventilation systems.²²⁰ Decreased bills and enhanced indoor comfort also promote increased mental health outcomes. However, research highlights that the application process and surrounding communication requirements often serve as a barrier to the program.²²¹ Further, Weatherization programs can lead to green gentrification, as it may increase property values and displace current inhabitants.^{222,223,224} However, despite their barriers, Weatherization programs are highly Effective and targetable. Importantly, California’s Low-Income Weatherization Program (LIWP) – overseen by the Department of Community Services and Development (CSD) – does not have the same immigration status documentation requirements as federal energy efficiency programs, thus improving accessibility for undocumented immigrants.²²⁵ Moreover, the program offers more comprehensive, full building retrofits than the weatherization programs that the state IOUs offer.²²⁶ To improve Weatherization programs and ensure that they maintain their success, the County should seek to streamline the state and federal application process and offer support to residents through increased awareness, application support, and target outreach towards key groups.

TABLE 13: Secondary Communications & Information Recommendation & Scoring

Policy Classification	Time Horizon	Sustainability	Efficacy	Feasibility	Overall Score
Identifying Key Groups	Medium	High	Medium	Low	Medium

²¹⁷ Ellie Wolfe and Billy Yeung, in discussion with authors, February 9, 2021.

²¹⁸ Dr. Alessandra Jerolleman, MPA, CFM, in discussion with authors, February 3, 2021.

²¹⁹ “Weatherization Assistance Program,” U.S. Department of Energy (Office of Energy Efficiency & Renewable Energy, January 2021).

²²⁰ Ibid.

²²¹ Tara Siegel, “Barriers to Weatherizing California: An Examination of the Weatherization Assistance Program’s Challenges to Serving Low Income Multifamily Rental Housing” (California Housing Partnership Corporation, 2012), pp. 1-34.

²²² Dr. Ladd Keith, in discussion with authors, January 7, 2021.

²²³ Shina Robinson, in discussion with authors, March 2, 2021.

²²⁴ Jamal Lewis, Diana Hernández, and Arline T. Geronimus, “Energy Efficiency as Energy Justice: Addressing Racial Inequities through Investments in People and Places,” *Energy Efficiency* 13, no. 3 (2019): pp. 419-432, <https://doi.org/10.1007/s12053-019-09820-z>.

²²⁵ Shina Robinson, in discussion with authors, March 2, 2021.

²²⁶ Ibid.

TABLE 14: Secondary Social Capacity Recommendation & Scoring

Policy Classification	Time Horizon	Sustainability	Efficacy	Feasibility	Overall Score
Social Programs at Cooling Centers	Immediate	Medium	High	Medium	Medium

In Contra Costa County, Public Health Services nurses reached out to residents about Weatherization services – this is a useful method of information dissemination that can be replicated in LAC.²²⁷ LAC should also work with various stakeholders and housing authorities to minimize any communication issues that arise during the weatherization process. In addition, anti-displacement measures should be put in place, similar to those in the SGC’s TCC program, to ensure that weatherized homes do not relocate existing inhabitants.²²⁸

Funding Alignment and Evaluation Metrics

Beyond the report’s directly mentioned Cooling Center alternatives, there are additional programs and offerings the County can consider in enhancing its heat adaptation services. First, many interviewees mentioned two common barriers: difficulty funding the programs and issues in measuring program Effectiveness. There are existing funding streams that rely on evaluation metrics, providing a solution to address both issues.²²⁹ As the interviews found, the most promising areas of funding are from federal or state sources, aside from the numerous utility

offerings. For example, FEMA’s BRIC grants fund projects that improve hazard capacity building, through specified infrastructure improvements and partnership developments, among other predetermined criteria.²³⁰ The County can develop projects that best align with BRIC funding criteria to increase their chances of securing funding. At the state level, the SGC also funds key projects, like the aforementioned TCC, targeted at groups most impacted by heat and evaluates these programs based on GHG reductions.²³¹ Therefore, the County could develop programs that reduce GHG emissions and track how their programs impact these reductions, aligning with state funding avenues. There are numerous other examples of funding alignment opportunities, and LAC could look to potential funders to motivate future evaluation metrics.

Like the report’s policy recommendations, the evaluation and metrics cannot be generalized: how the County collects data about the programs it implements, and the most advantageous data to collect, will depend greatly on the policy’s intended outcome. Again, metrics for programs that lower heat morbidity will be different from those that aim to increase tree coverage. This report does not purport that metrics are the end-all and be-all for

TABLE 15: Secondary Utility-Based Support Recommendation & Scoring

Policy Classification	Time Horizon	Sustainability	Efficacy	Feasibility	Overall Score
Weatherization	Medium	Medium	High	Low	Medium

²²⁷ Dorette Quintana English, MA, in discussion with authors, February 16, 2021.

²²⁸ Shina Robinson, in discussion with authors, March 2, 2021.

²²⁹ Daphne Lundi, in discussion with authors, February 11, 2021.

²³⁰ “Before You Apply for Building Resilient Infrastructure and Communities (BRIC) Funds” Federal Emergency Management Agency, Retrieved April 2021, <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities/before-apply#eligibility>

²³¹ “Transformative Climate Communities” California Strategic Growth Council. Retrieved Mar 25, 2021 from https://sgc.ca.gov/programs/tcc/docs/20200214-Fact_Sheet-TCC.pdf

climate adaptation but does suggest that having metrics can enable the County to more readily apply for federal and state funding.²³²

Extreme Heat Working Group

Beyond metrics and evaluation, the County might also consider creating an Extreme Heat Working Group. In talking to County interviewees, it is apparent that LAC's departments work in close collaboration during extreme heat emergencies and coordinate on technical assessment and plans related to extreme heat, like the Sustainability Plan and Climate Vulnerability Assessment.^{233,234,235,236}

However, there may be a specific benefit in bringing together County departments in a more directed planning capacity. In San Francisco, the City created an Extreme Heat Coalition Working Group that connects various government entities – such as the Department of Emergency Management, the San Francisco Public Utilities Commission, the City Administrator – to proactively plan for upcoming extreme heat events, rather than responding to immediate-term threats.²³⁷ The

Working Group creates a regular standing space for different groups to collaborate on extreme heat adaptation, and membership is expanding to include CBOs, academics, and others engaged in extreme heat planning.²³⁸ A similar, locally-based working group is the Los Angeles Urban Cooling Collaborative, co-founded by Edith de Guzman, which brings together stakeholders from universities, nonprofits, and government agencies across the country to research and implement cooling solutions that promote improved public health outcomes.²³⁹ The County already has avenues that would make a dedicated Extreme Heat Working Group fairly seamless, with County departments already in close contact through the Countywide Sustainability Plan. LA was also engaged in these planning processes, adding further benefit through increased stakeholder engagement. In sum, a dedicated Extreme Heat Working Group with membership across numerous departments and organizations has the potential for large-scale impacts across the entire County.

²³² Kristin Baja, CFM, in discussion with authors, February 2, 2021.

²³³ Ramon Bernal, in discussion with authors, February 10, 2020.

²³⁴ Dr. Caroline Chen and Thuy Hua, in discussion with authors, February 3, 2021.

²³⁵ Ellie Wolfe and Billy Yeung, in discussion with authors, February 9, 2021.

²³⁶ Kristen Torres Pawling, Alison Frazzini, and Rebecca Ferdman, in discussion with authors, February 2, 2021.

²³⁷ Matt Wolff (Climate and Health Program Manager, San Francisco Department of Public Health (SFDPH)), in discussion with authors, February 9, 2021.

²³⁸ Ibid.

²³⁹ Edith de Guzman, in discussion with authors, February 3, 2021.

APPENDICES

Appendix I: Climate Change and Health Vulnerability Indicators (CCHVI)

CCHVI were developed by the CalBRACE Project with support from the Centers for Disease Control and Prevention. Table 16 highlights heat risk indicators based on population factors.

Population Sensitivity Domain¹

TABLE 16: CDPH CCHVI Population Sensitivity Indicators

Sustainability	Indicator Definition
Children	Percent of population aged less than 5 years
Elderly	Percent of population aged 65 years or older
Poverty	Percent of population whose income in the past year was below poverty level
Education	Percent of population aged >=25 years with less than a four-year college educational attainment
Race and Ethnicity	Percent of population of color
Outdoor Workers	Percent of population employed and aged >=16 years working outdoors
Vehicle Ownership	Percent of occupied households with no vehicle ownership
Linguistic Isolation	Percent of households with no one aged >=14 years speaking English
Physical and Mental Disability	Percent of population living with physical disability. Percent of population living with mental disability
Health Insurance	Percent of population without health insurance
Violent Crime Rate	Number of violent crimes per 1,000 residents

Adaptive Capacity Domain²

Table 17 highlights select adaptive capacities to mitigate heat risk.

TABLE 17: CDPH CCHVI Adaptive Capacities

Indicator	Indicator Definition
Air Conditioning	Percent of households without air conditioning
Tree Canopy	Percent of area not covered by tree canopy
Impervious Surfaces	Percent of area covered by impervious surfaces
Public Transit Access	Percent of population not residing within 0.5 mile of bus/ferry/ferry stop with <15 minutes waiting time during peak commute hours

¹ These factors were taken directly from the California Department of Public Health's Climate Change and Health Vulnerability Indicators. See: "CDPH Climate Change and Health Vulnerability Indicators," accessed March 2021, <https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx>.

² These factors were taken directly from the California Department of Public Health's Climate Change and Health Vulnerability Indicators. See: "CDPH Climate Change and Health Vulnerability Indicators," accessed March 2021, <https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx>.

Appendix II: OurCounty Countywide Sustainability Plan Goals³

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- GOAL 1:** Resilient and healthy community environments where residents thrive in place
-
- GOAL 2:** Buildings and infrastructure that support human health and resilience
-
- GOAL 3:** Equitable and sustainable land use and development without displacement
-
- GOAL 4:** A prosperous LA County that provides opportunities for all residents and businesses and supports the transition to a green economy
-
- GOAL 5:** Thriving ecosystems, habitats, and biodiversity
-
- GOAL 6:** Accessible parks, beaches, recreational waters, public lands, and public spaces that create opportunities for respite, recreation, ecological discovery, and cultural activities
-
- GOAL 7:** A fossil fuel-free LA County
-
- GOAL 8:** A convenient, safe, clean, and affordable transportation system that enhances mobility while reducing car dependency
-
- GOAL 9:** Sustainable production and consumption of resources
-
- GOAL 10:** A sustainable and just food system that enhances access to affordable, local, and healthy food
-
- GOAL 11:** Inclusive, transparent, and accountable governance that facilitates participation in sustainability efforts, especially by disempowered communities
-
- GOAL 12:** A commitment to realize OurCounty sustainability goals through creative, equitable, and coordinated funding and partnerships
-

³ Note the goals are taken directly from the Countywide Sustainability Plan, See: OurCounty: Los Angeles Countywide Sustainability Plan,” OurCounty (LA County Chief Sustainability Office), accessed March 2021, <https://ourcountyla.lacounty.gov/plan>

Appendix III: Interview Methodology & Participants

Interviews lasted 30 to 60 minutes and encompassed three main areas: historical ways the stakeholder has addressed extreme heat, management of emergency situations, and future plans to address extreme heat. Interview questions remained largely the same for participants across sectors and were written in an accordion style, such that each main question led to subsequent follow ups. For a sample of the questions see “Sample Interview Script,” below.

Each interview was recorded, with consent, and accompanying written notes were taken to supplement the audio. Consent was obtained to use each interviewee’s name and affiliation within the report. Once the report was finalized, a draft version was distributed to each of the over 35 interviewees, wherein they confirmed the locations they were cited to ensure proper representation.

Sample Interview Script

Consent Script

- » Do you consent to having this interview recorded and having your name and position used in our final report?

APP Overview Script

We are Masters of Public Policy students. As part of our capstone project, we are working with the LA County Office of Emergency Management to research innovative programs or efforts to address extreme heat exposure. In particular, we are focusing on efforts aside from Cooling Centers that target key groups (such as low-income individuals, the elderly, and minority populations).

COVID-19 has drastically changed how Cooling Centers operate, with social distancing guidelines, and the heightened risk of infection if LA County residents use these services to keep cool. These changes will continue into 2021. Thus, we are focusing on alternatives to Cooling Centers that can allow for better adaptation during COVID-19 and as the need for extreme heat planning increases.

Interview Questions

- » First, could you briefly describe your current role and the work you are doing on extreme heat planning?

Historical Ways of Addressing Extreme Heat

- » What are the most innovative efforts (1-2 maximum) that your department has implemented in the past 5 years to address extreme heat? Explain how those programs developed over time.
 - ◇ How long have these programs been in place?
 - ◇ What resources are available to them? (i.e., training, best practices, research, consulting, etc.)
 - ◇ Who oversees them?
 - ◇ How were these programs funded?
 - ◇ What are the most effective aspects of these heat resiliency efforts?
- » Did any unforeseen issues occur during implementation of these efforts?
 - ◇ What is the best way to resolve these issues?
 - ◇ Do any issues arise in working between departments or coordinating with multiple localities/levels of government?
 - ◇ What about issues with funding streams or other logistics?

- » How does your department evaluate programmatic success?
 - ◇ How can you ensure your heat resiliency programs meet this threshold of success?
- » What specific groups, in the context of extreme heat, does your organization consider as most impacted by extreme heat?
 - ◇ What efforts does your organization specifically take to target these groups in times of extreme heat?
 - ◇ Would you consider these efforts effective?
 - What would make them more effective?
 - ◇ How many people do these programs target?

Short-Term Solutions

- » Does your department face any limitations in keeping the most impacted groups cool in an emergency?
 - ◇ Do you see any gaps in this service - any people or communities that are difficult to reach?
 - ◇ Where does the funding come for these services?
 - ◇ Is your department working with other stakeholders or partners to provide these solutions?

Long-Term Solutions

- » What are your department's goals for addressing extreme heat in the next 5- 10 years?
 - ◇ Do you foresee any limitations in reaching these goals? Either existing or anticipated limitations.
 - ◇ What are the biggest barriers that your department faces in implementing large-scale and long-term extreme heat planning?
 - ◇ How will these programs be funded?
 - ◇ Will your organization work with other departments or partners to implement these solutions?

Wrap Up

- » Are there any other departments, stakeholders, or groups you recommend we contact? If so, could we get their information?
- » Do you mind if we follow-up via email with any follow-up questions?

Interview Coding

After interviews were conducted, two group members coded each interview to ensure inter-coder reliability. Coding categories broadly related to policy mentioned, barriers addressed, and program evaluation methods. For a complete list of categories see Table 19, below.

Each policy intervention mentioned was divided into four main areas (Intervention Category): Communications & Information, Planning Infrastructure, Social Capacity, and Utility-Based Support. Program specifics such as population reached, funding, key target populations, and time horizon were also coded. Next, information regarding program barriers was categorized. These Policy Classification Areas were developed based on common issues interviewees cited. Finally, information on program evaluation metrics was also coded.

TABLE 19: Interview Coding Categories

Policy Interventions	Barriers	Program Evaluation
Intervention Mentioned	Funding	Existing Evaluation Criteria/Metrics
Intervention Category	Communication	Gaps in Evaluation Criteria/Metrics
Population Reached	Coordination	
Funding Sources	Reaching Key Groups	
Overall Budget	Data-related	
Other Available Resources	Other Short-Term	
Programs that Target Key Groups	Other Long-Term	
Key Group(s) Targeted		
Time Horizon (Short or Long)		

These data were then used to inform the decision tree, evaluative criteria, and policy recommendations.

Interview Participants

Table 20 below names each of the interview participants, grouped by affiliation, with a summary of the main topics discussed in each session.

TABLE 20: Interviewee Name, Affiliation, and Summary

Interviewee	Title and Affiliation	Interview Summary
Dr. Monique Edwards-Greer, DBA	Director of Technology, Data, and People, Clean Power Alliance (CPA)	CPA is Los Angeles and Ventura Counties' Community Choice Aggregation (CCA) program and is responsible for procuring electricity on behalf of its customers. This interview, with Dr. Monique Edwards, DBA and Tyler Aguirre discussed CPA's program offerings such as Demand Response, Flex Alerts, and long-term goals of grid electrification and Solar and Storage. We discussed CPA's coordination with Southern California Edison during Public Safety Power Shutoff (PSPS) Events, as well as how CPA is working to identify and target customers most impacted by these events.
Tyler Aguirre	Account Services Manager, CPA	
Kristin Baja, CFM	Climate Resilience Officer, Urban Sustainability Directors Network (USDN)	USDN works with 240-member local governments to develop holistic, community-based solutions to addressing climate resilience. This interview focused on Resilience Hubs and how Kristin Baja, CFM works to develop partnerships with communities. Discussion also included how systemic racism has led to environmental inequalities and how USDN works with and shifts power back to communities to develop tailored solutions to the climate crisis and building long-term resilience.
Dr. George Ban-Weiss	Associate Professor, Civil and Environmental Engineering, University of Southern California (USC)	Dr. George Ban-Weiss specializes in heat mitigation program research. In this interview, we discussed Dr. Ban-Weiss's research on A/C penetration rates, solar reflective materials, and vegetative cover. Dr. Ban-Weiss also offered some insight on how best to approach policy evaluation and how researchers and policymakers can work together to improve heat adaptation interventions. Overall, this interview helped us shape our decision tree.

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Interviewee	Title and Affiliation	Interview Summary
Nancy Sutley	Chief Sustainability Officer & Senior Assistant General Manager of External and Regulatory Affairs, LADWP	This interview with Nancy Sutley and Steve Baule discussed the numerous ways The Los Angeles Department of Water and Power (LADWP) addresses extreme heat and the UHI effect. LADWP funds and supports Cool Pavements, Cool Roofs, Urban Forests, Weatherization Programs, and numerous other energy efficiency-centered offerings. LADWP’s Fan Distribution and HVAC Upgrade programs were also discussed. The technical implementation side of these programs were discussed, as well as barriers LADWP faces in implementation and reaching target populations of interest. LADWP’s equity programming and long-term heat goals were also discussed.
Steve Baule	Director of Special Projects for Sustainability and Economic Development, LADWP	
Ramon Bernal	Senior Recreation Director II, Los Angeles County Department of Parks and Recreation	Ramon Bernal is a Senior Director at the Los Angeles County Department of Parks & Recreation – the department that oversees more than 70,000 acres of parks, greenspace, and other natural areas within the County. Parks and Recreation is also in charge of deploying and operating select Cooling Centers during extreme heat events. Mr. Bernal provided information about Cooling Center coordination occurs and current limitations.
Dr. Hilda Blanco	Project Director, Center for Sustainable Cities, METTRANS Transportation Center, Sol Price School of Public Policy, University of Southern California (USC); Professor Emeritus, Dept. of Urban Design and Planning, College of Built Environments, University of Washington	Dr. Hilda Blanco specializes in a wide array of topics from climate change policy to sustainable city planning. In this interview we discussed the current limitations of heat adaptation policies and programs, current gaps in evaluation metrics, and future directions for heat-related interventions. Dr. Blanco also discussed the importance of equitable heat planning that targets lower income communities and communities of color.
Carol Brown	Program Development & Advocacy Manager, Western Arizona Council of Governments (WACOG)	Carol Brown serves Yuma County at WACOG, where she works with various stakeholders to provide services during extreme heat events. Carol Brown provided insights into WACOG’s service offerings, from rapid rehousing to utility assistance programs. The interview provided in-depth information about how the County manages communication and coordination among different departments, programming offerings at Cooling Centers offer, and how Yuma has engaged the business community in extreme heat adaptation.

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Interviewee	Title and Affiliation	Interview Summary
Thuy Hua	Supervising Regional Planner, Los Angeles County Department of Regional Planning	This interview with Thuy Hua and Dr. Caroline Chen discussed the Department’s Climate Action Plan and Safety Element updates. Extreme heat planning within the Department is largely in the development and data collection phase, so policy and program specifics were not the focus. However, we discussed the prioritization of disadvantaged communities (DACs) within the Climate Action Plan, as well as how County departments coordinate their efforts. We also discussed the development of program evaluation metrics. Finally, we discussed challenges in getting information to the general public.
Dr. Caroline Chen	Regional Planner, Los Angeles County Department of Regional Planning	
Edith de Guzman	UCLA Institute for the Environment and Sustainability; Former Director of Research at Tree People	This interview discussed Edith de Guzman’s research through the Los Angeles Urban Cooling Collaborative, an organization she co-founded. The research centered on measuring health outcomes of tree coverage and reflective surfaces. Edith de Guzman also discussed her research on community engagement and heat awareness through environmental stewardship and offered expert insights on existing gaps in heat programming and areas for improvement.
Jonathan Parfrey	Executive Director, Climate Resolve	Climate Resolve is a nonprofit based in Los Angeles working directly with communities in advancing climate change resilience. This interview, which included, Executive Director, Jonathan Parfrey, Chase Engelhardt, and Gabriel Varela, provided an overview of Climate Resolve’s efforts to address extreme heat adaptation through Cool Roofs, Cool Streets, living streets, microgrids, and Resilience Hubs, to name a few. We also discussed the importance of cross-sector communications, ways to improve correspondence with the general public, and options for better involving communities in heat planning. We also discussed forthcoming initiatives aimed at increasing community-level resilience.
Chase Engelhardt	Climate Planning & Resilience Coordinator, Climate Resolve	
Gabriel Varela	Outreach Program Manager, Climate Resolve	
Dorette Quintana English, MA	Health Planning and Policy Specialist, Office of Health Equity at California Department of Public Health	Dorette Quintana English, MA has been managing the state’s CalBRACE program since 2013. The state’s CalBRACE programs engage local public health departments and enhance their capabilities to plan for and respond to climate change. In this interview, we discussed differing adaptation programs in varying localities across the State, from San Luis Obispo to Contra Costa County. Through this interview, we gained an understanding of how the State funds local adaptation efforts and how localities can engage with the state.
Kristen Torres Pawling	Sustainability Program Director, Los Angeles County (LAC) Chief Sustainability Office (CSO)	Kristen Torres Pawling, Alison Frazzini, and Rebecca Ferdman work at the CSO of LAC within the Chief Executive Office (CEO). Overall, CSO oversees and advises sustainability efforts across the County. In this interview, we discussed CSO’s role in projects such as Urban Forestry management, the Cool Roof ordinance, and managing communications across departments and with stakeholders. We also discussed broad concerns regarding program evaluation metrics, and how general communications and expectations across departments and with the public can be improved.
Alison Frazzini	Sustainability Policy Advisor, LAC CSO	
Rebecca Ferdman	Sustainability Policy Advisor, LAC CSO	

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Interviewee	Title and Affiliation	Interview Summary
Dr. Juliette Finzi Hart	Program Manager, Integrated Climate Adaptation and Resilience Program (ICARP), Governor’s Office of Planning and Research	This interview discussed ICARP’s role in heat planning, its functions, and how Dr. Finzi Hart manages communications both with ICARP Technical Advisory Council Members and to the general public. Dr. Finzi Hart also spoke to broader barriers that arise in communications across various sectors and levels of government, and the importance of fostering cross-sector partnerships to achieve any climate resilience-related ends.
Dr. C.J. Gabbe	Assistant Professor, Santa Clara University	Dr. Gabbe’s research focuses on climate change mitigation, housing, and land use. This interview discussed Dr. Gabbe’s work comparing heat adaptation programs in cities across California as well as his work on heat vulnerabilities in statewide subsidized affordable housing units.
Aaron Gross	Chief Resilience Officer for the City of Los Angeles, based out of the office of Mayor Eric Garcetti	Aaron Gross is the Chief Resilience Officer for the City of Los Angeles. Craig Tranby, Environmental Affairs Officer at LADWP, also joined the interview. We discussed current resiliency efforts the City of Los Angeles is taking. We discussed barriers the City often faces in program implementation and the intricacies of heat and resilience planning funding streams. Long-term goals for the City were discussed, as well as the City’s role in efforts to develop a Resilience Hub.
Dr. Jeremy Hess	Director at Center for Health and the Global Environment, University of Washington	Dr. Hess is a recognized leader in extreme heat adaptation for his work in South Asia and the US. We discussed Dr. Hess’s research, and lessons learned from his work abroad. Critically, Dr. Hess highlighted how to integrate water access into our understanding of heat risk, which helped guide our Planning & Resource Infrastructure recommendations. Moreover, Dr. Hess offered insight on the evaluation and metrics mentioned in the “Discussion” section of this report.
Dr. Alessandra Jerolleman, MPA, CFM	Assistant Professor of Emergency Management, Jacksonville State University; Federal Emergency Management Agency (FEMA) Reservist; Analyst at Lowlander Center	Dr. Alessandra Jerolleman is an expert on resilience, hazard mitigation, and emergency management. This interview discussed communications between multiple levels of government and provided insights on better coordination with tribal groups and local community and faith-based organizations. We also discussed funding streams for emergency management. Dr. Jerolleman also discussed the importance of engaging small, private businesses in hazard mitigation and planning. Finally, Dr. Jerolleman provided insights into how to reframe thinking about resilience.
Dr. Ladd Keith	Assistant Professor at University of Arizona; Chair, Sustainable Built Environments Program	Dr. Ladd Keith’s research focuses on urban planning and climate change, with a focus on extreme heat planning and mitigation. He is one of the foremost experts on extreme heat and has served on the City of Tucson’s Planning Commission to assist in the creation and adoption of the General & Sustainability Plan. This interview discussed Dr. Keith’s research on nationwide heat programs, as well as common barriers within governance, coordination, and public awareness.

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Interviewee	Title and Affiliation	Interview Summary
Victoria Ludwig, MEM	National Program Manager, Heat Island Reduction Program, United States Environmental Protection Agency (EPA)	This interview with Victoria Ludwig, MEM of the EPA provided an overview into the federal government’s Heat Island Reduction Program. Victoria Ludwig gave a broad overview of the agency’s interactions with local governments, the programs and evaluation tools it has funded in the past, and the resources that it makes available to local governments about heat mitigation strategies. Further, we discussed how the EPA evaluates program effectiveness.
Daphne Lundi	Deputy Director for Social Resiliency, New York City Mayor’s Office of Resiliency	Daphne Lundi’s work focuses on the hazards New Yorkers face and targets the City’s efforts towards those most impacted. Taking a multi-hazard approach, Daphne Lundi works on climate risk communications and preparedness, improving the built environment, and expanding green infrastructure. Given her extensive experience working in New York City, Daphne Lundi provided first-hand accounts of available programs, their effectiveness, common resource-related issues, and long-term barriers towards addressing extreme heat.
Sona Mohnot, J.D.	Environmental Equity Senior Program Manager & Policy Analyst, The Greenlining Institute	Sona Mohnot is an expert on equity-based climate resilience strategies. She provided invaluable insights regarding strategies to advance equity-conscious legislation on extreme heat mitigation and adaptation. The interview provided concrete ways to operationalize equity within programs, while focusing on metrics and evaluative criteria. Sona Mohnot provided in-depth knowledge on pending state bills related to extreme heat and the existing funding streams and programs that are currently helping California become more adaptive in the face of climate change.
Irene Ogata	Urban Landscape Manager, City of Tucson	Irene Ogata discussed her early efforts to coordinate UHI awareness to her government colleagues through programming and workshops. She discussed her efforts to map vulnerability and tree coverage across Tucson. Irene Ogata also discussed the city’s 1 Million Trees Project, the intricacies of program implementation, and barriers associated with program logistics.
Kathryn Phillips	Former Director, Sierra Club California	In this interview Kathryn Phillips provided insight on heat adaptation programs across the state of California, as well as international leaders in the field. She discussed the current drawbacks of existing programming, and how the Sierra Club engages elected officials with environmental advocacy. Kathryn Phillips also provided insight on future policy directions, notably, for heat mapping.
Dr. Gregory Pierce	UCLA Luskin Center for Innovation, Senior Researcher & Associate Director	Dr. Gregory Pierce’s research focuses on water and environmental equity. This interview discussed the often-overlooked aspect of water access in extreme heat planning, as well as related funding barriers. Dr. Pierce also discussed gaps in efforts to keep those most impacted by extreme heat cool – both in the short-term and long-term. Barriers related to funding and coordination between stakeholders were also discussed.

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Interviewee	Title and Affiliation	Interview Summary
Dr. Elizabeth Rhoades	Program Director, Climate Change and Sustainability, Los Angeles County Department of Public Health	Dr. Elizabeth Rhoades is helping to integrate public health into climate change-related decisions and actions being undertaken around the county. Dr. Rhoades provided insight on current efforts to incorporate climate change planning into cooling initiatives, the efforts that DPH is taking to serve the most impacted Angelenos, and the opportunities that exist for increased County department cooperation.
Matthew Roach	Epidemiology Program Manager, Arizona Department of Health Services	This interview discussed several ways the state of Arizona is utilizing funding from the Centers for Disease Control and Prevention (CDC) to evaluate the effectiveness of Cooling Centers and track environmental-related public health outcomes. Matthew Roach discussed the intricacies of Cooling Center operations and current limitations in their structure. Matthew Roach also discussed the importance of public health data reporting and limitations of existing funding mechanisms for addressing heat adaptation.
Shina Robinson	Policy Coordinator, Asian Pacific Environmental Network (APEN)	Shina Robinson is a Policy Associate at APEN and provided in-depth information about the organization’s work on extreme heat, especially in Oakland and Richmond, California. She discussed APEN’s role in developing a community-based Resilience Hub, which provided a more detailed understanding of this intervention and informed our analysis. Shina Robinson also provided detailed information on utility programs, particularly Weatherization, and its benefits for traditionally underserved groups.
Leah Fisher	Senior Advisor, Research & Innovation, California Strategic Growth Council (SGC)	This interview discussed the coordination efforts of the Strategic Growth Council in meeting California’s climate change goals. Discussion centered on program evaluation metrics and the importance of racial equity in meeting climate resilience goals.
Dr. Nicole Hernandez	Science Policy Fellow at California Council on Science and Technology (CCST)	
Gary Singer, MEP	Emergency Management Coordinator, City of Los Angeles Emergency Management Department	This interview discussed the intricacies of extreme heat coordination from the City side. Relevant City departments and stakeholder involvement were discussed, including the City’s process for opening and operating Cooling Centers once an extreme heat advisory is issued. Current barriers and areas for improvement within existing Cooling Center infrastructure were also discussed.
Craig Tranby	Environmental Affairs Officer, Los Angeles Department of Water and Power (LADWP)	As LADWP’s Environmental Affairs Officer, Craig Tranby oversees LADWP-funded programs that improve nonprofit capacity. This interview discussed various research metrics and methods for program evaluation, funding sources, communication challenges, and targeted outreach towards key groups within the Grants Program. Craig Tranby also discussed LADWP’s UHI mitigation programs, as well as energy conservation and program implementation barriers that LADWP often faces during decision-making.

Interviewee	Title and Affiliation	Interview Summary
Rev. Vernon K. Walker	Program Manager, Climate Communities Responding to Extreme Weather (CREW)	Climate CREW focuses on equipping communities with extreme weather resources through workshops, training, and direct community engagement. In this interview, Reverend Walker illuminated the ways Resilience Hubs are currently operationalized, underscoring how to best serve communities and target key groups most susceptible to heat's impacts. Reverend Walker also highlighted the undue climate burden placed on communities of color, and ways in which his organization is working to combat these inequities.
Ellie Wolfe	Program Manager, Los Angeles County (LAC) Department of Workforce Development, Aging and Community Services (WDACS)	Ellie Wolfe and Billy Yeung discussed the services WDACS offers during extreme heat events, with a focus on programming for the County's elderly population at WDACS-operated Senior Centers. The two were invaluable in highlighting some barriers and challenges that WDACS encounters in its general service provisions, such as ensuring transportation to sites and ensuring residents can bring their pets to Centers on hot days. The two further discussed COVID impacts on programs.
Billy Yeung	Administrative Services Manager II, LAC WDACS	
Matt Wolff	Climate and Health Program Manager, San Francisco Department of Public Health (SFDPH)	Matt Wolff discussed climate and health programming in San Francisco, which includes Climate 40 goals as well as funding from the Centers for Disease Control and Prevention (CDC) through the Building Resilience Against Climate Effects (BRACE) program. Matt Wolff also discussed the communication and coordination efforts necessary to assemble multiple government departments and stakeholders together in Extreme Heat Working Groups. We also discussed overall program planning and research efforts.
Dr. Sonya Ziaja	Assistant Professor of Law, University of Baltimore	Dr. Sonya Ziaja was the lead author on California's Fourth Climate Change Assessment. In this interview, Dr. Ziaja referred us to multiple colleagues at the state and local levels, academics, and nonprofits that work closely with marginalized groups.

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