Methods for Addressing Adaptation, Social Equity, and Environmental Justice in the Escondido Climate Action Plan

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1 OVERVIEW

Climate change is a global problem that can lead to significant fluctuations in regional climates. While there is consensus that global climate change is occurring and that it is exacerbated by human activity, there is less certainty as to the potential consequences of climate change, particularly at the local level. However, local efforts to build resilience in the face of adverse climate change effects can make a difference. Communities build resilience by determining what their social and economic vulnerabilities and disparities are and how they can make themselves less susceptible to, or able to cope, with the adverse effects of climate change. The City of Escondido ("City") initiated a Climate Action Plan ("CAP") update in 2018 to develop a detailed and strategic framework for measuring, planning, and reducing GHG emissions and related climate impacts. During the course of reviewing and considering ways to reduce the impacts of climate change, it became evident that much more work remains to scale these benefits. While many CAPs in the State of California have been successful in building momentum for climate action in their respective communities, they lack an analysis of who benefits, who is burdened, and if/where there are missed opportunities.

Old problems require new thinking. Rather than being indifferent to the reality that different groups are situated differently relative to their access to resources and opportunity, our vision for a climate-positive future in the City starts when we address existing disparities and advance more equitable outcomes. By seeking for social equity and environmental justice opportunities, the community will grow stronger. Not only will the City adapt and/or become more resilient to unavoidable impacts from climate change, the City will position itself for a more positive future.

This document helps summarize climate impacts and environmental changes that may take place over the near and distant future. It evaluates the ability of the City to respond to those changes and identifies strategies to adapt to changes while simultaneously building community capacity by mitigating the disproportionate harm faced by certain groups. It provides guidance to balance the needs of a growing city while enhancing quality of life for current and future residents, businesses, and other community members.

2 BACKGROUND

2.1 Framing Adaptation, Social Equity, and Environmental Justice

Many agencies and organizations have been working to reduce their GHG emissions associated with transportation, electricity, natural gas, solid waste, water, wastewater, etc. Within each major industrial sector there are specific mitigation options available. These sector specific measures that are developed to reduce GHG emissions are motivated by set goals known as a "roadmap" to create better communities with cleaner environments. However, certain groups of people have been systematically excluded from the benefits of these programs. In reference to the needs of different classes, ages, backgrounds, and identities, this can increase negative side effects on the City. Agencies and organizations should be more aware of their role to integrate, plan for, and implement a more universalism approach to climate action planning efforts within their respective business, industry, or jurisdiction. While openly discriminatory practices like redlining districts and other prejudicial housing practices are illegal in 2020, many sections of the community are still struggling to recover from generations of targeted exclusion and/or unequal investment. We must first recognize that previous practices have had a disparate impact on certain

communities, before we can actively work to create better communities for all. Especially when determining how best to prepare for future weather-related emergencies and/or climate hazard events.

This CAP addresses much more than climate change. While reducing emissions is one of the main contributions, this CAP establishes a series of cross-cutting priorities to build thriving and resilient neighborhoods for all. This document will identify short, medium, and long-term adaptation needs and develop strategies and programs to address those needs. The CAP advances a state-of-the-art way to expand choice and opportunity to give people what they need to enjoy full, healthy lives – this is among the reasons that equity and environmental justice serves as a thread to tie everything together.

- Adaptation efforts seek to reduce vulnerabilities within neighborhoods and minimize the expected effects of climate change. Adaptation planning aims to mitigate damage in the short-term, minimize negative impacts in the long-term, and, when possible, take advantage of changes that may lead to beneficial opportunities. Developing strategies to adapt to the changing conditions can only be achieved through efforts that continue to change the way individuals interact with the environment.
- Social equity means ensuring that all communities are treated fairly and given an equal opportunity to participate in the planning and decision-making process. Unlike equality, which connotes sameness, equity is responsive and accommodating to this difference and includes a broader decision-making process. Social equity reduces the social barriers as part of an overarching framework to make sure there is fair and just distribution of societal benefits and burdens, within a more inclusive decision-making process.
- Environmental justice means the same degree of protection from climate hazards regardless of age, race, color, national origin, income, or other potential discriminatory factor, with respect to the development, implementation, and enforcement of environmental laws.

Adaptation strategies may include social equity considerations by analyzing possible disproportionate impacts to lower income or vulnerable population groups. Attempting to isolate or uniformly apply solutions to future weather-related emergencies and/or climate hazards will only at best be able to address the symptoms, ignoring the multi-faceted social and economic causes of the issues. When the adaptation strategy implementation incorporates social equity and environmental justice, it attempts to accomplish at least one of the following:

1) Increase resiliency to climate change and build climate resilient infrastructure.
2) Promote a high quality of life for all. Reduce the equity gap for transformational change.
3) Create the foundation for new and higher quality job opportunities for shared economic prosperity and inclusion.
4) Establish trust and relationships within the community. Engage with lower income communities and under-represented populations to empower climate actions.

2.2 Co-Benefits of Adaptation

Climate change can seem like a distant threat for many residents and businesses, and the idea of making communities more climate resilient may seem a bit abstract compared to more tangible demands like housing, transportation, water, energy, etc. The good news is that communities are creating viable models and success stories that show the benefits of early preparation. These programs are not only reducing impacts on the environment and increasing resilience to climate impacts, but they are also providing for people's basic housing, transportation, food and work needs.

In order to successfully plan for climate change adaptation, we must examine our past, where we stand today, what is likely change in the future, and how we intend to react to those changes. Actions to reduce GHG emissions can greatly curtail the costs of climate change, especially over the longer term. However, themes related to GHG mitigation and climate change adaptation are often treated separately, if at all. Even if so, they are often discussed in isolation from each other and/or the broader sustainable development agenda. The City recognizes the potential to leverage the positive side benefits of GHG mitigation and climate change adaptation, as well as identifying potential trade-offs (co-costs) between the themes. Acting quickly and decisively to address climatic change will bring significant benefits – while also helping us avoid some of the worst consequences of unchecked climate impacts. This allows the City to take a more integrated and potentially balanced approach to mainstream climate considerations into broader economic, social, health, and development planning goals. Implementing the actions in this document would strengthen our economy, improve risk management, clean our environment, and improve health and wellness. Even if climate change is not a factor, taking the actions laid out in this section would still make sense.

This following list of indicators represent a range of potential benefits or positive outcomes of preventative adaptation actions.

- People
    1) Community engagement
    2) Education
    3) Social inclusion and capital
    4) Food security
    5) Water use, efficiency, and conservation
    6) Waste reduction and recycling
    7) Emergency preparedness
    8) Mental, physical, and physiological health
- Economic Prosperity
    1) Job creation
    2) Shared economic prosperity and inclusion
    3) Economic stability
    4) Lower household energy and water use costs
    5) Lower runaway health costs
    6) Supported local food production
- Environment
    1) Livable communities - land use/community design
    2) Transportation mobility and alternative transportation options
    3) Infrastructure improvements
    4) Air quality
    5) Energy use, efficiency, and conservation
    6) Water quality and availability
    7) Reduced waste generation, diversion wastes, and more recycling
    8) Biodiversity

The climate change adaptation strategies included in this document are generally geared to mitigating and/or preventing damage from climate impacts, but they also intersect with other City goals. This is a win-win paradigm in that the City can simultaneously build capacity for resiliency, while establishing and

strengthening the connections between people, the economy, and the environment. Co-benefits can play a useful role in prioritizing adaptation measure interventions. Given the prevailing uncertainties relating to the timing, severity, and consequences of climate change, it is sensible to seek out co-benefits between GHG mitigation, climate change adaptation, and social equity and environmental justice themes. This ensures that any measure implemented contributes to reducing global climate change impacts, while building resilience to current climatic variability.

2.3 Co-Benefits of Social Equity and Environmental Justice

Environmental issues are almost always rooted in economic and social issues. In fact, climate change is a direct product of extended environmental and social policies. An ironic, yet unfortunate, aspect of climate change is that the individual, businesses, agency, or organization most responsible for causing climate change are often the ones that are the least affected by it. The world's richest households, businesses, and industries generate more than half of the greenhouse gas emissions and the poorest half contribute just 10% of all emissions.[10] Even though all residents and businesses will all be effected by a changing climate, they will be effected in different ways and in time only in other ways less discussed (such as people moving, animals migrating, agriculture changes, diseases, etc.). The ones that have the most resources will be able to escape changing weather-related emergencies and climate hazard events (or otherwise change their circumstances to reduce their exposure). But most others will not. The real world is shaped by all of the past decisions that cities and counties have made through for recreation/parks programming, planning, engineering, and public works projects. Regrettably, the ones most affected by climate change, are often those with the least amount of representation in the political process. This dichotomy has led to disputes over how to share responsibility for curbing or mitigating greenhouse gas emissions or adapting to climate change. Climate change threatens to widen the social equity gap as the different groups are disproportionately affected.

Social equity, as a term, is more than just the fair, just, and equitable distribution of public services and implementation of public policy, it also means understanding and giving people what they need to enjoy full and healthy lives. If properly planned, an emphasis is placed on ensuring that traditionally disadvantaged and under-represented groups are not left behind. This involves being inclusive of both dominant and marginalized groups, and ensuring that neither of which is a precursor to how one fares. Planning for equity does not stifle growth or impede development. Instead, it expands opportunities to all members of a community and builds local capacity to respond. The benefit of social equity and environmental justice interventions is that they advocate the interests of human capital as a resource. By recognizing a special responsibility to plan for the needs of the disadvantaged or under-represented, and promoting racial and economic integration, it can serve as a catalyst to enrich social settings and provide meaningful variations in the physical environment. It can make life better and more interesting by combining the results of many diversities, perspectives, economic contributions, and different cultural experiences in spectacular ways.

Despite interest in the importance of social equity and environmental justice to sustainability, there is a concern that equity is often left behind in practice relative to social and economic imperatives. This City's vision of climate justice is where solutions begin with addressing the needs of those who are most vulnerable to climate change and/or experiencing disparate outcomes. If the City strives to provide equitable protection from environmental hazards and burdens, we must involve all social groups in the development and implementation of environmental policies, as well equitable benefits from projects funded and directed by the City. A snapshot assessment of Escondido's unique socio-economic profile will help provide the context for making policy decisions to better address existing disparities and advance

more equitable outcomes. Not only will the City adapt and/or become more resilient to unavoidable impacts from climate change, the City will also support a more targeted universalism approach to climate resiliency – one that addresses social equity and environmental justice to help mitigate the disproportionate harm faced by certain groups in the City.

2.4 Vulnerability Assessment Methodology

Recognizing that some degree of impact from climate change will occur regardless of future GHG emissions, local governments are implementing climate change adaptation approaches to adapt to climate impacts and/or become more resilient to weather-related emergencies and climate hazards. Responses to climate change can be either reactive or anticipatory. Reactive adaptation happens after a disaster has already taken place. In the context of weather-related emergencies and climate hazards, reactive adaptation will be especially costly because, decade by decade, the severity of climate impacts is likely to increase. Anticipatory adaptation looks ahead to projected changes and tries to implement responses *before* a weather-related emergency or climate hazard impact occurs. Careful and in-advance planning can ensure that incremental change incorporates adaptation, which allows costs to be minimized and spread out over time. In developing resilience and adapting to climate change, communities need to pay particular attention to engaging and assisting lower income and under-represented populations. These populations are more likely to be the vulnerable to weather-related emergencies and climate hazards. They include low-income communities, overburdened populations, children and youth, elderly individuals, certain communities of color, households and people with limited English proficiency, immigrants, individuals with chronic medical conditions, people who are homeless or at risk of homelessness, and individuals with disabilities. A diverse population like in the City will require many different targeted strategies, rather than just a singular set of universal policies.

This section establishes a benchmarking framework to help identify how the community will be affected by climate change in the coming years. Put simply, a "vulnerability assessment" is a process of identifying future risks associated with climate change. This is determined by three (3) factors: the magnitude and onset of potential environmental changes, the various characteristics of the City, and the ability to successfully respond to change. Ultimately, a vulnerability assessment and taking active steps to mitigate threat and prevention, helps shift from a reactive approach to an anticipatory one, with increase awareness of future climate impacts. Reusing the step-by-step assessment over time would also show where the City has progressed and then be able to re-evaluate things down the line as new information becomes available. Although the steps associated with preparing a vulnerability assessment are listed numerically, often the process will require moving from step-to-step in no established order.

1) Exposure: Identify climate change effects that may take place. This includes the magnitude or intensity of changes, and how quickly they will occur. As part of this effort, the City also needs to find a way to allow everyone to fairly share the same benefits and burdens from climate solutions and attain full and equal access to opportunities regardless of one's class, age, background, and identity.
2) Sensitivity: Identify populations, infrastructure, utilities, essential facilities, economic areas, and natural resources/habitat that are susceptible and vulnerable to each possible effect. To address social equity and environmental justice, the City must acknowledge where disparities exist and identify ways to redress those disparities.
3) Potential Impacts: Identify the range of impacts that may occur from climate change or changes in conditions in the environment.

4) Adaptive Capacity: Evaluate the ability to handle potential impacts. Identify to what capacity those natural and human systems have to adapt to offset negatives changes.
5) Risk and Onset: Adjust the impact assessment to account for uncertainty, timing, and adaptive capacity.
6) Prioritize Adaptive Needs: Prioritize initiatives based on vulnerability, while considering the effects such actions will have on people, habitat, infrastructure, and services. Despite interest in the importance of social equity and environmental justice to sustainability, there is a concern that equity is often left behind in practice relative to social and economic imperatives.
7) Identify Strategies: Identify strategies to address the highest priority needs along with co-benefits of potential solutions. These should be flexible, targeted, cost-effective, and integrative.
8) Evaluate and Prioritize: Prioritize strategies based on potential impact, cost, resources available, onset, and duration. Throughout the nation, lower income and under-represented populations are hit hardest by climate change. As the City addresses future climate impacts, it is imperative that decision-making tools are created and utilized to respond more effectively in communities that need it most.
9) Phase and Implement: Develop a plan that includes phasing of strategies and a monitoring system to assess effectiveness and resiliency goal setting. This step will include applying for grants to assist in funding, partnering with other local communities and agencies for cross-boundary solutions, and taking actions that coincide and align with other goals. This may also include an additional step, which is to evaluate the effectiveness of the implementing activities and to modify these actions based on the results of their effectiveness.

3 CLIMATE CHANGE IMPACTS

For the City to continue to thrive in the future (one that might include unavoidable impacts from climate change), it is important to understand how climate change can evolve gradually. This involves weather-related emergencies and climate hazards resulting from increased temperature, extreme weather events, and frequency and intensity of precipitation.

3.1 Increased Temperatures

Temperature affects the smallest details of our daily life. It also has been found to affect the living organisms in various ways, including the physiology, behavior, growth, and distribution of plants and animals. Temperature increase can have an exponential number of impacts on the environment. For example, temperature plays an important part in the life cycle of insects. Many insects die during the colder winter months, but if temperature increase by just a couple of degrees, some of these insects won't die. This could lead to an increase in insect population or change in insect breeding habits. Both scenarios could be devastating to the agricultural crop industry. In addition to warm-weather insects/vectors, rising air temperatures causes stagnant air masses, which interacts with pollution from vehicles and industry and will increase the frequency and intensity of conditions conducive to smog formation. Children and the elderly are particularly vulnerable to respiratory, cardiovascular, and heat-related illnesses exacerbated by these conditions. Furthermore, numerous research studies have shown that indoor air temperature and circulation can impact one’s level of productivity, as well as one’s ability to learn, concentrate and remember important information. Warmer oceans put coastal communities at risk, increasing infrastructure costs, endangering plant and animal habitats, and threatening coral reefs. Warmer lakes, rivers, and streams threaten aquatic species, by disrupting reproductive cycles, displacing cold-water species and creating dead zones in deep lakes. Warmer climates may also lead to lake, river,

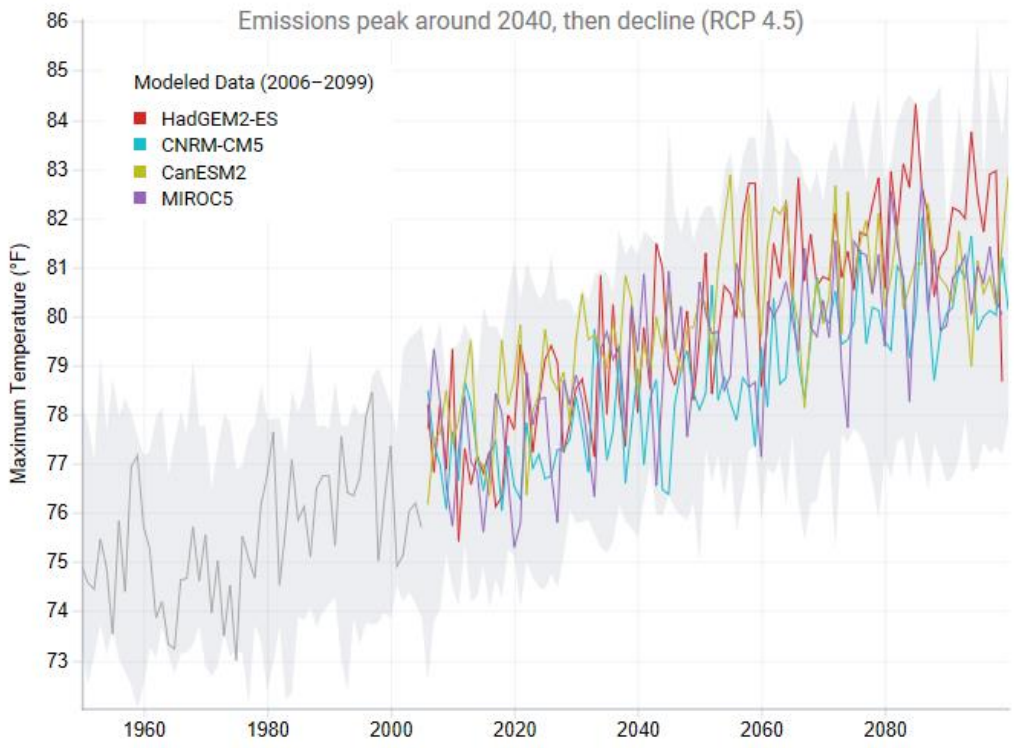
and ocean acidification. Warmer air temperatures also put inland communities at risk by expanding dry areas and their propensity to fuel wildfires.

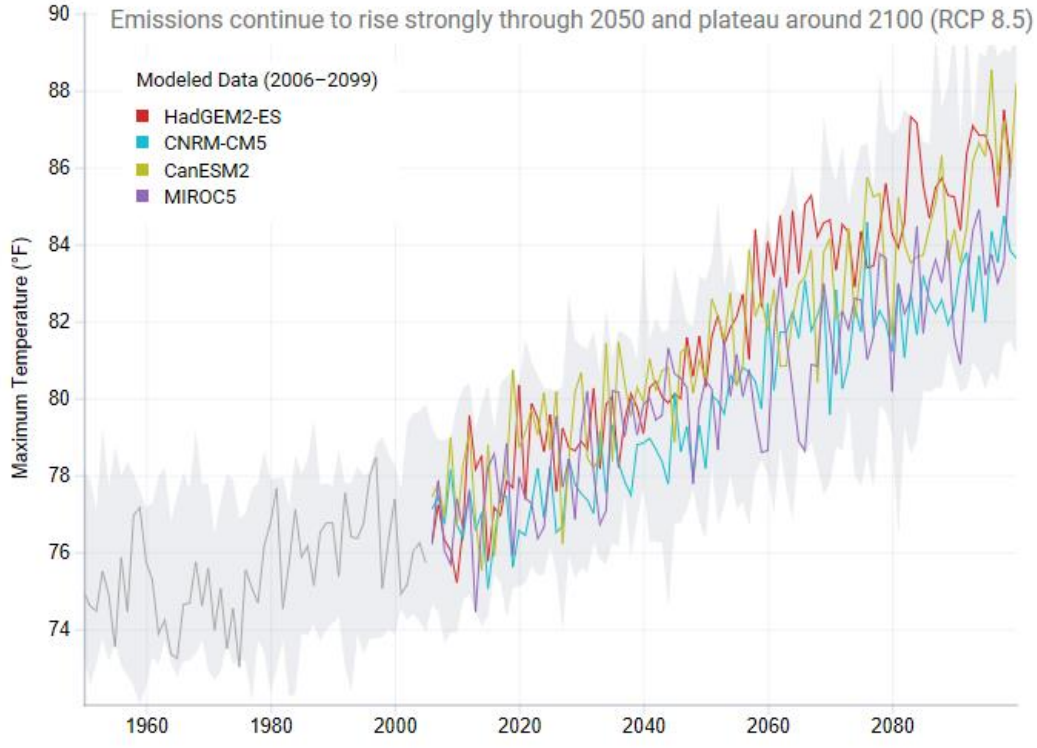
The greenhouse gas effect has already begun to heat the atmosphere and it will continue to do so over the next century, even if emission reduction targets are met. From 1900 to 2000, there was an average global daily maximum temperature increase of about 1 °F. The average global temperature rose by an additional 1 °F in just the last 20 years. Using the California Energy Commission's Cal Adapt tool, it was predicted that there would be an average temperature increase of 3-10°F by 2099, based on different future emission scenarios. [1a] The low emission scenario (RCP 4.5), projects emissions to peak by the year 2040 then start to decline. The high emissions scenario (RCP 8.5), projects emissions to rise throughout the next century, plateauing around the year 2100.[1a] These different scenarios provide a possible range of emission outcomes that can be used to analyze anywhere between ideal and worst-case future scenarios. It is important to note that the tipping point to many of the aforementioned climatic changes is an increase of 1-2°F. [11]

In Escondido, using baseline observed temperatures from 1960-2000, the collective projections from Cal-Adapt under the low emissions scenario (RCP 4.5) show an average maximum temperature increase of 3.9 °F by 2050 and 5.4 °F by 2099.[1a] The high emissions scenario (RCP 8.5) projects an average maximum temperature increase of 4.9 °F by 2050 and 9.6 °F by 2099.[1a]

Average daily maximum temperature projections for Escondido through 2099

	Low Emissions Scenario		High Emissions Scenario	
	Projection	Increase	Projection	Increase
1960-2000 (Observed Temperature)	75.6 °F	-	75.6 °F	-
2050	79.5 °F	3.9 °F	80.5 °F	4.9 °F
2099	81.0 °F	5.4 °F	85.2 °F	9.6 °F

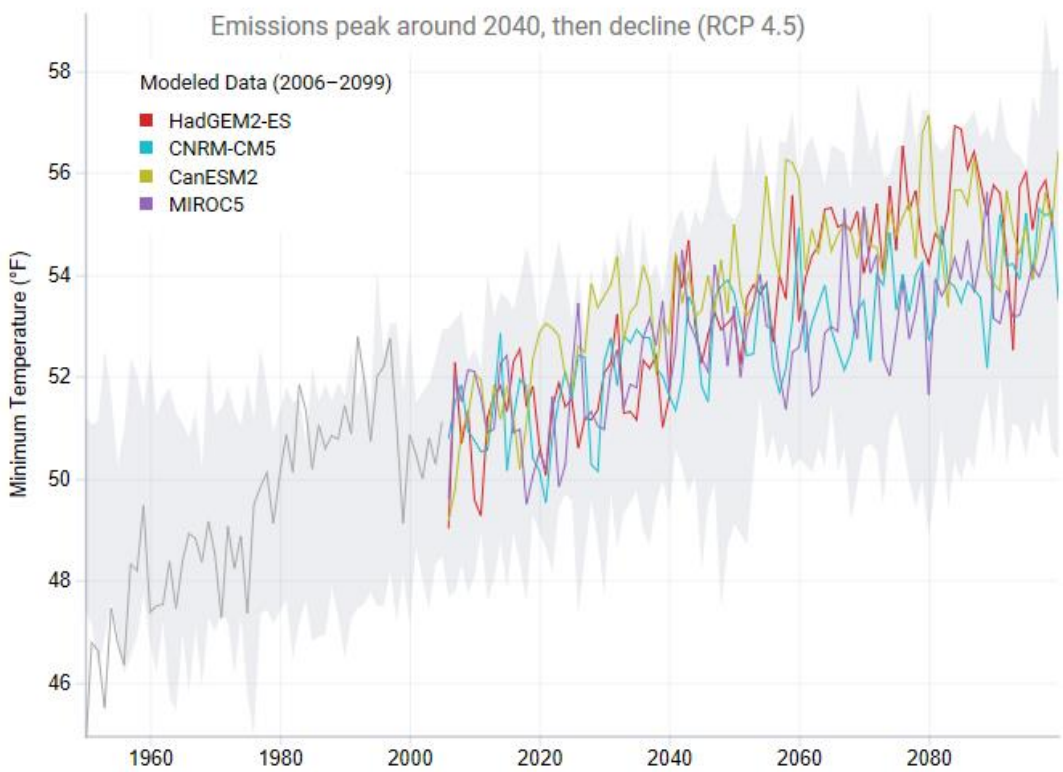

Emissions peak around 2040, then decline (RCP 4.5)
Modeled Data (2006–2099)
HadGEM2-ES
CNRM-CM5
CanESM2
MIROC5
Maximum Temperature (°F)
86
85
84
83
82
81
80
79
78
77
76
75
74
73
1960
1980
2000
2020
2040
2060
2080

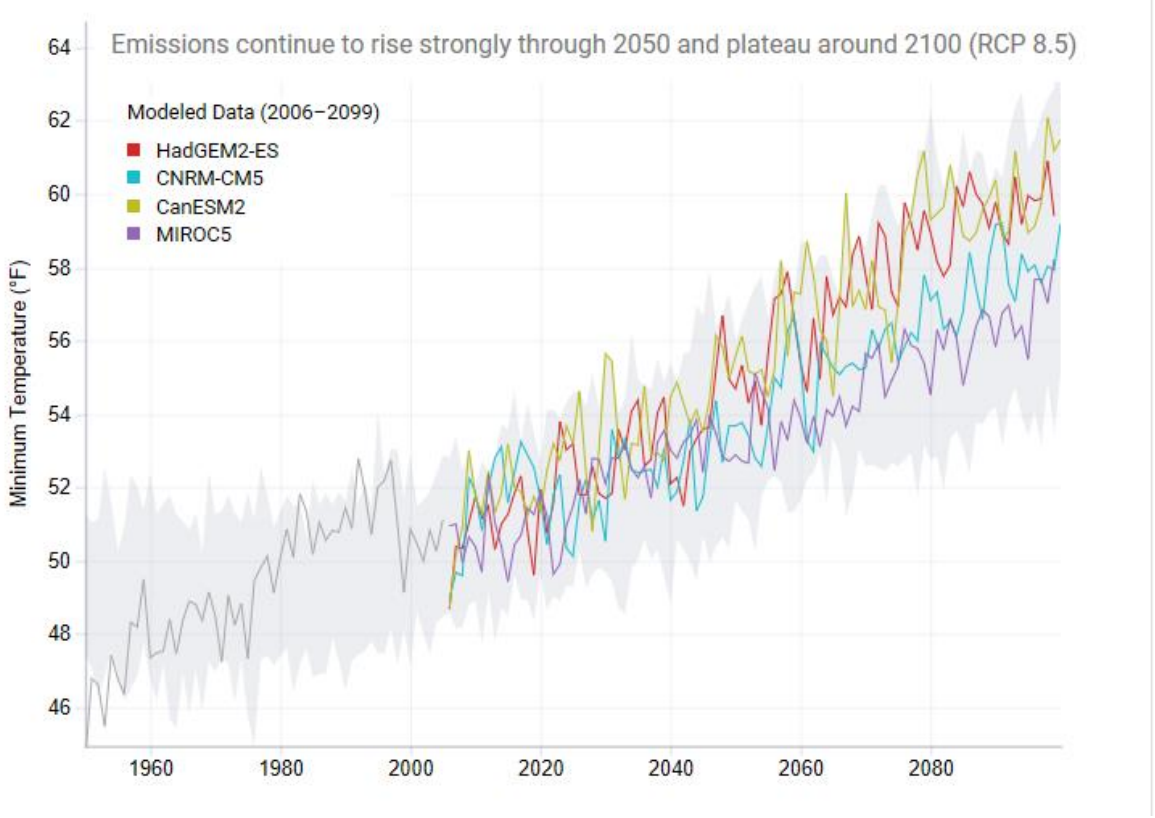

Emissions continue to rise strongly through 2050 and plateau around 2100 (RCP 8.5)
Modeled Data (2006–2099)
HadGEM2-ES
CNRM-CM5
CanESM2
MIROC5
Maximum Temperature (°F)
90
88
86
84
82
80
78
76
74
1960
1980
2000
2020
2040
2060
2080

Average daily minimum temperatures are also projected to increase. The Cal-Adapt tool using the low emissions scenario (RCP 4.5) projects an average minimum temperature increase of 3.5 °F by 2050 and 5.3 °F by 2099.[1b] The high emissions scenario projects an average minimum temperature increase of 4.6 °F by 2050 and 9.2 °F by 2099.[1b]

Average daily minimum temperature projections for Escondido through 2099

	Low Emissions Scenario		High Emissions Scenario	
	Projection	Increase	Projection	Increase
1960-2000 (Observed Temperature)	49.8 °F	-	49.8 °F	-
2050	53.3 °F	3.5 °F	54.4 °F	4.6 °F
2099	55.1 °F	5.3 °F	59.0 °F	9.2 °F





When one hears the words "global warming," most people tend to think that the expectation is that there will be consistent and constant temperature increases. But when it comes to climate, the rate of warming varies. As a result, some years are warmer than others. Factors, like air and ocean circulation patterns, affect both the rate and the intensity of what is experienced as increased temperatures. However, ever since the observations have been made, the average surface temperature has risen more quickly since the late 1970s (0.29 to 0.46°F per decade since 1979). Eight (8) of the top ten (10) warmest years on record in the United States have occurred since 1998, with 2012 and 2015 being the two (2) warmest years on record.

3.2 Extreme Weather Events

If high temperatures, especially when combined with high relative humidity, persist for several days (heat waves), and if nighttime temperatures do not drop, extreme heat can result. The frequency of heat wave days and nights with extreme nighttime temperatures are a threat because they induce injury, illness, and death from the resulting heat waves and wildfires. Heat stroke and dehydration can occur during extreme heat and hazardous weather can cause injuries and, in some cases, death. Warmer climates have increased levels of harmful air pollutants such as ground-level ozone, which can damage lung tissue, inflame airways, impair respiratory health, and aggravate lung diseases, which are amplified during extreme weather events. Extreme weather events also impact the transmission of food, water and animal-borne diseases. Prolonged drought in dry areas can lead to damage to property and infrastructure. Disruptions in daily life related to property and infrastructure damage can mean lost work and school days and harm commercial trade. Extreme weather-related health risks also reduce productivity, such as when extreme heat curtails construction, or when more potent allergies and more air pollution lead to lost work and school days.

Cal-Adapt loosely defines extreme heat days at or above the 98th percentile daily maximum temperature for a given area based on observed historical climate data. For Escondido, that threshold is 97.1 °F, and historical observations show an average of 5 extreme heat days per year from 1961-2000.[1d] The frequency of extreme heat days are projected to increase as average temperature increases, rising to 15-20 extreme heat days per year by 2050, and 21-40 extreme heat days per year by 2100.[1d] Warm nights, defined by the 98th percentile daily minimum temperature as 66.4 °F, are projected to increase, too. Historical observations show an average of 5 extreme warm nights per year from 1961-2000, and projections show an average of 25-37 extreme heat nights by 2050, and 36-91 extreme heat nights by 2100.[1d]

Average number of extreme heat days for Escondido through 2099

	Low Emissions Scenario		High Emissions Scenario	
	Extreme Heat Days	Increase	Extreme Heat Days	Increase
1960-2000	5	-	5	-
2050	15	10	20	15
2099	21	16	40	35

Average number of extreme warm nights for Escondido through 2099

	Low Emissions Scenario		High Emissions Scenario	
	Extreme Warm Nights	Increase	Extreme Warm Nights	Increase
1960-2000	5	-	5	-
2050	25	20	37	32
2099	36	31	91	86

While the world is certainly experiencing an overall warming trend, much more goes into winter than temperature alone — snowfall and large storms depend on moisture in the atmosphere, and under climate change, that is increasing. Snowy weather patterns depend on the large-scale flow of the atmosphere, which is changing, too. A phenomenon, called winter temperature dipole, is shifting winter weather patterns. This makes for an east-west contrast, where cold east periods in the winter have been increasing in their frequency and the arctic air is being pushed into areas where it has historically been uncommon. Many extreme temperature conditions that redistribute heat and produce some combination of clouds, precipitation, and wind are becoming more common. These atmospheric conditions will affect snowstorms, derechos, hailstorms, rainstorms, blizzards, low-pressure systems, lightning storms, hurricanes, typhoons, and twisters. Scientific studies indicate that extreme weather events, like large storms are likely to become more frequent and/or more intense with climate change. Tropical storm activity in the Atlantic Ocean, the Caribbean, and the Gulf of Mexico has increased during the past 20 years. Storm intensity is closely related to variations in sea surface temperature in the tropical Atlantic.

3.3 Frequency and Intensity of Precipitation

Both the amount and distribution of precipitation are likely to change over the coming years. Southern California already experiences highly variable precipitation patterns, and climate change will further increase this volatility. The range of precipitation extremes will likely expand, resulting in fewer wet days and more dry days. More intense rainstorms could occur, distributing precipitation over a smaller window of time, followed by longer periods of drought.

The Cal-Adapt projections do not show a significant increase or decrease in the average annual precipitation for Escondido, which is observed to be 15.3 inches per year using the 1961-2000 baseline.[1c] However, in an extremely variable climate, annual averages are not likely to provide the most useful measurement of precipitation. For example, the average annual precipitation in Escondido from 1996-1999 was 15.3", aligning exactly with the observed baseline average. But the actual recording of those years tells a different story. The recorded precipitation for those years were 13.1", 14.0", 27.4", and 6.8".[1c] While the average precipitation for those years suggests normalcy, the reality is that each year had to face substantially different challenges. The Cal-Adapt projections show yearly precipitation highs of 40" and lows of 2-3", highlighting the variability and uncertainty of the projections on a year to year basis.[1c]

Severe rainfall events can delay planting and harvesting, cause power outages, snarl traffic, delay air travel, induce soil erosion and mudslides, and otherwise make it difficult for people to go about their daily business. The expansion of flood-prone areas, flood plains, and inundations zones could put more people and property at risk. Higher year-to-year variability can change overall water availability even if the yearly average does not change significantly over time. Wetter years will see a higher proportion of water lost to runoff along with higher risk of flooding. Drier years will increase water demand while also losing more to evaporation. Overall, these factors will lead to less water capture by constructed and natural environments, depleting the local water supply. It could also lead to more water entering the lakes from the surrounding watershed, bringing with it nutrients, pesticides and invasive species.

4 CITY SETTING AND CONTEXT

4.1 Population and Economic Portfolio

In 2017, the City had a population of 150,783, consisting of many diverse population groups. But different classes, ages, backgrounds, and identities are not all starting from the same place. Projected climate change will affect certain groups of people more than others, depending on where they live and their ability to cope with different climate hazards. In some cases, the impacts of climate change are expected to worsen existing vulnerabilities and disparities. Therefore, extra attention should be given to supporting those disadvantaged and under-represented groups. They might be more susceptible to health issues, financial burdens, or information barriers that limit their ability to adapt to changes in the social and economic environment. Some of the vulnerable groups are detailed here, along with several additional descriptive characters to further identify the makeup of the groups and how they might be impacted by climate change.

The City is also expected to grow relatively significantly over the next several decades, at a time when we may realize some of the climate impacts. SANDAG provides a tool for projecting changes in various population characteristics in the near future.[6] These projections are important for visualizing the potential changes in community makeup in order to better serve the diverse community groups.

Population Forecast to 2035

	2035	% Increase
Total Population	172,892	+14.7%
Seniors (60+)	19.1%	+21%
Children	27.4%	+8.3%
Hispanic or Latino	66.4%	+29.4%
Number of Jobs	---	+11.1%

Employment Breakdown by Industry [9b 9c]

Industry	2013	2017
Retail Trade	11.9%	12.5%
Health Care and Social Assistance	11.8%	10.7%
Manufacturing	11.2%	9.86%
Construction	8.45%	8.99%
Administrative, Support, & Waste Management Services	8.07%	8.37%
Accommodation & Food Services	8.69%	8.23%
Other Services	5.60%	7.15%
Educational Services	6.66%	6.70%
Professional. Scientific, & Technical Services	5.97%	5.93%
Arts, Entertainment, & Recreation	3.39%	3.39%
Transportation & Warehousing	2.36%	3.11%
Wholesale Trade	2.67%	3.08%
Finance & Insurance	2.78%	2.82%
Agriculture, Forestry, Fishing, & Hunting	3.17%	2.42%
Public Administration	2.71%	2.29%
Real Estate, Rental, & Leasing	2.47%	1.92%
Information	1.29%	1.79%
Utilities	0.81%	0.71%

From 2013 to 2017 employment rose by 15.1% overall, going from 62,200 jobs in 2013 to 71,600 jobs in 2017, a much higher rate than the population increase of 3.4% during those years (ACS). Escondido saw a notable rise in the percentage of jobs in retail, wholesale, construction, transportation, information, and other various services. These expanding industries are candidates for targeted job information outreach and training programs.

Escondido saw a relative decline in manufacturing, health care / social assistance, agriculture / forestry / fishing / hunting, accommodation / food services, and real estate jobs. Workers in these industries might be at risk of losing their job, so attention should be given to assisting with the transition from these shrinking industries to emerging ones. Future action plans and policies should review the most current data and adjusts their target groups to properly reflect which groups are vulnerable to job loss.

4.2 Lower Income Households

Usually there are high levels of residential segregation by income, which inhibits economic mobility. Lower income households are markedly different from other households. The vast majority of low-income households are working but still struggle to make ends meet. They seek to balance work and family life, yet face much greater risk and vulnerability than their higher-income counterparts. Lower income households also pay higher interest rates on loans when starting businesses and generally have less in reserve during emergencies, which frustrates economic opportunity. For that reason, lower income households tend to focus on immediate costs out of necessity. As a result, there are fewer lower-income households living in stable housing conditions, which means there is a great dependency on economic, policy, and cultural foundations. Changes in the social and economic environment can put disproportionate financial and health stresses on low-income households, which typically live on fixed incomes.

Population below 100% and 150% of the Federal Poverty Level [9a 9c]

	Below 100% poverty level	Below 150% poverty level
2010	15.6%	28.4%
2017	16.3%	29.0%

Lower income populations are more likely to live in areas with less greenspace, and in more compact areas that are built-up. As covered elsewhere in this document, heat islands form as vegetation is replaced by asphalt and concrete for roads, buildings, and other structures necessary to accommodate growing populations. These hardscape surfaces absorb, rather than reflect, the sun's heat causing surface temperatures and overall ambient temperatures to rise. Therefore, this group will be more likely to be impacted by temperature increases, extreme weather events, and increased frequency and intensity of precipitation that occur as a result of climate change. Because of residency location, this group is more likely to be exposed to a wide range of pollutants, which will be exacerbated by climate impacts. This group also has reduced access to key information and available programs and services as a result of language, cultural, or geographical barriers. Lower income household are also more likely to be “time poor,” in that they have less time and capacity to seek out information sharing civic activities. For example, lower income households may be unaware of the existence of resources, such as cooling centers or cool zones. For those in the extremely low-income category, their poverty exacerbates their vulnerability. Basic needs may not be fulfilled as easily, such as food and clean drinking water. Threats do not only take form in depletion, but also in the changing environment with malnutrition and food security, which can leave to hunger and/or diet-related diseases such as diabetes, high cholesterol, and high blood pressure.

4.3 Homeless Populations

For the most part, individuals that are homeless are unable to turn to the comforts of home during extreme weather events Some homeless are able to receive temporary housing accommodations through supportive housing provisions, where on-site or off-site services are provided to assist homeless individuals retain housing or improve their health conditions. Regardless of their living situation, basic needs, such as food and clean drinking water are not always readily accessible. They have a greater need for transportation services and public health and emergency services, especially if the individual or family lacks access to a personal vehicle (i.e. transit dependent) or basic health care. There is a general inability

of the individual (or family) to meet the demands placed upon the, and often find it difficult to cope with change. Their precarious standing as a group or class exacerbates their vulnerability to social and economic changes.

Homeless count from 2018-2019 [8a 8b]

	Total	Sheltered	Unsheltered
2018	411	148	263
2019	350	109	241

The homeless population can be considered one of the groups or classes that is a frontline environmental justice community. Not only are rising temperatures a danger to individuals already experiencing homelessness, extreme weather events and increased frequency and intensity of precipitation driven by our changing climate are leaving more and more people with nowhere to turn. Basic needs may not be fulfilled as easily, such as accessing food and clean drinking water. Rising temperatures decrease air quality, in part, by increasing the formation of ground-level ozone and fine particles. Exposure to high levels of ozone can lead to shortness of breath, wheezing and coughing, chest pain, and temporary decreases in lung function. The homeless are less able than most of us to find respite from this polluted air. Waste heat from vehicles, factories, and air conditioners may add warmth to their surroundings, further exacerbating the heat island effect. Hotter temperatures are also more hospitable to warm-weather insects/vectors, and longer-lasting warm weather seasons extend the life and breeding cycles of many of these same insects. Forced to move around, the homeless population interacts with more people and are more susceptible to infectious diseases. This is alarming since infectious diseases may be an undesirable outcome to climate change. In the alternative, during the cold winter months, especially with an increase in frequency and intensity of precipitation, it will be increasingly difficult to stay warm. Finding an appropriate place to sleep can also be the difference between staying warm and freezing. This dynamic situation, and the circumstances that put them and their families in their current situation, increases their exposure to a variety of environmental risks and vulnerabilities, such as limited access to health care coverage, unknown exposures due to social and economic barriers and lack of training, prejudice of social class, transit dependence, and limited access to healthy, safe and affordable housing.

4.4 Seniors, Retired, Elderly

Senescence, or the state and period of aging, is inevitable. Because many seniors are of retirement age, and are no longer working, they are more likely to be disconnected from the community. For this reason, many seniors seek out the company of other seniors or settings where other seniors live or recreate. At the later stages of the life cycle, many individuals seek dependent relationships, or have some sort of semi- or full-dependency, with family or professional care givers. Many seniors voluntarily seek out housing arrangements in senior housing or residential care facilities where varying levels and intensities of care and supervision, protective supervision, personal care, or health-related services are provided. As one ages, a person's ability to perform everyday tasks diminishes. Alterations in physiological functions can occur, including increased task-difficulty in the dark, increased vulnerability to falls and accidents, reduction of mobility, and ability limitations. For this reason, the elderly also pays a larger share of their fixed incomes on health care services and medications, and this indirect cost of living expense is increasing at greater rates than real wages or the return on investments for many people. Based upon their varying needs, some seniors may reside in community treatment facilities or receive specialized services and support or special adaptations directed toward social or economic habilitation. Given that they are often on a fixed income; they are financially vulnerable to health issues associated with climate change.

Generally, as one ages there is an increasing inability to adapt to new situations, making alterations in the social and economic environment poorly withstood.

Elderly Population (60+) and additional characteristics [9a 9c]

	Total	Hispanic or Latino	Below 100% Poverty	Below 150% Poverty	Non-English Speaking	Renter
2010	15.0%	16.8%	8.0%	25.6%	16.4%	29.7%
2017	15.8%	20.2%	9.1%	18.6%	19.1%	27.0%

The challenges seniors will face adapting to climate change could have significant implications for the individual's health and the population as a whole. Individual physiological and social factors associated with aging may render the effects of climate change on older adults more severe as compared to other age groups and classes. Historically, extreme heat is unusual and unexpected. In these situations, older people are the most likely to suffer health issues (encompassing infectious diseases, decreasing nutrition, injuries, etc.) because individual health factors interact with environmental exposure. Pre-existing chronic medical conditions (i.e., cardiovascular disease, obesity) make susceptibility to heat worse. Ambient air pollution, especially ozone and fine particulates, affects older people more frequently, particularly those with chronic illnesses such as heart disease, lung disease, or diabetes. Those with a pre-existing health conditions that limits mobility, and those on medications that increase susceptibility to climate-related parameters, are thus the most likely to be impacted. Displacement caused by wildfires can put disproportionate financial and health stresses on the elderly, who are typically on fixed incomes and/or may be semi- or fully-dependent on hospice care or specialized services.

4.5 Renters

Renting lets people stay mobile and move without being tied down to a place or to regular house payments. Renting gives people flexibility in how they manage their household budgets, so it tends to be convenient (or necessary) for households who may not want to (or cannot) make the long-term financial commitment that comes with buying a home. In some cases, tenure by age of population can be at a younger stage in the lifecycle, often referred to an entry-level household, where personal wealth and purchasing power is low but grows with age. In other cases, local housing markets are not providing sufficient affordable and accessible units to the renters who require them, so this group or class may contain a variety of household ages. The cost of living may be so great that households are forced to live paycheck to paycheck. The diversity of rental housing is as reflective of the housing supply as it is of the condition. Because the household does not own the property, so they are in less control over how it is maintained or improved over time. Substandard housing exposes people to additional physical risk and mental stress, stemming from numerous structural deficiencies prevalent in poorly maintained rental properties. Substandard housing and environmental conditions contribute cumulatively to poor health outcomes such as asthma, gastrointestinal disease, and other conditions. Housing instability and lack of privacy due to overcrowding can create additional stress that leads to anxiety and depression.

Renters and average size of renting household [9a 9c]

	Total	Average size of renting household
2010	45.1%	3.03
2017	51.9%	3.40

As the effects of climate change intensify over time, many families may be displaced from their current housing accommodations. Human health impacts can encompass infectious diseases, decreasing nutrition, injuries, and job loss. Even those who are not directly impacted by extreme climate change may be paying tens of thousands of dollars in their lifetime due to its effects. This is money that not all families can afford, and money that could otherwise be put to other necessities like housing, transportation, food, healthcare, and so on.

4.6 Children, Youth, and Students

The social, economic, and culture status of children and minors are tied to the group classification or lifestyle of their family or guardian unit. Generally, as a dependent, there is an increased inability to meet and deal with new situations without the family unit or guardian group. Alterations in the environment are badly withstood independently. This group is more vulnerable to higher temperatures, extreme weather events, and increased frequency and intensity of precipitation, because they rely on caregivers to provide support services. Members of this group do not have a car and are unable to drive without assistance. The health impacts flagged by this group and class starts at the prenatal level with a heightened risk of low birth weight and neonatal death, and continues through childhood and adolescence with potential infectious diseases, decreasing nutrition, injuries, and job loss. Because of their status in the lifecycle, i.e. formative years, changes in the social and economic environment has a greater propensity to translate to irrecoverable physical, emotional, and mental changes. For example, with climate impacts and increased temperatures, winters will be shorter, making outdoor allergy seasons longer and warmer. This worsens allergic episodic symptoms in the development stage, which increases the chances of lung problems and asthma symptoms. Also, a changing environment might directly change potential exercise behaviors, which is well documented to support fighting obesity and other chronic illnesses.

Children Population (<18 years) and additional characteristics [9a 9c]

	Total	Hispanic or Latino	Below 100% Poverty	Below 125% Poverty	Renter
2010	27.1%	61.0%	20.9%	28.7%	51.0%
2017	25.3%	68.6%	22.6%	30.7%	62.7%

4.7 Minority Groups and Non-English Speakers

There are so many racial minority groups that some people question whether "minority" is the appropriate term to describe people of different groups or classes. For example, the Hispanic-American population is among the fastest-growing in the United States, in particular San Diego County. Notwithstanding, the size of a minority group or class is an important component that plays a role in shaping the experiences of those that belong to it. Racial and ethnic minority groups are often segregated geographically from other groups or classes. The size of the group or class is an important component that plays a role in shaping the experiences of its members. In particular, members of smaller groups theoretically have a lower chance of seeing other group or class members across various social and economic contexts.

Some of the critical barriers faced by ethnic minority communities include: logistical barriers to transportation, childcare, access to programs and services, and obtaining time off from work, etc. Services that offer languages other than English are lacking in many areas and/or programs, even in communities

where minority group populations are high. In addition to language barriers, other challenges may arise, such as spiritual, religious, or cultural differences, each of which may affect perceptions about government programs and services. Some individuals may also be distrusting of government and City or County Officials. In addition, a lack of accurate information can inhibit those in need from seeking or receiving services.

Hispanic or Latino Population and additional characteristics [9a 9c]

	Total	Elderly (60+)	Children	Below 100% Poverty	Below 125% Poverty	Renter
2010	46.2%	5.4%	35.8%	22.0%	31.6%	61.3%
2017	51.3%	6.2%	33.7%	20.5%	29.4%	70.6%

Non-English Speaking population [9a 9c]

	Total
2010	25.4%
2017	22.7%

Although climate change is expected to affect the city as a whole, there are a few communities who will feel the effects the most, including those households living in marginalized communities. Minority groups and non-English speakers are often already overburdened with poor environmental conditions and are disproportionately affected by, and less resilient to, the health impacts of climate change. Among minority groups and non-English speakers, there is usually a disproportionately low attendance at meetings and a lack of civic participation. Therefore, ethnic minority groups might be more disconnected from the community, affecting awareness about social programs and services. For example, households consisting of minority groups and classes may be unaware of the existence of resources, such as cooling centers or cool zones. They may be more vulnerable to financial and health stresses due to a lack of social networks to help provide guidance in times of need. This dynamic situation, and the circumstances that put them and their families in their current situation, increases their exposure to a variety of environmental risks and vulnerabilities, such as limited access to health care coverage, unknown exposures due to language barriers and lack of training, racism and an increasingly hostile sentiment towards immigrants, and transit dependence.

4.8 Agricultural Industry Workers and Farmworkers

It is crucial to have a reliable and healthy workforce. Migrant farmworkers and their families live in a range of housing types, if at all. In addition to traditional housing such as single-family homes and apartments, seasonal and year-round farmworkers take shelter in labor camps, mobile homes, motels, cars, in fields, under tarps, or in barns and tool sheds. Seasonal and year-round farmworkers and their families often reside in dilapidated rental housing and mobile homes. Not only do many workers live in crowded, unsanitary conditions, but they often lack basic utilities. Also, they are increasing likely to reside in isolated areas far away from important services like health clinics, grocery stores, and public transportation. Hazardous conditions are routine, including pesticide exposure, extreme heat and lack of shade, and adequate clean drinking water. Farmworkers comprise one of the most vulnerable populations, experiencing multiple social and economic disadvantages that negatively impact their health. Farmworkers tend to live in isolated neighborhoods or areas that are “informal” and often poorly served

by municipal governments. Due to the difficult nature of surveying migrant workers, projections tend to underestimate the true number of this group.

Agricultural industry workers and farmworkers are another group that can be considered as a frontline environmental justice community. Because many farmworkers and day laborers are temporary and seasonal workers, they are forced to live a transient life and are constantly looking for work and housing. This group will be more likely to be impacted by temperature increases, extreme weather events, and increased frequency and intensity of precipitation because of the irregular and hazardous work available to them. Basic needs may not be fulfilled as easily, such as food and clean drinking water. They are among the most economically vulnerable workers. For some, their precarious immigration status exacerbates their vulnerability to labor issues and economic security. Service boundaries and language restrictions can provide additional barriers in accessing programs and services. This dynamic situation, and the circumstances that put them and their families in their current situation, increases their exposure to a variety of environmental risks and vulnerabilities, such as limited access to health care coverage, increased costs associated with exposure to various pesticides and herbicides, unknown exposures due to language barriers and lack of training, racism and an increasingly hostile sentiment towards immigrants, transit dependence, on the job injuries due to heavy or repetitive labor, and limited access to healthy, safe and affordable housing.

5 IMPACT AND NEEDS ASSESSMENT

Projected climate impacts related to increased climate change, such as temperature, extreme weather events, and increased frequency and intensity of precipitation, etc., will impact our daily lives in many different ways. The impact may be more significant depending on individual or household status in a group or class, as well as various variables within the social and economic environment. Things that we depend upon and value — housing, transportation, water, energy, agriculture, ecosystems, business activity, and human health — will all experience the effects of a changing climate. This section attempts to document the scope and extent of these changes.

5.1 Housing

Climate and land use patterns are expected to change social and economic environments dramatically in the coming century, raising concerns about their effects on how cities and county's can accommodate social equity and environmental justice in its land development policies. Today, many people are having difficulty paying for safe, decent, and attainable housing – this forces households to make difficult decisions about where their housing is located, its relative size, and/or its condition. As the population grows, shortfalls in the housing stock become increasingly difficult to contend with. This housing shortage generates a housing affordability problem, exacerbated by growing income disparities. Meanwhile climate change is a threat multiplier that exacerbates social equity and environmental justice issues already faced by people of disadvantaged or under-represented groups. As a new set of climate-adaptation policies are being developed to build more housing, there is an opportunity to create new policies that strengthen our housing options to promote climate resiliency. This could mean that the City should strive to build more compactly and use energy-efficient, green building techniques, constructed with resilience in mind. It could also mean that the City should put homes, schools, commercial areas, and park and other destinations close to each other so that people can easily walk, bike, use public transit, or drive shorter distances. Increasing the resiliency of our housing is particularly critical in lower-income

neighborhoods and underserved communities who have historically lacked adequate housing – because of long-term social disinvestment – and are at greater risk from climate-change impacts. Because adding to our housing stock in ways that are climate-resilient can help reduce energy- and transportation-related pollution, slowing the effects of climate change and increasing resiliency to climate impacts, including extreme heat, while reducing economic burdens for residents. Smarter choices about accommodating future housing demand can help promote development in previously developed areas, which helps reduce pressure to build on undeveloped land or discourages building in areas that are currently or are projected to be more vulnerable to climate change-related impacts. The relative influence of fire patterns and severity, remains unclear, particularly given the substantial geographical variability in fire-prone places. New housing must mitigate this growing threat through sound building and site design practices.

5.2 Transportation

As climate changes, agencies may have to deal with new weather stressors that require different planning and engineering approaches or responses. Potential operational impacts and anticipated changes to system maintenance include more inspections, a higher frequency of repairs, more frequent diversions to alternate routes, increased emphasis on alternate modes of transport such as transit, biking, or walking, and potential dynamic or seasonal restrictions for trucks or rail during times of high heat. While most planning and engineering approaches are often reactive, the increasingly unpredictable nature of extreme weather events could place increasing strain on an already stressed system. Changes in relatively short duration extreme events often result in the most significant consequences, and while an ad hoc response to these events on an individual basis make sense now, the cumulative impact of more severe and more frequent events may warrant a change in business practices to address any of the following concerns:

- More frequent/severe flooding of underground tunnels and low-lying infrastructure.
- Increased thermal expansion of paved surfaces, potentially causing degradation and reduced service life, due to higher temperatures and increased duration of heat waves.
- Higher maintenance/construction costs for roads and bridges, due to increased temperatures.
- Asphalt degradation and shorter replacement cycles; leading to limited access, congestion, and higher costs, due to higher temperatures.
- Culvert and drainage infrastructure damage, due to changes in frequency and intensity of precipitation.
- Decreased driver/operator performance and decision-making skills, due to inclement weather.
- Increased risk of vehicle crashes in severe weather.
- Restricted access to local economies and public transportation.

Operational and system maintenance programs must take a proactive approach to regularly re-evaluate existing programs and practices in light of new, unforeseen demands to ensure they are climate resilient. For example, being able to create alternative transportation methods has a multitude of benefits, including taking cars off the road, reducing emissions/pollutants in the air, and giving more accessibility to a wider range of people and more choices for mobility. It can make travel accessible for those that cannot drive, such as children, elderly, and disabled, as well as for those that cannot afford a personal vehicle. Safe streets for pedestrians and bicyclists can improve the quality of life and health for residents, and can attract new businesses and development. The City should take actions to ensure that investment decisions address potential climate impacts as appropriate in order to protect infrastructure investments. Through such actions, transportation systems will gradually become better prepared for future climate shifts.

Commute to work for Escondido residents is almost exclusively by automobile. According to the 2010 census, 3% take public transit to work, 2% walk, and only 1% bicycle to work. This may not seem like a big deal, but it becomes more evident when being socially or economically disadvantaged intersects with what is referred to as "transport disadvantage." A lack of access to walking and biking opportunities and/or reliable and frequent transit service, automatically excludes people from using that service. Some people may have transport disadvantages, but if they have the means to, they can overcome these barriers and without limiting their ability to get to work, to grocery shop or go about their daily lives. The development of complete streets, strategically places transit stops, reduced off-street parking requirements, transportation demand strategies, and the proper incentives can be used to increase the use of alternative transportation and provide more equity into transportation planning.

5.3 Water

Fresh water supply will be greatly impacted by climate change effects. Local water supplies are limited due to the generally arid climate, seasonal availability of surface supply, the relatively shallow aquifers, and lack of permeable soils.[7] As Southern California already faces recurring water supply shortages, further response to climate change effects will be vital. Prolonged droughts will cause stress on supply sources, while increasing overall water demand. The San Diego County Water Authority projects overall water demand for the San Diego region could increase by 25% by 2040, even when accounting for expanded water conservation practices.[7] Changes in precipitation patterns could decrease snowpack by up to 65%.[3] Climate change impacts on groundwater sources are also a cause for concern, although the effects are not fully understood. These potential water shortages and demand increases can increase supply costs and put a financial burden on customers.

5.4 Energy

Changes in temperature, extreme weather events, and the frequency and intensity of precipitation will affect how much energy is produced, delivered, and consumed. Energy plays an important role in many aspects of our lives. For example, we use electricity for lighting and cooling. We use fuel for transportation, heating, and cooking. Our energy production and use is interconnected with many other aspects of modern life, such as land use, population growth, economic demand, and use of goods and services. In a warmer climate, it is anticipated that we will use more electricity for air conditioning and less natural gas, oil, and wood for heating. If the climate warms by 3.5°F, the demand for energy used for cooling is expected to increase by about 5% - 40%, while the demand for energy used for heating is expected to decrease by about 3% - 30%. Such high peak energy demand, especially in summer months, runs the risk of grid shutdown and higher energy costs. Additionally, the impacts of higher temperatures will be different depending on location as there can be local-scale temperature differences between urban and rural areas. Urban areas tend to have higher temperatures than surrounding rural areas in what is known as the urban heat island effect. Heat sinks into manmade landscapes such as asphalt or concrete due to their increased heat capacity. Meteorological services have found an average annual difference between urban and surrounding rural areas on the order of 4°F - 5°F. Expanding urban tree canopies, utilizing heat-reflective surfaces, and lowering emissions are long-term solutions to addressing the urban heat island effect. Tree canopies can serve as an inhibitor to the magnitude of the urban heat island effect. Shade provided by trees can cover paved surfaces, shade buildings, cool the air through evapotranspiration, and sequester carbon from the atmosphere. Studies have also shown that habitat conservation and restoration can be a strong tool to combat the urban heat island effect from growing.

5.5 Agricultural Production

Agriculture is vital to the economy and to the foundation of community health. However, crop yields will decline when temperatures exceed a crop's optimal temperature range. Furthermore, changes in climatic levels can have unpredictable results on crop yields when combined with other varying factors like temperature, ozone, nutrient availability, and water resource availability. The currently utilized crop species may not be suitable for cultivation as climate-related atmospheric changes occur. For example, avocados are susceptible to damage from high maximum daily temperature, and projections estimate overall avocado yield could decline by 15% - 45% by 2050 due to rising temperatures.[5] Higher temperatures can introduce new and higher concentrations of pests and weeds which can damage crops and/or require more expensive and potentially damaging control techniques. Constraints on water supply could increase production costs, which can decrease margins and might lead to higher crop prices for the consumer. Potentially suitable agricultural land will be very important as climate change impacts take effect. Farmers' markets will become important community pillars to support local farmers and reduce food waste. Supporting locally sourced foods also reduces the vehicle miles traveled from "farm to fork," which with all other things being equal, means less greenhouse gas emissions.

5.6 Ecosystem

The natural environment is susceptible to degradation caused by climate change. More intense storms can increase the risk of damage from landslides and flooding, causing habitat loss and natural ecosystem disturbances. Similarly, wildlife is vulnerable to the negative health issues caused by climate change and may put some species at risk of endangerment or extinction. Invasive species might proliferate as a changing climate creates an environment that better suits their ability to compete in the surrounding area. Furthermore, some species are vulnerable to changes in temperature, humidity, or drought conditions. Governments and their associated partners should develop action plans to increase the survivability of species, and prioritize efforts based on the susceptibility of extinction for each species. Policy should reflect future changes in the climate through the establishment of guidelines for constructing and managing open spaces. Possible additions could include a shade-to-space ratio, drinkable water, and site supervision.

Higher temperatures, prolonged droughts, and precipitation changes can all exacerbate California's already very high wildfire risk. By 2100, the average area burned in California could increase by up to 77% based on current emission projections.[3] Drier vegetation becomes more flammable, both increasing the risk of catching fire and the intensity of burning. The length of the fire season will likely grow as temperatures rise over time, increasing the probability of fire events occurring. Increased wildfires can create stress for communities including limited water supplies to combat fires, health problems from smoke inhalation, and increased property damage. As risk increases, fire insurance is estimated to go up by 18% by 2055, which may put some individuals under financial stress or risk major devastation to go without.[3] Adaptation to rising wildfire risk will require community awareness, evacuation plans, damage mitigation plans, and long-term prevention plans. The City has a high to very-high fire risk along the outskirts of almost the entire city. The Escondido Fire Department makes regular trips to high risk areas to communicate with residents about wildfire preparation. The Department conducts interviews with residents, helps them identify evacuation routes, and educates them on the steps to take during a wildfire event.

5.7 Business Activity

The climate change crisis is a non-market crisis, in that the market doesn't monetize these impacts. Traditional economists are even increasingly acknowledging this and are calling for ways to monetize the impacts of carbon, which is where everything from the cap and trade program to carbon tax credits. Whatever the means employed, the price of greenhouse gas emissions will increase in coming decades. Climate change will cause a shift in many industries as consumer demand behavior changes. As energy supply moves towards renewables instead of fossil fuels, we will continue to see changes in the transportation industry, construction, home appliances, and energy production. These industry shifts will have associated job gains and losses, which create new opportunities for some, while eliminating employment opportunities for others. Potential increased costs of food, water, and energy can put burdens on consumers, especially those of lower income, which can have far-reaching effects on the community and the economy. A strong workforce with quality jobs can be one of the most important factors in building resiliency. As climate change impacts occur, and as actions in the CAP are implemented, economic changes are expected to occur in various industries, specifically in the creation of green jobs. For example, potential increased public transportation ridership might create a demand for transportation-related jobs. Incentives and programs that promote solar panels could create demand for solar panel installation and maintenance jobs. Green jobs are predominately middle-class jobs that pay well, so they can provide a pathway up the social and economic ladder. It is important for Escondido to understand these possible industry shifts so that job seekers can be prepared for and aware of new job opportunities. Priority should be given to communicating job announcements and providing training to vulnerable populations. It is also very important to understand the past industry changes as well as industry trends that are taking place today.

5.8 Human Health

Despite future efforts to implement these concepts, climate change will still have numerous negative effects on existing homes and the livability of certain housing types and/or locations. Prolonged higher temperatures can lead to air quality issues from things like ground-level ozone which can cause breathing difficulty and lung problems. Exposure to higher temperatures increases the risk of heat-related illness and death, especially for vulnerable populations like children, elderly, and outdoor workers. Elevated nighttime temperatures can increase perspiration, lead to dehydration, and cause people to lose sleep. Heat-related deaths in California are projected to increase by 100-200% by 2050.[3] A warmer climate can also create an atmosphere that introduces pests carrying vector-borne diseases. These health problems can cause peripheral impacts in the community, such as straining hospital supplies and increasing medical expenses. To help assist residents during high heat events, Escondido has established community cooling centers or cool zones where people can take refuge from the heat. However, public education and awareness of the changing environment will be instrumental in the successful implementation of these adaptation strategies as well as to build community capacity.

Cool Zone Locations in Escondido

Organization	Address	Zip	Phone
East Valley Community Center	2245 East Valley Parkway	92027	760-839-4382
Escondido Public Library	239 Kalmia Street	92025	760-839-4684

Interfaith Community Services	550 W. Washington, Suite B	92025	760-489-6380
San Diego Humane Society	3500 Burnet Drive	92027	619-299-7012
Park Avenue Community Center	210 Park Avenue	92025	760-839-4688

6 PRIORITIZATION OF NEEDS

The lower income and vulnerable groups discussed earlier in the document should not be considered an exhaustive collection of local socio-economic demographics, but should be referenced as a baseline for understanding the City's populations (groups and classes) in order to inform decision-making and implementation. Additionally, each potential vulnerability listed earlier should not be viewed in isolation. Instead we should be acutely aware of any overlapping population groups and risk factors, as containing multiple vulnerable characteristics can compound the potential problems that climate change presents. By analyzing the intersectionality of risk factors, we will become aware of specific groups that consist of multiple risks making them more vulnerable than the sum of the parts. Careful analysis of the spatial relationships of different inequalities can help identify these possible overlapping characteristics. For example, the maps depicting median income, non-English speaking areas, and housing tenure all show similarly distributed characteristics. The South Centre City area and the East Valley area contain the highest proportions of non-English speaking, renters, and low median income. Those areas should be highly prioritized when implementing programs intended to assist with any or all of the mentioned population groups. The exercise also highlights social and economic inequities within the City as a disproportionate number of lower income households and people of color are concentrated in census tracts with very low to moderate access to open space areas. Other connections can also be found by identifying what is lacking in a particular area. The map depicting the senior population shows the highest concentrations residing along the outer areas of the city. When contrasting that map with the transit routes map, we can see that those areas have few transit stops. Seniors may need transportation assistance if they cannot afford a vehicle or cannot physically operate one, so areas with a high proportion of seniors could be priority areas to target new transit stops.

When implementing a climate change adaption strategy, it is of vital importance to analyze the geographic distribution of intended recipients of the strategy. Analyzing the relationship between geographic locations and vulnerabilities provides information on potential causes of risk factors and helps to prioritize areas of most need. Careful attention must be given during the analytical stage so that the City can be prepared to provide the right level of information to City Officials to help their decision on where to distribute services that will help the most disadvantaged groups. Maps have been provided as attachments to this document to help capture and illustrate various socio-economic and geographic indicators at the neighborhood level, which can be used to explore broader sustainability through location efficiencies.

6.1 Social Equity and Health Index Map

The City created a Social Equity and Health Index Map to better understand how local decisions can impact lower income and vulnerable populations, and to establish benchmarks and metrics to serve as a citywide assessment of social equity and environmental justice disparities. This mapping tool creates an opportunity to assess different geographical areas of the city and developed standardized indicators for comparison purposes. U.S. Census and health survey data was utilized to determine the social

vulnerability of every census tract. Census tracts are subdivisions of counties for which the Census collects statistical data. Each census tract was ranked on socio-economic and chronic health factors, including poverty, income, unemployment, education, elderly, non-English speaking, and housing tenure; as well as asthma and cardiovascular incidence rates; and pollution burden indicators such as diesel, ozone, particulate matter. Whereas, the separate rankings help create a heat map of related risk factors, the aggregated database helps public health and city officials identify and map sections of the community that need support before, during, and after a hazardous event. The overlap of these risk factors highlights areas of greater cumulative risk that should be prioritized when implementing corresponding adaptation strategies. The Social Equity and Health Index Map is provided as an attachment. This mapping tool can help inform decision-makers about how best to incorporate climate equity into City operations and ensure every department is able to identify which communities will need support before, during, and after a hazardous event. The City can also assess other mechanisms to help dismantle barriers our communities face to become more civically engaged and a part of the decision-making process, internally and, where applicable, with other agencies within the City.

6.2 Heat Vulnerability Index Map

As discussed Section 5.4 *Energy,* there are many urban areas that experience a heat absorption phenomenon, called "heat islands" whereby certain areas experience warmer temperatures than their rural surroundings. Research has found that temperature difference is usually due to human activities and from the modification of land surfaces which remove green and shaded areas from urban settings. A few factors that contribute to localized heat islands include: reduced vegetation in urban areas; and an increase in roads, roofs, buildings, and other materials that have low solar reflectance and high heat absorption rate. The best way to assess the community's exposer to the formation of an urban heat island is to identify and assess tree canopy areas and impervious land cover, like buildings and roads. Many urban areas have a lower percentage of green space compared to rural regions. Since trees and vegetation provide shading effects, which help lower surface temperatures, a low percentage of green space of the total urban land area can directly translate into higher surface temperatures. In contrast to vegetated areas, impervious surfaces are very effective at trapping heat. Hardscape areas do not effectively dissipate ambient heat. To determine the amount and location of vegetation and impervious land cover throughout Escondido, data from SANGIS helped extrapolate and distinguish tree canopy coverage and impervious surfaces throughout the city. By combining data from the above maps, specific areas of the community that are particularly sensitive to heat are identified. The Heat Vulnerability Index Map is provided as an attachment. The densest clusters of tree canopy exist in areas of the city committed to parks or open space. Buildings, roads, and other surfaces that absorb heat are located predominantly in commercial and industrial areas of the city. This mapping tool can help inform decision-makers about green space planning, landscaping installation requirements, and/or other programs to reduce heat absorption.

7 ADAPTATION STRATEGIES

This section includes adaptation strategies that have been identified to improve the ability of the City and its residents and businesses to adapt to the climate impacts. These actions may be further refined so that there is a clear roadmap on how to prepare for climate impacts and how to ensure the City is addressing adaptation, while moving in the right direction to address social equity and environmental justice when implementing the CAP. Implementing the actions in this section would strengthen the City's economy, improve risk management, clean our environment, and improve health and wellness.

Table A1	Become a "Climate Smart" Leader
Measure A1.1: Fully anticipate, plan for, and mitigate the risks of climate change and seize the opportunities associated with the social and environmental change.	
Recognize climate impact variables as a risk in how the City manages programs, projects, and infrastructure.	
Target Year	**Performance Metric**
2020	Annually monitor climate change research and best practices to improve the understanding of local climate change, weather-related emergencies and climate hazards, and to support climate change preparation efforts in local, state, and federal partners.
2023	Adopt established methods for projecting the lifecycle carbon emissions of land use and transportation investments and begin to prioritize projects that have the greatest potential to sustain future changes and changing weather-related emergencies and climate hazards.
2023	Assess climate impacts in the 2023 Multi-Jurisdictional Hazards Mitigation Plan update, and incorporate social equity and environmental justice concepts to the extent practicable, and develop system wide approach to prepare for and respond to changing weather-related emergencies and climate hazard events.
2024	In infrastructure project design - prioritize plantings, materials, and infrastructure specifications that will be resilient to climate change hazards and be cost-effective over the lifetime of the asset.
2025	Update the "2020 Escondido Climate Adaptation Study."
Measure A1.2: Make sure that everyone is given the opportunity to be prepared for the current and future risks that are exacerbated by climate impacts.	
Develop and build capacity for a transparent and inclusive education, outreach, process, and decision-making framework designed to achieve equitable access and other climate health-related goals.	
Target Year	**Performance Metric**
2020	Designate point of contact(s) to establish and maintain staff ability and capacity to ensure effective implementation and equitable outcomes of climate action efforts.
2022	Create collaborative partnerships with community-based organizations, including vulnerable populations to broaden and diversify community engagement and to support community-based initiatives that align with climate impact preparation priorities.
2023	Develop a climate change adaptation public outreach and education program. Engage hard-to-reach vulnerable populations by creating neighborhood climate ambassador liaisons.
2025	Provide quality information and/or how-to resources using interactive approaches that may include competition, feedback, and recognition. Activities may include: • Provide free technical assistance to businesses. • Develop working groups with workforce development and training organizations to integrate green jobs into existing work. • Develop and implement a local green business program to provide recognition for business achievements. • Partner with business groups to conduct Fix-It Fairs or participate in street-fairs by engaging under-served businesses in learning about sector opportunities • Hold regular workshops with building contractors on green building best practices.
2026	Minimize health issues and disparities caused by weather-related emergencies and climate hazard events (such as extreme heat days), especially for populations most vulnerable to these impacts, by improving the preparation for and response with health, community service, public safety, and emergency staff, resources, and/or services. Actions may include:

Table A1	Become a "Climate Smart" Leader
	• Leverage partnerships and support organizations to provide assistance to vulnerable populations in high fire hazard areas. • Advertise outdoor worker protection measures, including heat safety and employment security. • Develop a cool zone plan in consultation with resident, business, and community groups and provide updates in conspicuous locations online and social media when cool zones are activated. • Educate homeowners and tenants of multi-family housing about weatherization projects and the cost savings gained from energy efficient homes through training programs. • Develop evacuation assistance plans and advertise their availability to vulnerable populations in hazard areas, and be prepared to implement as part of emergency operations during climate hazard events. • Utilize citywide publication and social media to reach a broad audience to advertise preparedness, risks of potential climate hazard events, and/or implementation status of these measures.

Measure A3.1: Hardwire social equity and environmental justice into new programs and projects.

Focus planning and intervention programs on neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.

Target Year	Performance Metric
2020	Redress social equity disparities by targeting some of the CAP implementation projects into the most vulnerable areas as defined by the "2020 Social Equity and Health Index Map."
2020	Maximize mitigation benefits locally by prioritizing community specific (i.e. local) mitigation for greenhouse gas emissions and biological impacts/habitat loss. If no local mitigation credits or mitigation opportunities are available, allow project applicants to seek out regional solutions, first. If no regional solutions are available, then state solutions, with a preference to proximity.
2023	Consider establishing equity considerations for recreation/parks programming, planning, engineering, and public works projects, such as: • Does the proposed action generate burdens either directly or indirectly to vulnerable populations? If yes, are there opportunities to avoid, minimize, or reduce those impacts? • Can the benefits of the proposed action be targeted in ways to reduce vulnerable population disparities? • Are the benefits of the proposed action broadly accessible to residents or businesses of vulnerable populations?

Measure A4.1: Develop working relationships with other agencies and continue to analyze climate impacts.

Establish working groups and collaborate with regional and state agencies and groups to promote becoming "Climate Smart" and promote complementary adaptation strategy development.

Target Year	Performance Metric
2020	Work with SANDAG and NCTD to make the regional transportation network more resilient, incorporate consideration of climate impacts as part of infrastructure planning and development, and prioritize transportation investments that have the capacity to adapt to climate change, while promoting social equity and environmental justice.
2022	Work with law enforcement, CALFIRE, City of San Marcos, County of San Diego, City of Vista, and City of Poway to reduce risk from high fire hazard areas and develop effective response mechanisms and evacuation scenarios.

Table A2	Build Thriving and Resilient Neighborhoods
Measure A2.1: Make sure that everyone has equitable access to full, healthy lives.	
Recognize the importance of the ecosystem and improve personal, environmental, and economic health	
Target Year	**Performance Metric**
2022	Develop equitable programmatic resources to increase the production and consumption of home grown and locally sourced food by supporting farmers' markets, community gardens, and other forms of urban agriculture.
2022	Establish partnerships with local businesses and groups to provide educational opportunities for residents to gain skills in organic gardening, fruit production, composting, food preservation, and cooking healthy foods.
2023	Review and update heat response plans to: • Coordinate operations of readily accessible cooling centers. • • Recommend potential ways for property managers and homeowners' associations to implement Cool Zones. • Develop an "early warning system" and response plans that alert residents, businesses, and community members, especially those most vulnerable to heat, when projected heat conditions exceed 100 degrees.
2023	Develop incentives to increase the planting of fruit trees in appropriate areas on private property.
2024	Use regulatory and voluntary tools to increase access to neighborhood parks, passive parklands, parklets, and/or pop-up recreation programs to increase parkland coverage and/or expand equitable access to recreational opportunities.
2025	Consider ways to improve equitable access to clean and sustainable energy. One way could be to create a "Clean Energy Equity Plan" to support low-income residents and small organizations to purchase or obtain renewable energy.
Measure A2.2: Create "climate safe and decent" housing options.	
Support more comfortable and resilient homes and buildings to proactively adapt to changing weather-related emergencies and climate hazard events.	
Target Year	**Performance Metric**
2020	Increase the use of public and private roofs for rooftop gardens. Provide education on how private property owners can use rooftop gardens as an eco-friendly alternative to bring greenery into a sterile space, provide a place to relax or grow food, delay stormwater runoff, and cool the building to reduce energy consumption. Expand green roof installations through outreach and incentives, such as the Stormwater Credit Fee.
2023	Update the building code to require new private buildings to have operable windows, providing choice levels of light and wall-to-wall ventilation.
2023	Update the building code to mandate the installation of cool roofs on all new and retrofitted roofs on multi-family projects.
2024	Analyze the feasibility of a point-of-sale weatherization audit and wildfire risk assessment for existing single-family homes in high or very high wildfire hazard areas.
2027	Develop and implement a mitigation plan for power outages, which may include any one of the following: • Adopt an ordinance that requires new senior housing or large care facilities to install air conditioning in all units and on-site home energy batteries and energy storage. The ordinance shall also require conversion projects to provide adequate on-site temperature controlled spaces in indoor common areas, if any. • Adopt an ordinance that requires new affordable housing projects to install air conditioning in all units. Require affordable rehabilitation projects or other conversions to provide adequate on-site temperature controlled spaces in indoor common areas, if any.

Table A2	Build Thriving and Resilient Neighborhoods
2028	Consider ways to reduce reliance on centralized sources for energy. • Facilitate access to local, decentralized renewable energy by incorporating renewable energy projects into community choice aggregations or other community-wide renewable programs. • Complete a micro-grid feasibility study and begin implementation.
Measure A2.3: Build capacity for adaptive neighborhoods.	
Reduce risks and impacts from increased temperatures, drought conditions, and shifts in seasonable precipitation in the areas around our homes and businesses.	
Target Year	**Performance Metric**
2022	Utilize the "2020 High Fire Hazard Map" to better manage the risk of wildfires as a result of drier summers, especially in areas where homes are next to natural open space areas: • Enforce statutory standards for provision of defensible space inhibiting wildfire spread on private properties, and implement brush clearing and fuel breaks to manage the potential spread of wildfire. Evaluate other ways to reduce risks in and around wildland-urban interface areas that are rated as high fire hazard areas such as improving the quality and plant palette around wildfire prone areas, and/or other ways to reduce risks in and around high fire hazard areas. • Manage the increased risk of wildfires of new residential subdivisions in very high fire hazard areas by expanding the required fuel modification zones from 100 feet to 150 or 200 feet, depending on geographic conditions such as land slope, unburnable areas, and surrounding vegetation fuel points. • When analyzing new residential projects in very high fire hazard areas, incorporate evacuation route planning into the analysis. Evaluate brush fire spread and wildland fire behavior characteristics that utilize a 60 mph prevailing wind factor at a minimum, or higher wind speeds if documented as necessary.
2024	Adopt plant palettes in the Landscape Ordinance to withstand drought conditions and promote plant-type resilience (in street and park trees, green roofs, etc.).
2024	Utilize the "2020 Heat Vulnerability Map" to identify at risk areas and help inform decisions and priorities about implementing ways to cool the urban environment. When evaluating programs, projects, and infrastructure in at risk areas, prioritize efforts that decrease the urban heat island effect, especially in areas with populations most vulnerable to heat, through strategies like revegetation, tree preservation, new plantings, de-paving and porous pavement, green infrastructure, and site specific development design.
2026	Consider a coordinated, integrated approach to flood or water-surge event planning and consider new innovate ways to adapt to climate impacts. • Increase resilience of natural systems by keeping natural resources areas, especially streams and creeks, cooler by adding vegetation in areas adjacent to the resource and maintain upland tree canopies. • Establish a fund to acquire or protect land in particularly vulnerable areas.
2027	Consider developing, adopting, and implementing integrated plans for mitigating climate impacts in wildland-urban interface areas that could include any of the following: • Collaborate with agencies managing public lands to identify, develop, or maintain corridors and linkages between undeveloped areas. • Use purchase of development rights or conservation easements to protect climate-vulnerable habitats. • Develop, adopt, and implement integrated plans for mitigating wildfire impacts in wildland-urban interface areas.
Measure A2.4: Build a sustainable and resilient transportation network.	
Align the transportation system with quality of life and enable a variety of environmentally friendly choices that feature green infrastructure and have the capacity to adapt to climate impacts.	
2023	Work with NCTD to build more bus shelter amenities to help prevent health effects from long sun exposure and incentivize usage of public transportation.
2024	Evaluate and pursue stable funding sources and financing strategies to accelerate and sustain natural and green infrastructure within the public right-of-way.
2025	Conduct walk audits around prioritized schools, transit boarding areas, and parks to encourage Safe Routes to Schools, Transit, and Parks.

Table A2	Build Thriving and Resilient Neighborhoods
2026	Develop urban tree canopy targets and equitable distribution of tree-related benefits which may include any one of the following: • Develop an urban heat island reduction program that includes an urban forest program or plan. • Develop a governance structure, including a way to fund new tree plantings such as an in-lieu program to offset trees plantings on highly constrained sites. • Expand and focus tree plantings in low-canopy neighborhoods and neighborhoods at a higher risk of adverse outcomes of urban heat island effects. • Encourage urban agriculture through edible landscapes within public spaces. • Adopt a new tree code in the Landscape Ordinance that considers tree selections so that tree plantings are known to perform well in the general climate conditions, are climate resilient trees, and will increase canopy or vegetative cover. • Set priorities to expand planning, maintaining and management of trees, such as expanding urban forest canopy to cover at least twenty (20) percent of each neighborhood and ten (10) percent of commercial and industrial areas. As part of the next CAP update, monitor tree canopy changes due to development and determine if policy and rule changes are needed.
2026	Give greater weight to investing in improvements to transportation infrastructure that are projected to be affected by multiple climate changes and/or build in flexible options that can adapt to changing conditions.
2027	Launch and implement a City Vision Zero initiative and help achieve the goal of zero traffic deaths and serious injuries.

A range of factors were considered in the design and selection of the various actions, including the projected timeframe and estimated likelihood of the vulnerability, the importance and effectiveness of each action in increasing resilience, and technical feasibility and City implementation capacity. The City must continue to place a high priority on public engagement and input to identify and select the final actions that will be included in the CAP.

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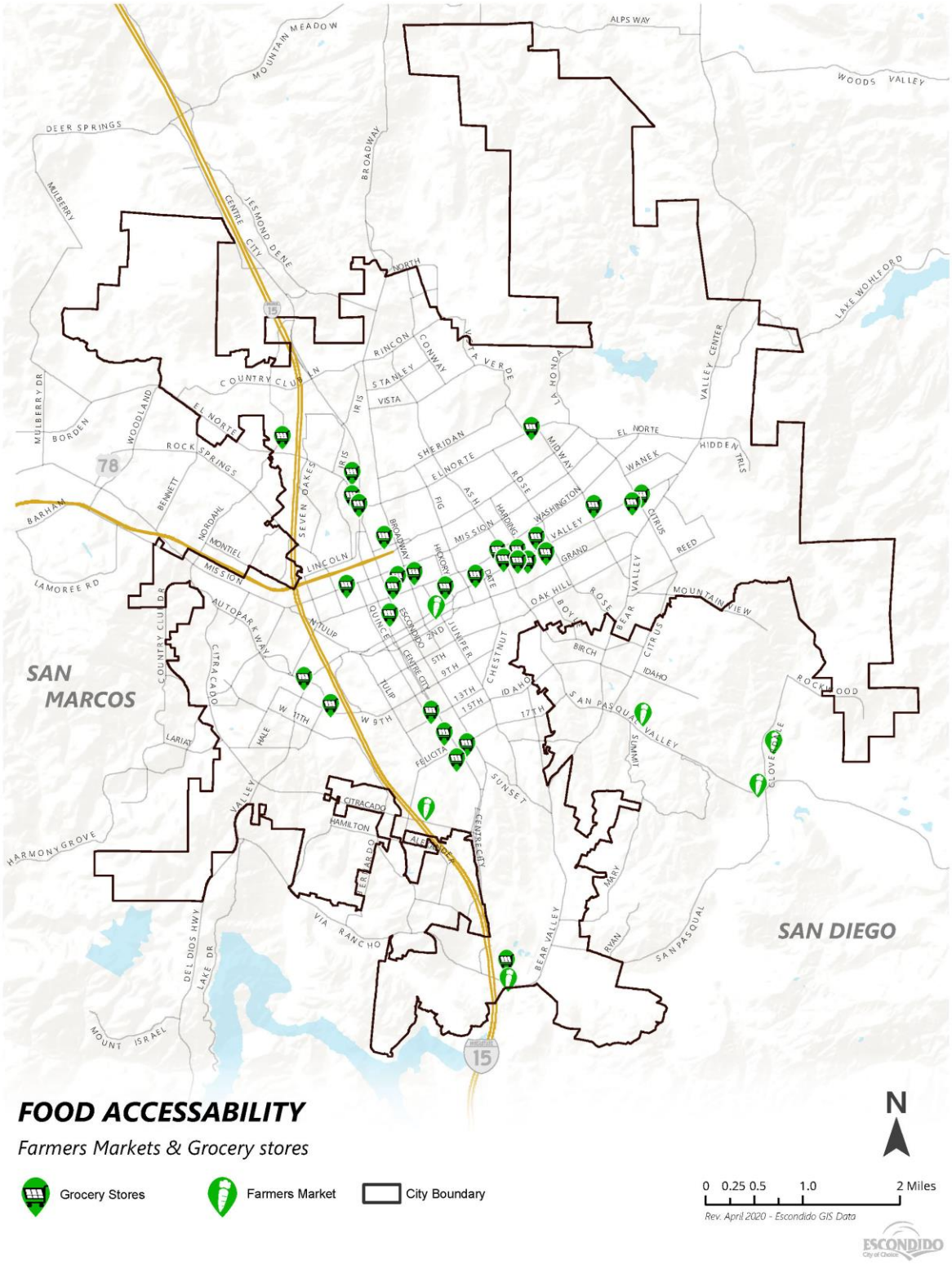
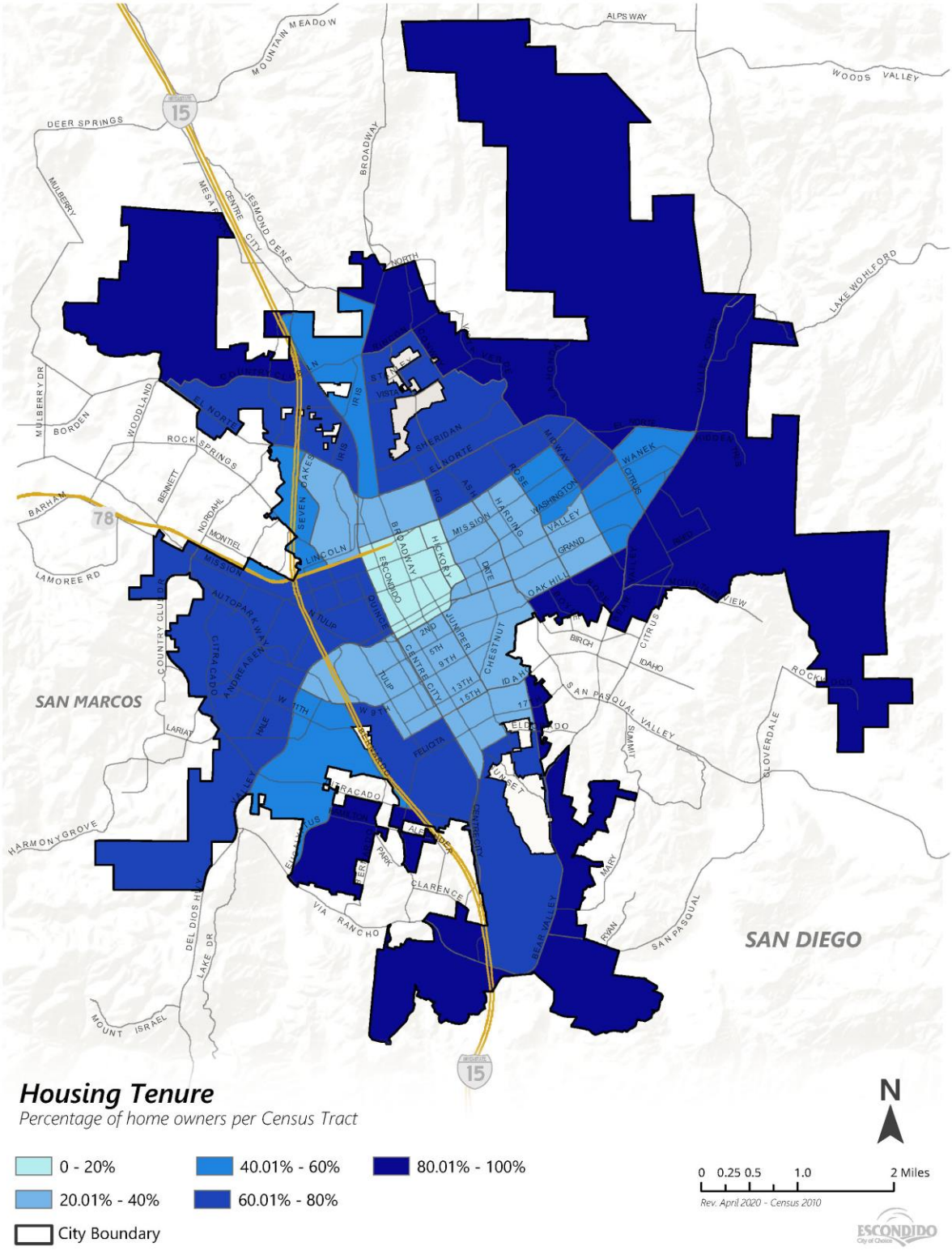
[11] The Nature. November 27, 2019. Climate Tipping Points. Accessed online at https://www.nature.com/articles/d41586-019-03595-0 on March 28, 2019.

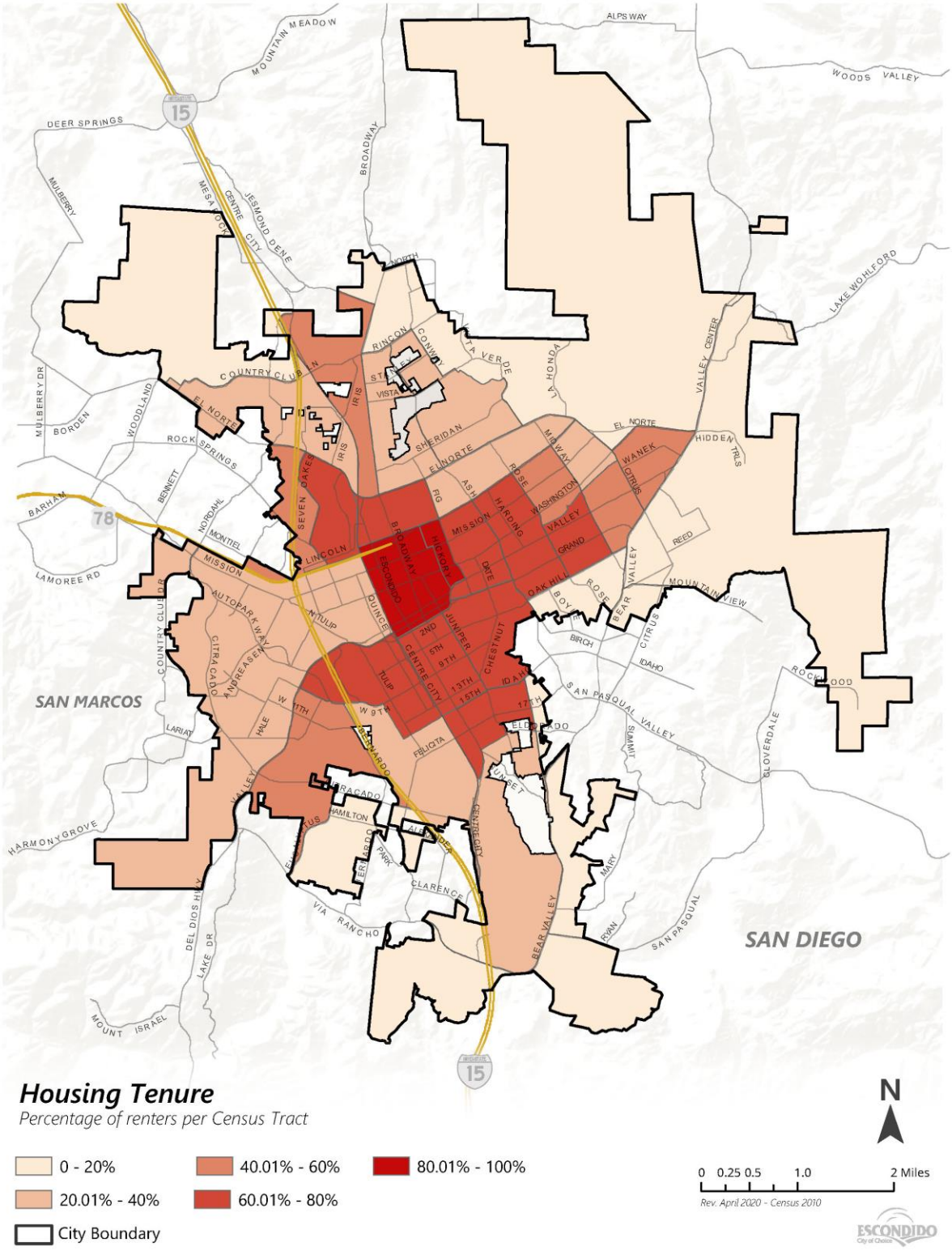
9 MAP EXHIBITS



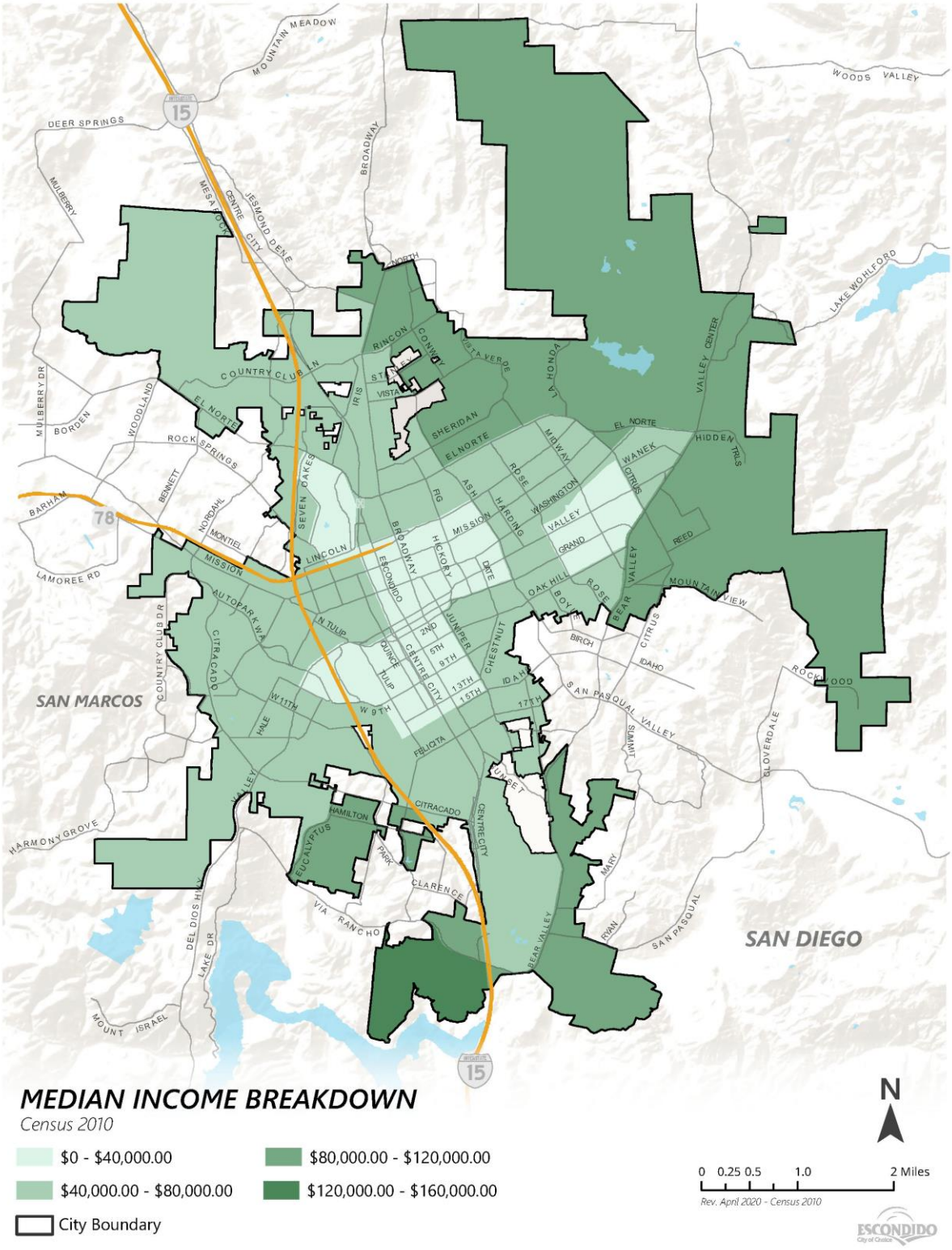
Map 1: Food Access Map (i.e. Groceries and Farmers' Markets)



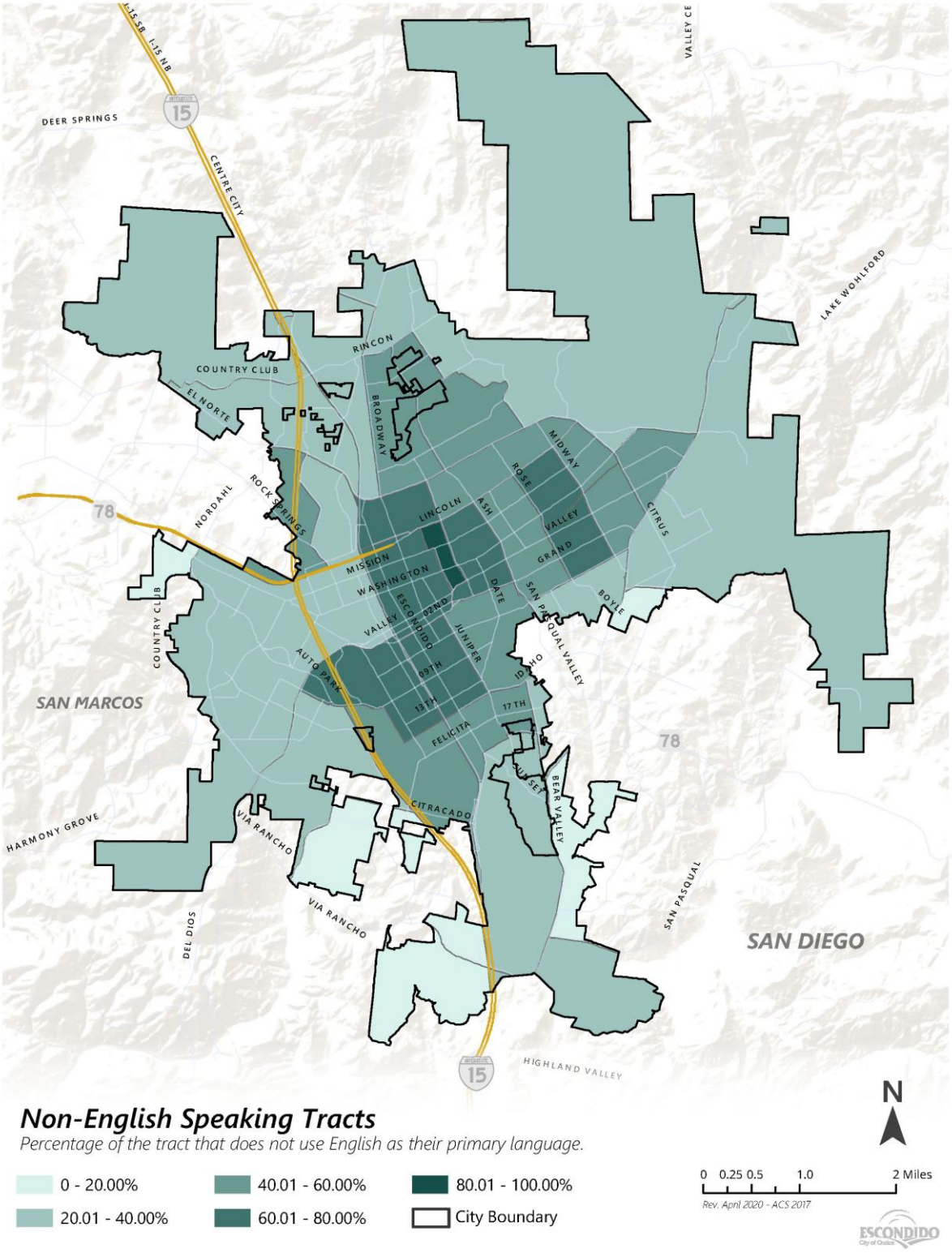
Map 2: Home Ownership Map



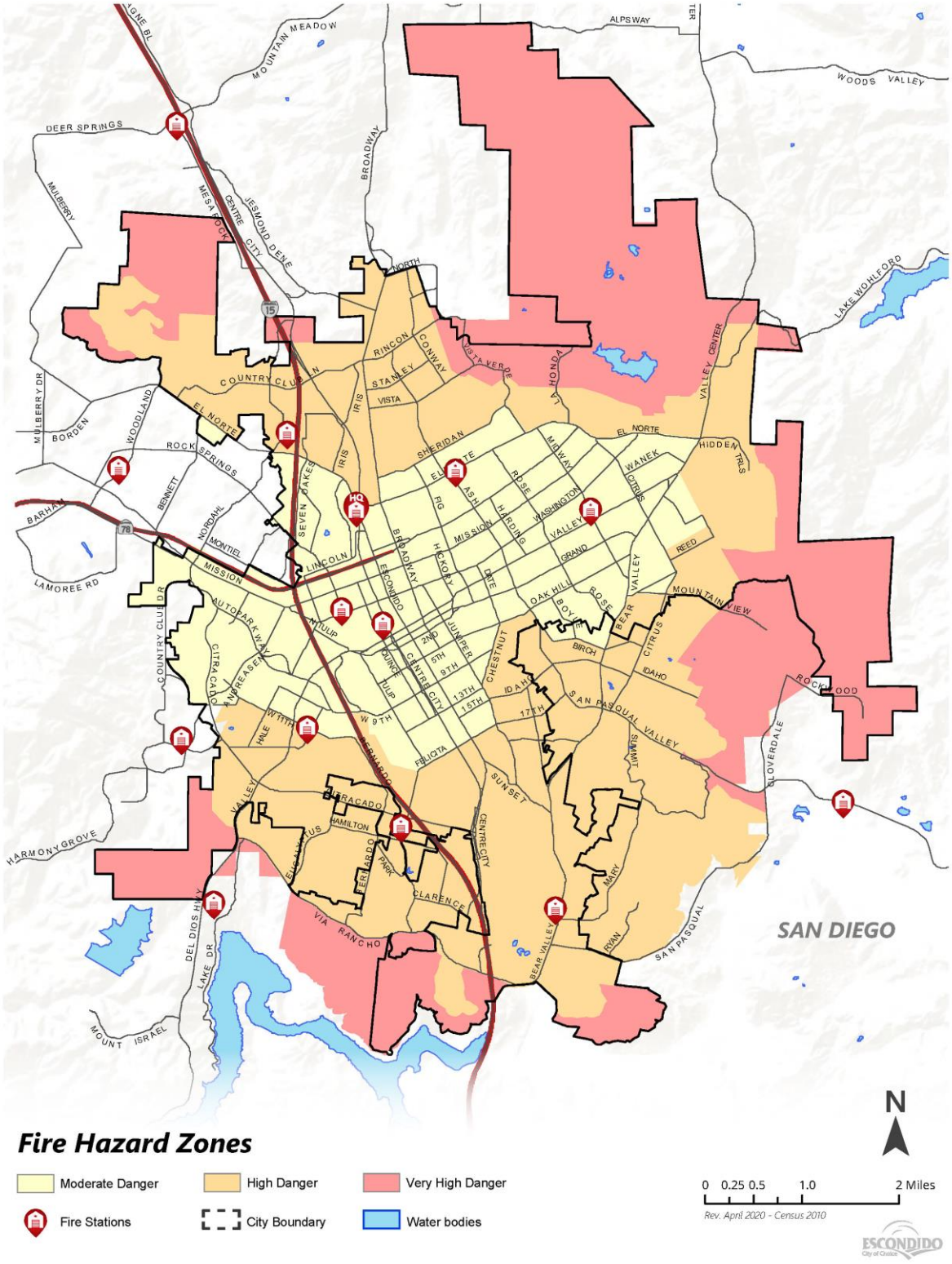
Map 3: Renter Map



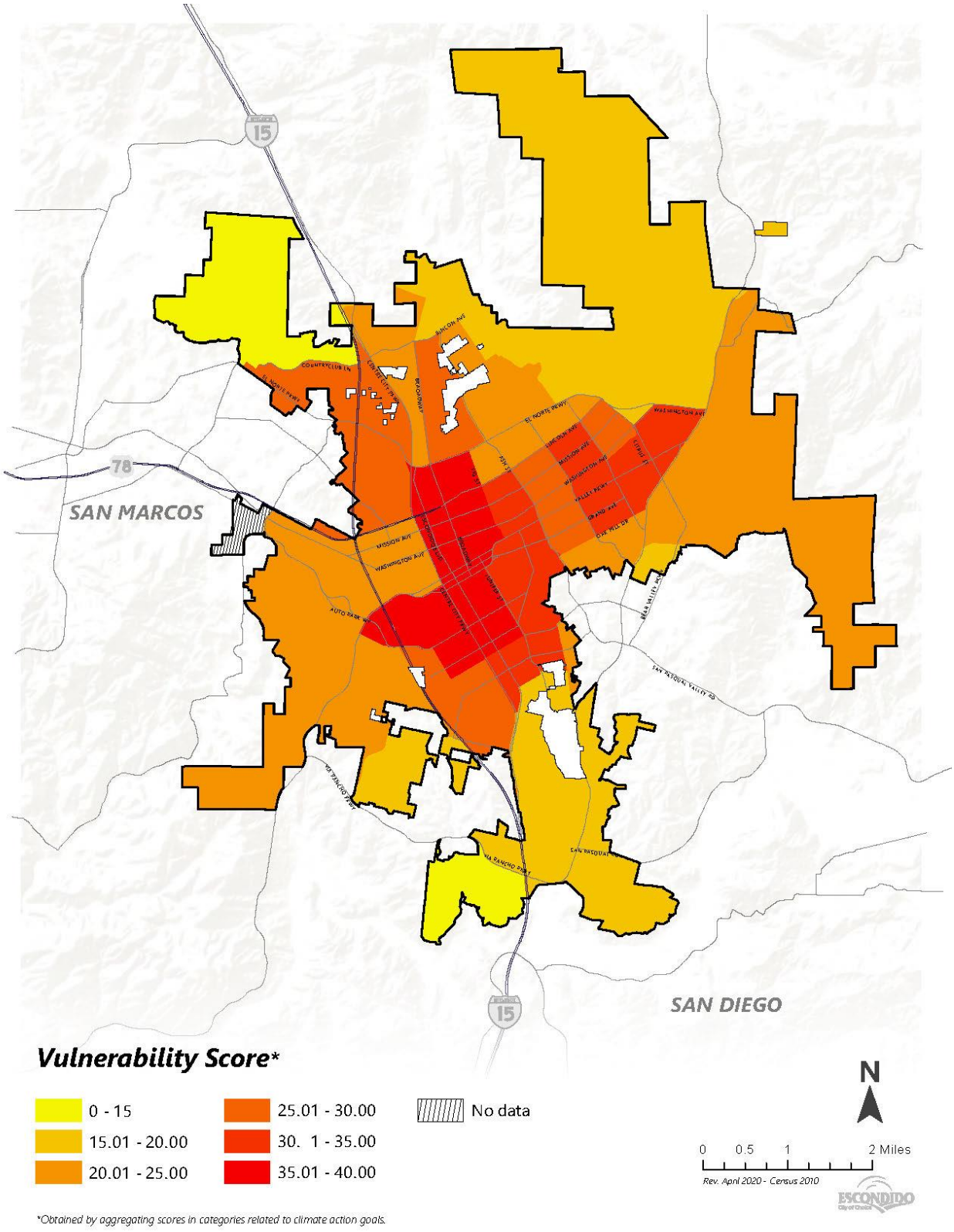
Map 4: Median Income Map



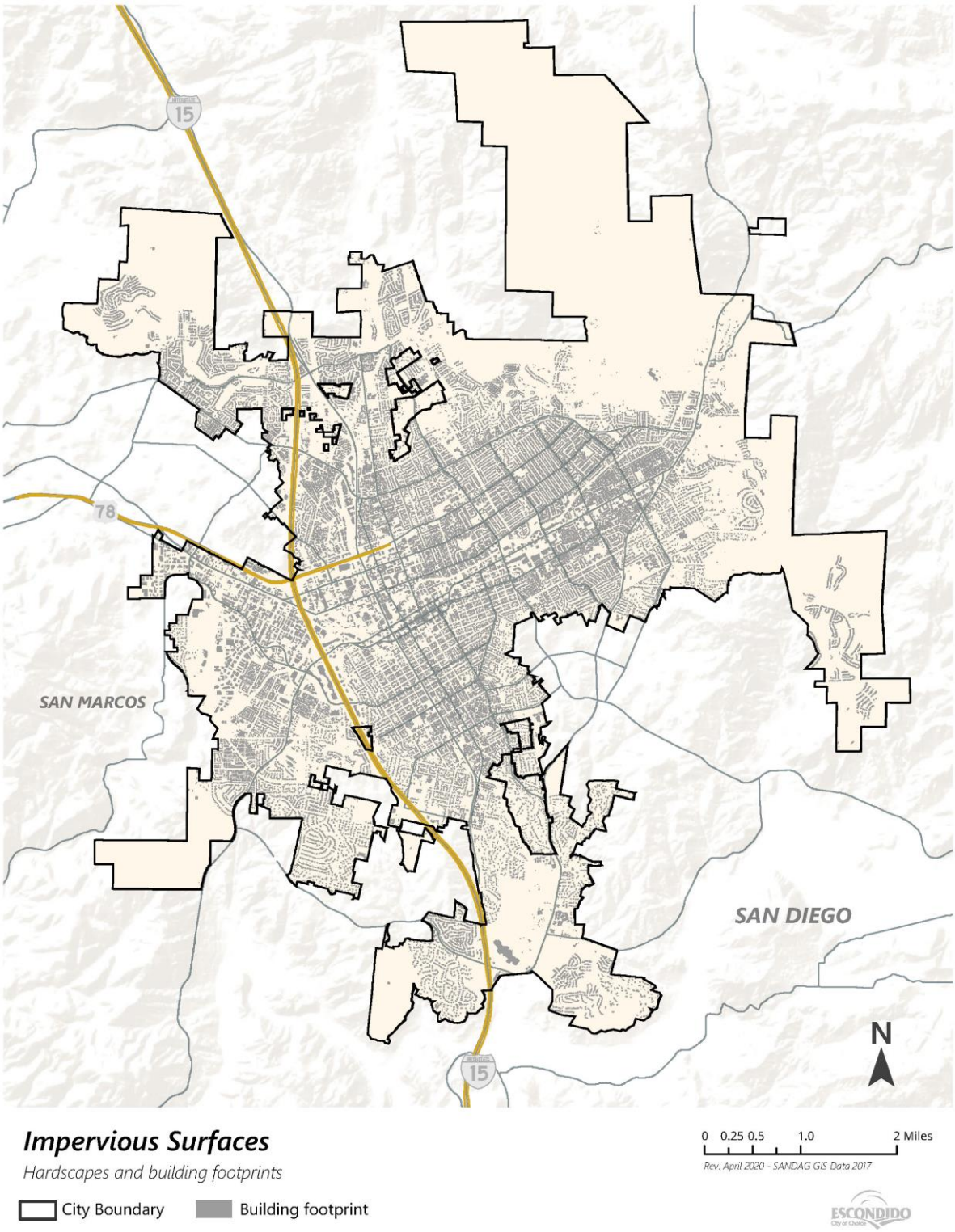
Map 5: Non-English Speaking Map



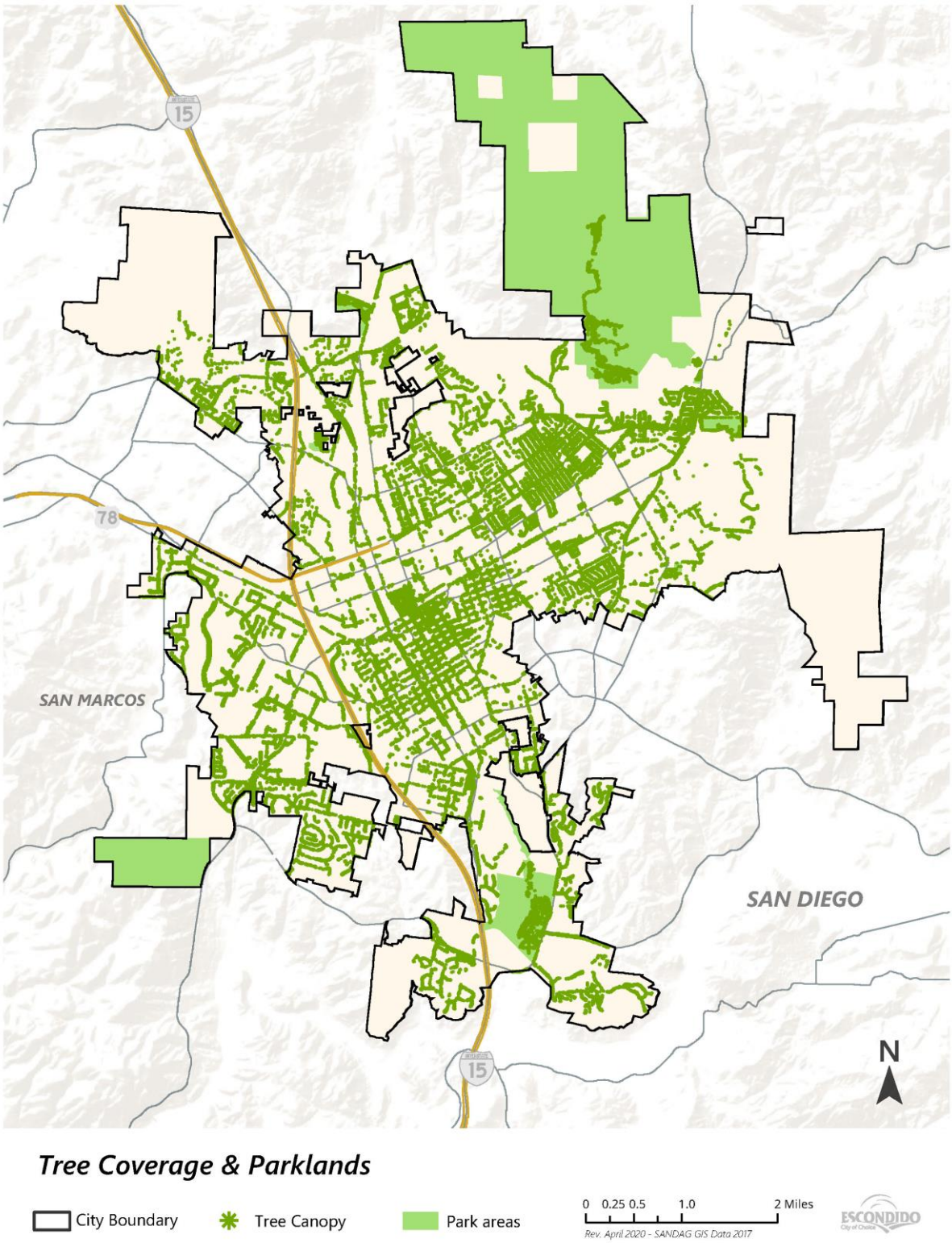
Map 6: 2020 High Fire Hazard Map



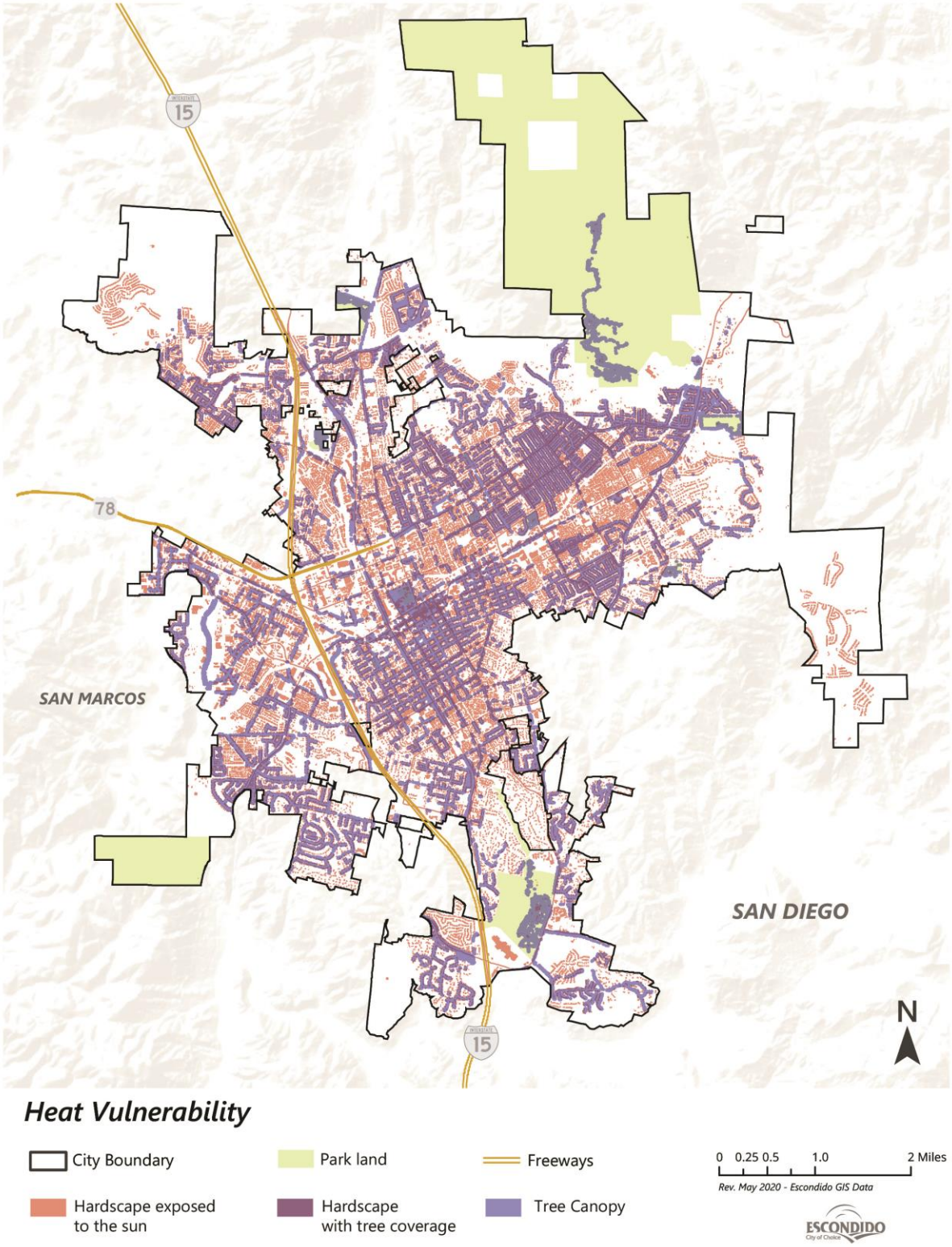
Map 7: 2020 Social Equity and Health Index Map



Map 8: Hardscape and Impervious Areas Map



Map 9: Tree Coverage Map



Map 10: 2020 Heat Vulnerability Index Map