

Planning for Extreme Heat in San Diego County



Technical Assistance Panel Report

*Prepared for the County of San Diego Planning and
Development Services Department*



Notice to Readers

The material presented in this document was prepared by members of the Urban Land Institute's San Diego-Tijuana chapter in Spring of 2022.

The report seeks to provide an informed outlook on local real estate and planning topics and as understood by ULI San Diego-Tijuana and our contributing members. The analysis, views and opinions expressed herein are those of the contributors and not necessarily their employers, the ULI, or the ULI San Diego-Tijuana chapter.

The material that follows was developed from a number of sources: interviews, research by individual contributing authors, surveys, and forecasting.

While the information contained in this report represents informed analysis of issues in the San Diego-Tijuana region, it should not be used to make business decisions in lieu of professional consultation.

PLANNING FOR EXTREME HEAT IN SAN DIEGO COUNTY

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About the Urban Land Institute

ULI, the Urban Land Institute, is a 501(c) (3) nonprofit research and education organization supported by its global network of members. The mission of the Urban Land Institute is to shape the future of the built environment for transformative impact in communities worldwide.

Founded in 1936, the Institute now has nearly 50,000 members across 81 nations worldwide, representing the entire spectrum of land use and real estate development disciplines working in private enterprise and public service. A multidisciplinary real estate forum, ULI facilitates an open exchange of ideas, information, and experience among industry leaders and policy makers dedicated to creating better places.

About ULI San Diego Tijuana

ULI San Diego - Tijuana is a community of more than 700 people from diverse professional and personal backgrounds in the binational region. As a nonpartisan organization, we have long been recognized as one of America's most respected and widely quoted sources of objective information on urban planning, growth, and development. The local program of work includes more than 50 educational forums, mentorship programs, and technical assistance interventions annually.

ULI San Diego-Tijuana's education and outreach is focused on four core areas including: housing affordability, transit, community engagement, and leadership. ULI San Diego - Tijuana is the only binational District Council in the global ULI network.

About Technical Assistance Panels

In keeping with the ULI mission, Technical Assistance Panels are convened to provide pro-bono planning and development assistance to public officials and local stakeholders of communities and nonprofit organizations who have requested assistance in addressing their land use challenges.

A group of diverse professionals representing the full spectrum of land use and real estate disciplines typically spend one to two days visiting and analyzing the built environments, identifying specific planning and development issues, and formulating realistic and actionable recommendations to move initiatives forward in a fashion consistent with the applicant's goals and objectives.

About the ULI Urban Resilience Program

ULI's Urban Resilience program is focused on how buildings, cities, and communities can be more resilient to the impacts of climate change and other environmental vulnerabilities. The program works with ULI members to provide technical assistance, advance knowledge through research, and catalyze the adoption of transformative practices for real estate and land use policy.

About the Resilient Land Use Cohort

This technical assistance panel is part of a larger series of resilience technical assistance and learning opportunities called the Resilient Land Use Cohort (RLUC). The RLUC is a network of ULI district councils, member experts, and community partners in eight cities working together to identify strategies to be more resilient in the face of climate change and other vulnerabilities, including floods, extreme storms, drought, wildfire, and extreme heat, as well as the related social, environmental, and economic impacts. RLUC provides on-the-ground technical assistance through ULI's flagship technical assistance models— Advisory Services panels and technical assistance panels. These panels leverage ULI member expertise to advise on complex real estate and land use challenges related to climate resilience, addressing planning, zoning, land use, development strategy, housing, and infrastructure. ULI's Urban Resilience program convenes the cohort regularly to learn from national best practices and discuss peer cities' next steps advancing resilience through land use policies and development strategies. Funding for this engagement and the cohort is provided by the ULI Foundation through support from JPMorgan Chase.

Acknowledgments

Our Client

The San Diego region is diverse – in every sense of the word. Planning and development issues, as well as interfacing with distinct communities and navigating sensitive environmental concerns is an immensely complicated task. We appreciate the time, insight and interest from our clients with the County of San Diego.

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Our Panelists

This report and the entire process of convening a Technical Assistance panel depends on the generosity of our ULI member experts. These individuals volunteer time from their daily lives and work to dedicate themselves to addressing the challenges outlined herein. We are grateful for their support.

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The TAP Background and Working Session



The ULI San Diego – Tijuana panel visited historic main street Lakeside to survey conditions on site in a heat-impacted rural community in San Diego County.

Introduction and Scope of Work

Heat Adaptation Planning in the County of San Diego

On April 14th and 15th, 2022, ULI San Diego - Tijuana led a Technical Assistance Panel (TAP) focused on the topic of Heat Resilience and Adaptation Planning for the County of San Diego. With county planning staff as our client, we convened a panel of experts in the fields of climate resiliency, urban planning, environmental planning, economics, and urban design, to explore how Cities across the San Diego and Tijuana region are addressing the threat of extreme heat. The TAP examined heat adaptation planning at citywide and community scales. Recognizing that land use planning plays a pivotal role, the TAP honed in on environmental threats facing urban areas, such as the Urban Heat Island, building and neighborhood-scale mitigation measures, and examples of collaboration efforts between the private and public sectors. Much of county land is rural and diverse. Over 50% of the metro population of San Diego live in unincorporated areas, and a majority of the county lies within very high fire hazard severity zones. Given this reality, the TAP also recognized the need to examine the real threat of fire hazards related to extreme heat in rural areas of the county.



Borrego Springs, a rural and heat-impacted portion of eastern San Diego County.

ULI San Diego/ Tijuana engages members on a diversity of issues and opportunities facing our region. Extreme Heat rose to the top of our list as a critical topic of interest for a ULI San Diego/ Tijuana TAP. Temperatures in the Southwest United States have markedly increased in the past two decades, and San Diego County is projected to see an increase in the frequency and intensity of heat waves, from the current 2 to 3 times per year to as much as 16 times per year, with prolonged durations. Extreme heat is exacerbated by the Urban Heat Island Effect created by urbanized areas with expansive paving and built structures with limited vegetative cover and urban forest. In rural parts of the county, extreme heat is a cause of wildfires. The County of San Diego has an Excess Heat Preparedness and Response Plan and a Multi-Jurisdictional Hazard Mitigation Plan. Both plans address extreme heat from a Health and Human Services perspective.

While numerous programs and design mechanisms – such as cooling centers, green roofs, cool roofs and community engagement programs – offer means of addressing the risks of urban heat, planning efforts offer a potential opportunity to integrate these approaches as well as develop funding and delivery structures for more resilient outcomes. The County of San Diego Planning Department has a unique opportunity to consider how the built environment contributes to and helps mitigate extreme heat, how planning policies and guidance can play a role, and how the private sector can respond. Moreover, the County Planning Department is well-positioned to lead heat resilience planning in the San Diego/ Tijuana region, given the diverse communities the County represents and the holistic planning that Planning staff engages in every day.

A particular challenge for this TAP was to articulate how heat adaptation strategies vary across a large county with diverse communities (both rural and urban). By leveraging the resource and knowledge base of the panelists, the TAP quickly identified case studies of heat resilience efforts underway across the country. From this list, we highlight key strategies with potential transferability across the region. The purpose of the case study analysis is to expose County staff to examples of the best research and work in the field and to identify ways in which those examples may translate to our unique setting and set of challenges facing our region. We anticipate that an impactful outcome of this effort will be to identify a specific site/ area in the county that warrants more detailed study.

TAP Questions:

1. What are relevant best practices / case studies of implementing heat adaptation projects across the country and state that the county should consider?
2. What relevant/current regulations and potential financing mechanisms / programs can be leveraged to support extreme temperature mitigation retrofits and create a market for resilient buildings in the region?
3. What are the building and site-scale landscape design heat resilience strategies that, if implemented more widely, have the potential to help the region achieve its extreme heat/cold resilience goals?
4. How could future county policy encourage local property owners and developers to mitigate extreme heat/cold at their projects and open spaces?
5. Given the health impacts of urban heat island and extended heat waves, how can the San Diego region ensure that heat adaptation measures are implemented in an equitable manner and to advance environmental, social, and racial equity?

Summary of TAP Events:



The ULI San Diego – Tijuana panel conducted its working session on site at the County of San Diego’s Planning and Development Services headquarters.

February 2022

ULI San Diego-Tijuana TAP Committee and staff develop project proposal for County of San Diego Planning and Development Services.

March 2022

ULI San Diego-Tijuana TAP Committee and staff present proposal to County of San Diego staff, which is accepted. Recruitment begins immediately for a qualified panel of experts.

Thursday, April 14, 2022

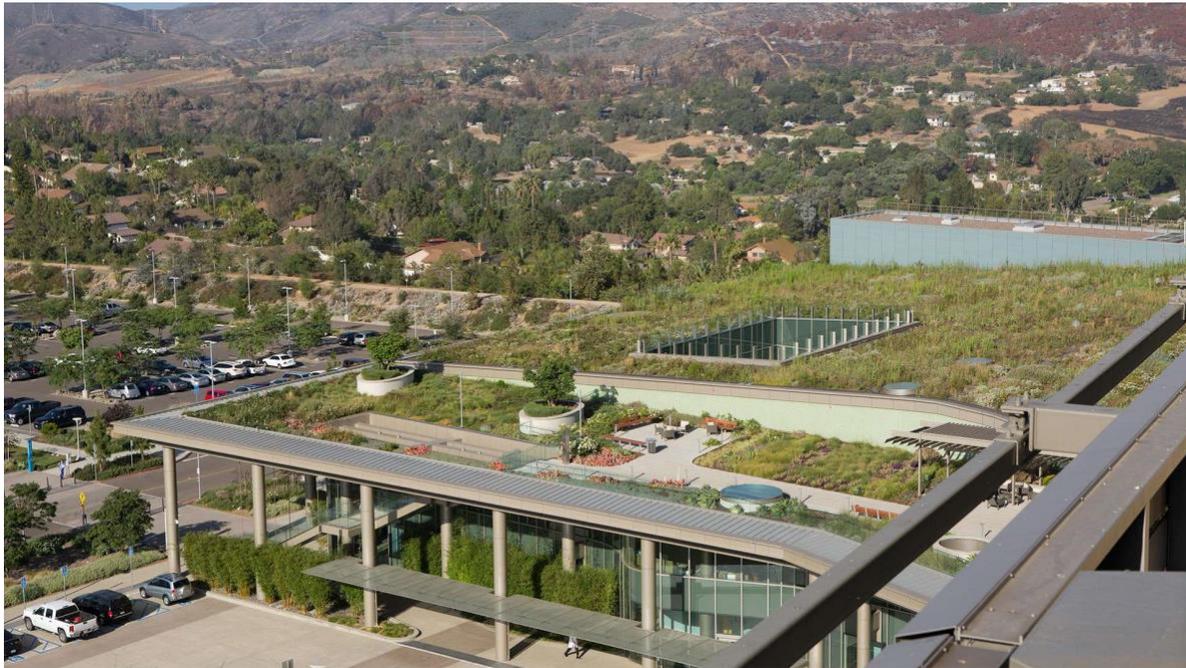
- Briefing on existing conditions from Rami Talleh and Dahvia Lynch at Lakeside Community Center
- Walking Tour of Lakeside Community to survey heat-impacted rural areas
- Stakeholder Interviews from Lakeside Community Center
- TAP Panelists begin recommendation development during working dinner

Friday, April 15, 2022

- Panelists reconvene at County of San Diego Operations Center
- Group meeting to review data, interview material and post-meeting research
- Additional stakeholder interviews
- Panelists develop final recommendations and presentation for County staff



Public park space and water features cool down visitors on hot days in Waterfront Park, Downtown San Diego, CA.



A green roof installation in the Palomar Medical Center in San Marcos, CA, located in northern San Diego County.

About San Diego County

San Diego County Background

San Diego is a diverse rural and urban county with a great mix of mountains, coastal areas, rural communities, urban areas, and deserts. It is the most biodiverse county in the country and that is primarily due to the diversity of its plants, native bees, over 480 species of birds, reptiles, and animals. With about 3.5 million residents across approximately 4,500 square miles and 2.9 million acres, it is the fifth most populous county in the country and larger in size than Delaware or Rhode Island.

San Diego County includes 18 incorporated cities, 18 Indian reservations, 16 naval and military locations, and 64 unincorporated areas. Coordination with other entities, such as tribes, state, federal, or other cities is critical. The County has a new board of supervisors that's leading changes in climate action planning, using data-driven policy and an equity lens to drive change. With recent redistricting, every board member now represents a piece of the unincorporated area, where before primarily just two board members represented the unincorporated area.



San Diego County Administration building located in downtown San Diego, CA

Vehicle Miles Traveled (VMT) has become the primary metric for determining appropriate locations for development across the county. 520,000 acres of the County land area is within a very high fire hazard spheric zone (see figure_). These areas are considered my many as “no go” areas for development. The board has revised what is defined as VMT efficient, so that approximately close to 22,000 acres of the county unincorporated areas

is outside of high fire, outside of very high fire, has access to transit, access to water, and is considered VMT efficient. These areas are considered appropriate for development, however, development has occurred outside of these areas and within the high fire and very high fire zones. Population of the unincorporated area is a little over 500,000 people. When you put the city of San Diego aside, this could be the second largest municipality in the region. Setting aside San Diego city, over 50% of the population in the region lives in unincorporated communities, and much of this population resides within high fire zones. Moreover, out of the entire county population, 41,000 people are groundwater dependent.

County General Plan

The County General Plan (adopted in 2011) focuses development into villages (see figure _) The highest intensity villages are shown in red, followed by yellow for semi-rural and green for rural villages. The plan provides for a total build out at 232,000 units in unincorporated areas. The plan shifts 20% of development capacity from the east to the west part of the county and ensures that 80% of the capacity is within the county water authority boundary. At the time the General Plan was adopted, the County had not prepared a Climate Action Plan. The County Climate Action Plan (adopted in _) puts into question the true capacity of development in the county when limitations on water, the reality of the climate crisis and its developing effects, and stakeholders' concerns are factored into the decision to develop in outlying areas. Motivation is building for the county planning department to go back and explore what options could be taken with the general plan in terms of either fine tuning it, identifying implementation tools within certain areas to focus development there, or overhauling the whole plan.

The County recently updated the general plan in 2021 with a new housing element, a new environmental justice element, and a new safety element. These three elements are all interrelated. First, for the housing element, county planners looked at housing rates in the unincorporated areas, and then identified sites within the unincorporated areas that have the right density, so if they were to develop, they could meet those housing needs. Goals, policies, and implementation plans were updated to ensure the production of those units. The number that was assigned to the county by SANDAG was 6,700 units (down from upwards of 25,000 units in the past cycle). This is in recognition of a shift towards a more sustainable growth pattern that focuses new housing units in incorporated cities. Second, for the Environmental Justice Element, county planners used CalEnviroScreen 3.0 mapping as a starting base and expanded upon it to include other indicators more reflective of the communities affected.

County planners continue to work on environmental justice planning to expand to communities that may not meet multiple indicators of environmental injustice but suffer from a single issue of extreme impact, such as the impact of renewable energy projects in Borrego Springs and their impact on the local economy there. Finally, the General Plan Safety Element covers four central components. The first is an evacuation route analysis for every community in the county. The other components include updated hazard maps, preparation of a vulnerability assessment, and development of an adaptation plan. After these components are completed, an implementation plan must be written for all those items. Critical challenges for implementation of the safety element include restricting or

prohibiting development in high fire hazard severity zones through downzoning, transfer of development rights, or other means, and ensuring backcountry communities have internet and cellular access to receive emergency notifications. Another concern of county planners is how to create a measurable standard for safe evacuation of development. This is an issue that comes up with every new project and is a major concern of environmental groups.

With respect to climate adaptation, the County General Plan Safety Element identifies 10 policies, from more planning and analysis to development project review, protection of county populations, and protection of assets. Community plan updates provide an opportunity to assess vulnerability at the community level and identify adaptation strategies. Future planning and development projects can integrate climate change projections into design solutions and engineering requirements. The County can increase resiliency by promoting design solutions and best practices that ensure future development infrastructure can adapt to climate change events. Protecting people and assets requires that emergency services have adequate capacity to address increased needs due to climate change related impacts and that the County has a strategy and the means to protect transportation systems, to respond to huge demand on the energy grid during extreme heat events, and to support resilient water sources and natural systems.



Galleta Meadows sculpture garden located in the Anza Borrego desert.

Heat Concerns in San Diego County

With the increasing trend in excessive temperatures occurring across the country, preparing for more extreme heat conditions in San Diego County is prudent. Since 2013, the region has seen increasing temperatures, evidenced by increased excessive heat alerts and warnings. July of 2022 set the record for being the hottest month ever recorded. With increasing temperatures due to climate change, even in the coastal areas, it will be vital to adequately prepare for excessive temperatures. By definition, from the National Weather Services, the coastal region is roughly 10 miles inland from the ocean/bay shorelines, followed by the inland, mountain, and desert temperature zones.

Historically, in September 1963, the temperature reached 111 degrees Fahrenheit at the airport along the coast. There have been at least four other years where the temperature went above 106 degrees Fahrenheit in the coastal region. In anticipation for additional events of this nature, this plan describes additional recommendations to support San Diego County residents, if excessive coastal temperatures occur.

Why Extreme Heat Matters

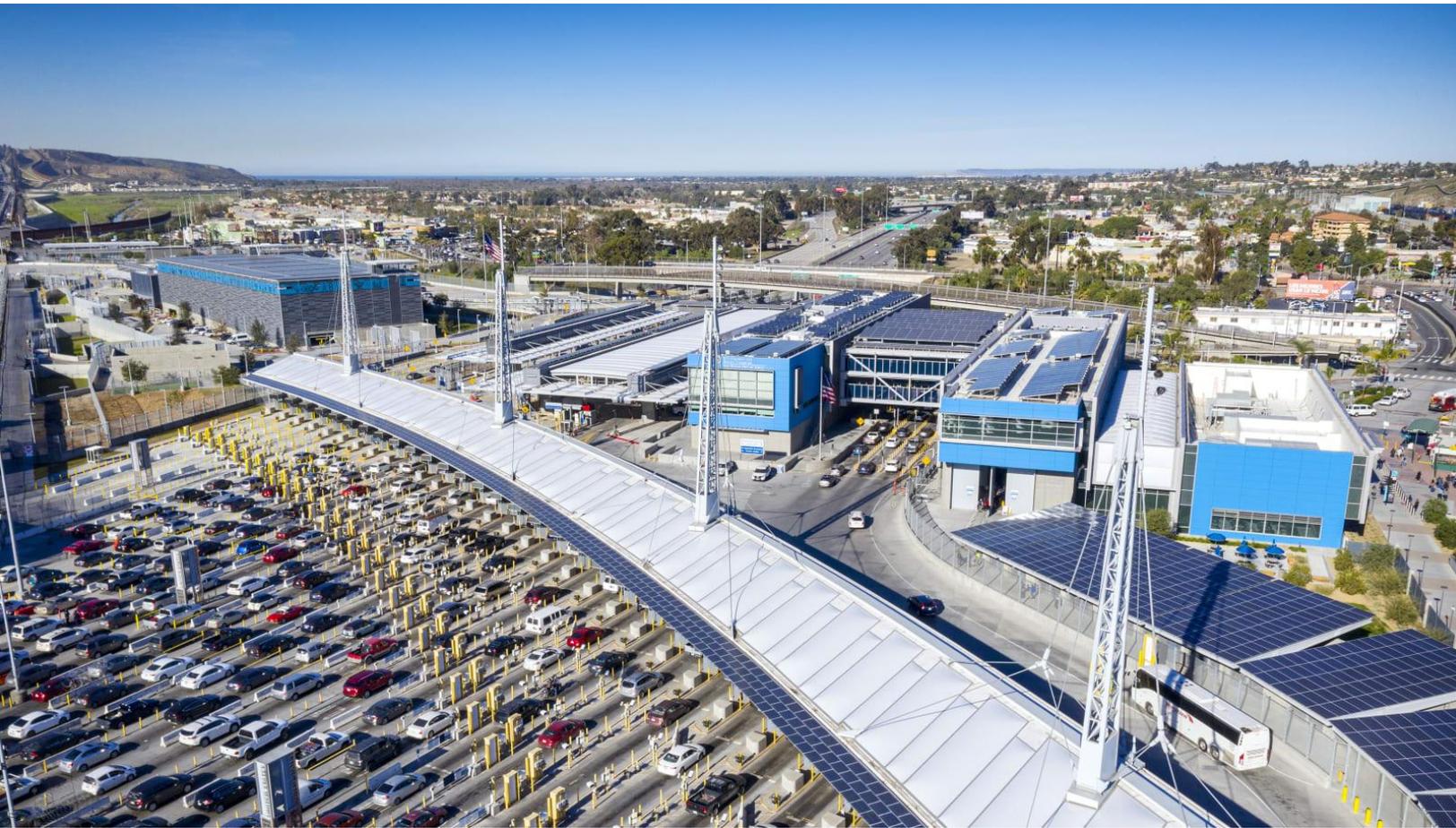
Exposure to excessive heat can cause illness, injury, and death. Heat-related illnesses could include heat rash, sunburn, heat cramps, heat exhaustion, heat stroke, and even death. A vulnerable individual may experience heat-related illness or fatality at any time when temperatures are high, but the overall effect of prolonged periods of heat (i.e., heat wave) increases the risk of illness and death in the population.

The Centers for Disease Control and Prevention (CDC) identifies Extreme Heat events as one of the leading causes of weather-related deaths and estimates an average of 618 people in the United States are killed by extreme heat every year. Those at greatest risk for developing a heat-related injury are individuals who are working or playing outdoors, without access to air conditioning, socially isolated, or on certain medications. Vulnerable populations include children, low-income individuals, pregnant women, older adults, and individuals with mental or chronic conditions.

Increases in excessive heat events are due to the continuous warming of the Earth. Rising temperatures and changing climates increase the need to establish response plans for heat emergencies. In efforts to limit the adverse health effects from excessive heat, this Excessive Heat Response Plan (the Plan) contains definitions and established guidelines for how the County of San Diego will respond to events of excessive heat.

ULI's TAP Process

1. Define the Problem
2. Assemble the team
3. Build the briefing book
4. Stakeholder Interviews
5. Site Tour
6. Panel Deliberations
7. Presentation and final Report

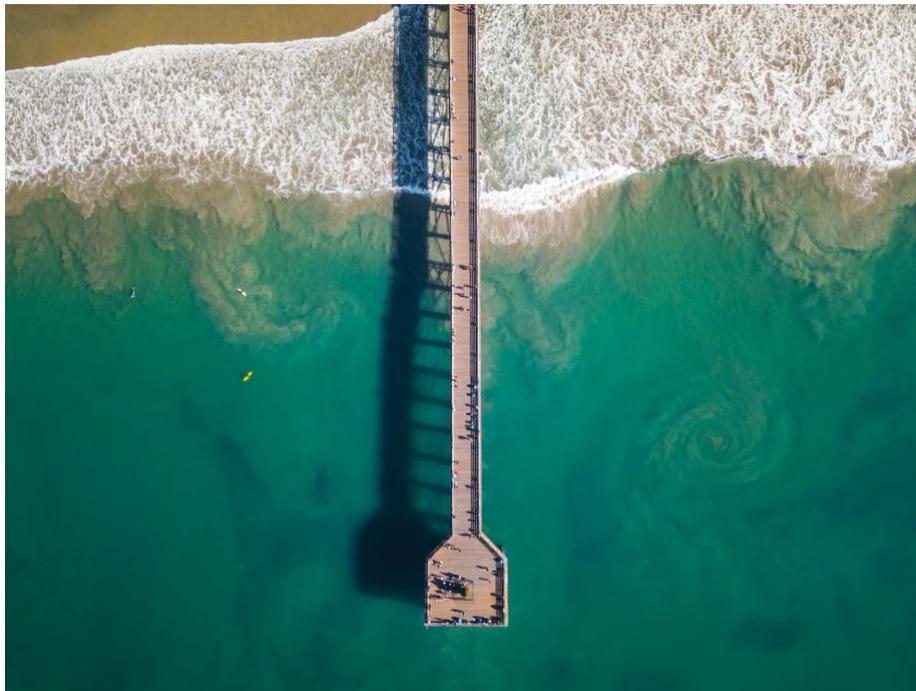


The San Ysidro neighborhood sits at the border of the U.S. and Mexico and sees significant environmental impacts from idling traffic and a noted lack of parks and green space.

Stakeholder Interviews

Anonymized Comments

- Region has a need for better, more robust communication around heat resilience and heat event warnings
- Consideration for language barriers; need to work with CBOs to get message to vulnerable populations
- The County can be effective in uniting disconnected regional efforts in this arena
- Leverage unique local scientific resources, current research and data
- Need for regionally tailored approach (urban, suburban, rural)
- How can the County more effectively and quickly respond to Heat events from a public health standpoint?
- “Not Causing More Heat” means keeping cool in the Summer
- Personal financial impacts of extreme heat can be severe: home renovations to keep up with increasing heat (insulation, solar, etc.)
- Rural locations of industrial solar arrays increase (about 4 degrees). “It is cruel and nobody is helping them fight back against this”



San Diego County contains a variety of microclimates.

- Avoid using tractors to clear brush that disturb the soils and introduce invasive species. “The second you bare your soil to the sun you increase the temperature of

your property”. If you “treat your soil kindly”, you invite a biodiverse array of vegetation that acts as ground cover that keeps the land cooler. This is an example of how industrial arrays can be built without destroying soil (therefore vegetation therefore cooling resilience factor). This takes maintenance to keep out invasive species like mustard that welcomes wildfire.

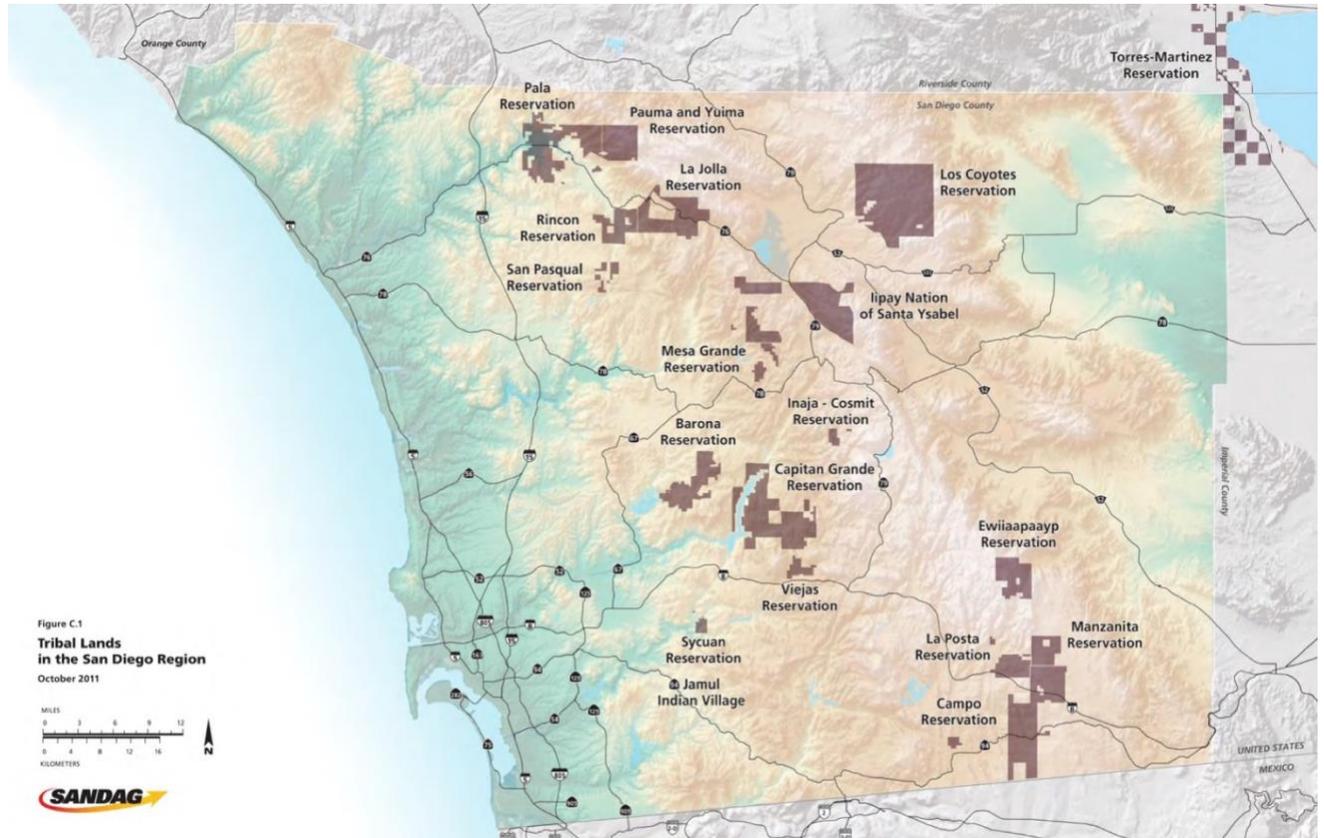
- Sustainable land management is not expensive, it just requires educating people
- The carbon cost of creating renewables, the distribution loss from these renewable farms (close to 40%), all while “cooking our small back countries”
- The only microgrids on the books right now for the County “are out here” – 60/70 miles away from the town centers.
- County needs to address auto dependence of region and its impacts on climate.
- There are a LOT of activities happening on a local, city, and regional level about heat prevention but no one person at the County is aware of all these networks



The County’s Cool Zones program is largely focused on public spaces like libraries and school facilities.

- Cooling centers are currently not effective in San Diego but have great potential
 - Not efficient because they are not attractive to people. They are more like triage centers only in emergency and not necessarily attractive and fun spaces.
 - Huge opportunity for cooling centers to be good places to go and to locate social services.
- The County should take a more experimental approach to solutions – try novel methods, accept that sometimes failure make occur, but learn and improve

- Indigenous population and reservation lands should be a major partner for County efforts on extreme heat, particularly in more rural eastern portions of the region.
- Evacuation routes in rural east county can be of wildly varying quality and safety.



San Diego Association of Governments mapping of tribal lands in San Diego County.

- Drones and other technologies should be used more proactively to gather data and provide live monitoring of conditions throughout San Diego County.
- The county of SD and SANDAG should support all of the other jurisdictions in updating their Safety Elements to contain climate adaptation policy.
- More than 70,000 farm operations currently exist in San Diego County, largely in rural areas. Impacts to these businesses could be a major loss in carbon sequestration potential.
- Huge lack of community gardens in County
- Solutions for urban areas are very different from rural or interface areas
 - For rural areas, it is more about preserving existing green space and open space
- Often times, decision makers in government often live along the urban coast and do not create policy for the more rural inland areas

- Have developers consider heat hazard as a consideration for proposed projects (much like flood zones)
- Lighter colors, and more efficient building envelopes



The Lakeside community has seen increasing incidence of extreme heat events and exemplifies the unique cluster of issues facing the eastern portion of San Diego County.



Historic photo of main street Lakeside. Courtesy of San Diego History Center.

Panel Recommendations

Leadership & Governance

The **County should position itself to lead heat resilience efforts** regionally.

- County government structure and policy oversight give it influence to unite cities, unincorporated communities, utilities, tribal communities and other stakeholder groups in a collaborative framework.
- The County already has advantageous systems in place that can be leveraged (ex. COVID warning systems)
- County's public health authority provides ample framework to influence regional policymakers outside of land use decisions.
- The County has demonstrated effectiveness in emergency response operations, and has been investing significantly in augmenting these capacities. Planning for extreme heat events must be added as an emergency category under this initiative.

A priority for County leadership should be to **identify a point person** (ex. Chief Heat Officer) either nested within an existing department or as a newly created office.

- This role should engage local, national and international experts in creating a heat resilience working group to leverage latest research, emerging best practices, applications of new technology and more.
- Chief Heat Officer should enhance public understanding of heat risks by developing communications and education program, annual reports and other marketing material.

Establish **framework for coordination** that positions County and Chief Heat Office role as influential voices in proactive preparation efforts and reactive emergency response to extreme heat events.

- Between departments (emergency management, parks & rec., etc.)
- Other governments & agencies (tribes, etc.)
- Non-profit & private sectors
- Utilities and business interests

Identify, access and **direct funding streams** toward agencies and programs making an impact on heat resilience planning.

- Federal infrastructure
- State climate
- Foundation support (ex. through ULI!)

Land Use & Urban Design

Integrate topics of extreme heat risk and exposure into **long-range planning** and development projects. This should include work being done under office of Chief Sustainability Officer.

Align housing, VMT and resiliency goals to comply with state and local **climate action benchmarks** and new heat-centered County policies.

Conduct **review and update of policies related to heat events**:

- Provide incentives for land use and building design strategies that address heat.
- Update site design strategies in county land use codes.
- Revise current ordinances that contribute to extreme heat effect.
- Compare County policy status quo with leaders in extreme heat planning (see Case Studies section later in this report).

Create a **developer toolkit** to support private investment in heat resilience and align incentives with County heat resilience goals.

- Identify local champions through connection to builders, industry and public affairs networks.

Demonstrate success: leveraging county-owned properties to showcase heat resilience strategies and new approaches. The **County can lead with experimentation in adaptation** and new best practices.

Consider strategies to **preserve and enhance agricultural lands** in the county, including review of impacts of current agricultural practices and their impact on heat effects.



The City of Canoga Park, near Los Angeles, has developed urban cooling design guidelines to address a number of concerns: improving biking and walking safety, capturing and managing water, reducing heat and its impacts, and providing community amenities.

Partnerships & Innovation

County Leadership (Chief Heat Officer) should champion innovative **demonstration projects** throughout the region aimed at both addressing known challenges of extreme heat conditions and sharing these approaches in an engaging manner for public education (example: SDGE Energy Innovation Center).

- Urban: partner with cities in the County to develop condition-specific projects that respond to community need and character.
- Suburban: educate children about the issues around climate change and heat preparedness through pop up events in community parks and schools.
- Rural: partner with tribal leadership, agricultural interests and rural communities to link preparedness in disparate areas of the county lands.
- Manufactured housing and low income communities: respond to unique needs of diverse county population with targeted outreach to communities in greatest risk of adverse health effects of extreme heat conditions. Partners in nonprofit and social services community will be key in reaching disadvantaged groups.

Invest in enhancing the preponderance and effectiveness of Resilience Hubs and Cooling Centers, including preparation for operation outside of specific seasons.

- **Make Cool Centers more cool** – look to example cities (Montreal) for innovative approaches to connecting residents to these important resources.

Promote Urban Forestry initiatives directly through County operations and in partnerships with Cities and other regional partners

- Community greening programs
- Community gardens

Actively partner and **collaborate with energy providers** and innovation programs at SDG&E.

- Implementing Microgrids for rural communities.
- Funding for retrofit and weatherization programs, particularly in rural and low-income communities.

Lead Community Awareness and Engagement efforts around heat risks and preparedness.

- Develop informational websites, apps and one-pagers
- Support robust translation program for outreach to region's diverse population
- Community based organizations and promotoras

Support **workforce development and education** initiatives.

- Partner with K-12 and trade school programs linked to heat resilience areas
- University partnerships (example. student competitions with planning programs)
- Sync efforts with leadership at local Labor Unions

Integrate arts & culture to **build awareness** and engage community members.

- Storytelling efforts should elevate the issue of heat risk and preparedness
- Connect to unique milestones like World Design Capital's resilience events

Appendix



Select Case Studies

Boston Heat Plan

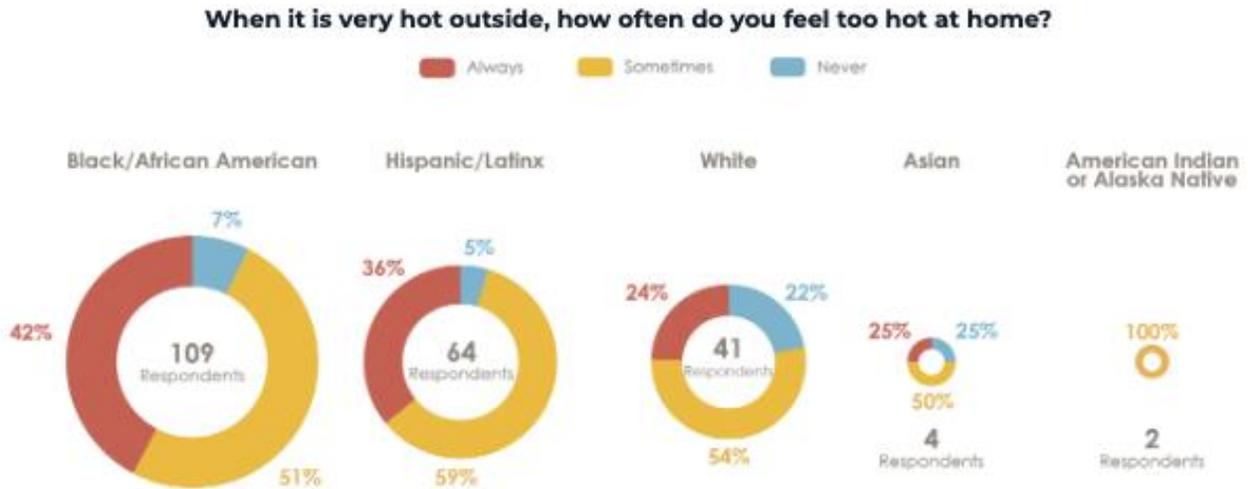
The City of Boston’s Heat Resilience Solutions for Boston (the Heat Plan) presents the City’s action plan to prepare for the near-term and long-term impacts of extreme heat in a changing climate by addressing the three factors of heat risk: exposure to extreme heat, the adaptive capacity to access cooling, and the sensitivity to changes in temperature due to underlying factors that may influence vulnerability to heat. The plan explores the threat of rising heat through a larger city-wide analysis as well as a focus on 5 neighborhoods, each with a section on neighborhood context, heat analysis, community heat experiences, cooling ideas, and heat resilience opportunities. The 350-page report is available to read in full as well as the city’s executive summary, a more accessible version for residents and stakeholders to read.



Boston’s [Heat Resilience plan](#) was released in April of 2022.

The city used a variety of resources to inform the development of heat resilience strategies to ensure accurate, inclusive, and effective guidance. The first method looks at the historic heat trends of the city, with average temperatures rising every year and projected to continue rising in the future. The plan provides a GIS map for residents to see how their neighborhoods will be affected. It also examines how the reduction of global emissions in the future can help regulate future temperatures, with Boston’s local climate culture depending upon reducing global emissions. Alongside the city-wide heat analysis, the plan utilized the voices of Boston residents and stakeholders through online surveys, focus neighborhood idea sessions, a youth idea session, and an open house. A notable community-organization tool used in the report was the Heat Resilience Story Comic

Builder, a web-based community engagement tool developed for the plan to cultivate empathy through storytelling.



Boston's heat resilience efforts center environmental justice concerns.

The plan presents new methodologies, updated future temperature projections, new extreme temperature models, heat risk and vulnerability, profiles for the five environmental justice focus areas, the city's heat resilience strategies, and next-step actions to advance heat resilience across Boston. Heat resilience strategies for Boston include inclusive and thorough resource access for all residents, intentional and targeted investments throughout the city to reduce temperatures in hotspot areas, and an indoor & outdoor approach to help transform existing spaces for the health and wellbeing of residents. These strategies address the three major factors of heat risk: heat exposure, heat sensitivity, and adaptive capacity. Specific strategies in the plan can be broken down into categories:

Operations And Communications:

- Boston Extreme Temperatures Response Task Force
- Pre-heat wave resources mobilization
- Heat sensors network

Cooling Off During Heat Waves:

- Pop-up heat relief
- Enhance and expand existing City-run Cooling Centers

Looking Out For Neighbors:

- Expand community climate leadership
- Extreme temperature plans for outdoor workers

Awareness, Education, and Training:

- Heat resilience public education campaign
- Heat survey
- Expansion of green workforce development for heat resilience

Buildings:

- Home cooling resources distribution
- Cool Roofs Program
- Home energy retrofits
- Affordable housing resources and retrofits
- Cool schools

Parks, Trees, and Outdoor Spaces:

- Enhance cooling in pocket green spaces and street-to-green conversions
- Increase shade on municipal sites
- Expanded drinking foundation network
- Planning for future parks

Transportation and Infrastructure:

- Cool commutes
- Energy resilience upgrade and microgrids
- Cool main streets

Planning, Zoning, and Permitting:

- Update climate resilience checklist
- Heat resilience best practices guidelines
- Zoning revisions to support cooler neighborhoods

Tucson's Infill Incentives

The city of Tucson, Arizona's Downtown Area Infill Incentive District (IID) encourages redevelopment as a tool to increase resilience through design solutions and best practices that ensure that future developments and infrastructure can adapt to rising heat. By encouraging sustainable infill development that creates pedestrian and transit-oriented neighborhoods, protecting historic and existing structures and neighborhoods from potential negative impacts of new development, and consolidating the regulations and design standards that apply to downtown areas into a single ordinance, the IID provides planning and design guidelines that address the threats of climate change.



The Rio Nuevo Area (RNA) Zoning Design Standards (Section 5.12.7) specifically outlines permitted uses, building heights, and building design standards for the city to follow. Design standards include:

- Building heights with vastly different scales than those on adjacent properties to reduce and mitigate potential impacts
- A simple plane of façade at the street level may not be longer than 50 feet without architectural relief or articulation by features such as windows, trellises, and arcades.
- Building façade design shall include pedestrian-scaled, down-shielded, and glare-controlled exterior building and window lighting
- Buildings shall be designed to shield adjacent buildings and public rights-of-way from reflected heat and flare
- 5% of the gross floor area of new construction shall be provided in public plazas or courtyards. Open space plazas, courtyards, and patios are landscaped outdoor

areas designed to accommodate multiple uses as well as provide more accessible heat relief for residents.



Heat resilience strategies. Image courtesy Ladd Keith.

Shade shall be provided for at least 50% of all sidewalks and pedestrian pathways as measured at 2:00 pm on June 21 when the sun is 82 degrees above the horizon. Shade may be through arcades, canopies, or shade structures while trees and plantings are permitted to meet this standard.

The RNA Zoning Design Standards demonstrate how purposeful design standards and guidelines can be implemented to ensure that the physical product addresses the threat of climate change and heat as well as meeting other city goals and visions. Sustainable principles of working toward a more pedestrian and transit-oriented city to increase resilience guide specific standards through more shade, tactical building placements to avoid added heat in existing buildings, and creating more cooling spaces for community members through parks, plazas, and patios, all work together to ensure the city's ability to provide a comfortable and safe environment for its residents.

Staying Cool in a Changing Climate

Reaching vulnerable populations during heat events

“Staying cool” report uses multiple qualitative case study designs to comprehensively examine practices on how to stay cool during hot weather in four US cities, specifically cities with documented racial/ethnic and socioeconomic disparities and diverse heat preparedness strategies. While current rates and projections of future heat-related mortality have motivated many adaptive government strategies through plans and interventions, some studies have reported that no more than half of people typically alter their behaviors in response to advisory warnings. These behaviors may include at-home strategies for staying cool (ex: air conditioner use, drinking fluids). Interventions and behaviors are likely to reduce heat-related morbidity and mortality, but the most vulnerable populations, including the elderly, low-income, and homeless, frequently do not perceive themselves as vulnerable to changing their daily practices during heat events.



Efforts aimed at reaching historically disadvantaged or linguistically diverse communities are a major focus of the Staying Cool report. Phoenix, AZ is highlighted for its effective approach to broadening outreach in this area, including its Tree and Shade Grant Program.

**Practique
SEGURIDAD DEL CALOR
a Donde Quiera Que Vaya**

Las muertes relacionadas con el calor son evitables. Protéjase usted y a los demás de los impactos de las olas de calor.

Lugares de Trabajo
Manténgase hidratado y tome descansos bajo la sombra tan a menudo como sea posible.

En el Interior
Revise a los ancianos, enfermos y aquellos sin acondicionador de aire.

Vehículos
Nunca deje a los niños ni mascotas desatendidas.
MIRE antes de PONER SEGURO

Al Aire Libre
Limite actividades extenuantes al aire libre, busque sombra, y manténgase hidratado.

weather.gov/heat

Emergency preparedness outreach materials should be translated to all applicable languages.

Over a one-year period from 2009–2010, 173 in-depth interviews were conducted with community members and organizational leaders in Phoenix, Arizona; Detroit, Michigan; New York City, New York; and Philadelphia, Pennsylvania to assess why vulnerable populations do or do not participate in health-promoting behaviors at home or in their communities during heat events. The results found that the responses from community members echoed the strategies promoted in health messaging: air conditioner use and leaving to go to cooler locations.

Many findings were consistent across all four cities and highlight that community and leadership participants are aware of the threats and vulnerabilities during heat events, use in-home and out-of-home cooling behaviors (such as staying indoors, altering their daily schedule to avoid the heat, etc), unintentionally display harmful behaviors during heat events (waiting too long to hydrate and misusing household thermostats), have financial barriers that restrict air conditioning usage, do not have access to cooler locations in their neighborhoods (public pools, parks, senior centers, etc), and find social support through peers, family, and community leaders.

The findings of this report indicate the need to improve heat-related health communication, such as explicitly addressing common misguided behaviors. Additionally, pre-season doctor recommendations and additional research regarding thermoregulation for various medications may not be reaching vulnerable populations and should be prepared in a professional manner that acknowledges the cultural and economic

characteristics of families and targets the messages accordingly. This includes recognizing local perceptions of vulnerability (how the heat affects and will affect the specific area) and intergenerational messaging specifically for older generations that need assistance. Methods to encourage intergenerational messaging may include school-based outreach to youth potential messages. All of these approaches may not, however, reach homeless populations where social service providers remain vital in locating individuals and communicating heat threats.



New York City heat event outreach materials.