

Climate-Resilient Housing Cooperative for Seniors

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Website:

<https://bit.ly/LoganResilientHomes>

Video:

<https://youtu.be/c0K-6iwL4MQ>

Dashboard:

<https://sdsugeo.maps.arcgis.com/apps/dashboards/e6f7ccc0a6ce45c7afcd7cee1ae5eccb>

Abstract

Using a multi-method approach that includes stakeholder interviews, SWOT analysis, ArcGIS dashboard spatial analysis, and business model development, this project examines how heat vulnerability, housing displacement threat, and climate resilience intersect in Barrio Logan. The complex, which contains 1,972 total residential units, 247 very rent-burdened households, and 382 seniors, has a severe heat rating of 1.4, according to the ArcGIS dashboard. Additionally, analysis revealed that 31 homes lack a fuel source and 1,836 use electricity for heating and cooling, increasing the risk of heatwaves. Areas with little tree canopy, high surface temperatures, and few cooling centers were also discovered by spatial mapping; these factors disproportionately affect older people who live in older, inadequately adapted homes. Systemic deficiencies in cooperative and communal land-trust models and affordable, climate-resilient senior housing were discovered through SWOT and stakeholder studies. In order to strengthen social cohesion and environmental justice, the suggested business model prioritizes participatory resilience approaches, in which locals jointly procure sustainable housing solutions. In order to enable vulnerable communities to age in place with security, dignity, and cultural continuity, this study emphasizes the necessity of integrated urban design that considers displacement and climate change adaptation.

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Introduction

The growing impacts of climate change and urban gentrification have intensified the housing crisis for low-income seniors, especially in vulnerable urban neighborhoods. In the heart of San Diego County, Barrio Logan stands vulnerable community grappling with the compounded pressure of gentrification and climate change, which is the issue that disproportionately affects low-income seniors (Santos et al., 2025). This historically Chicano neighborhood, rich in cultural heritage and activism, is undergoing rapid urban transformation that threatens to displace long-time residents, many of whom are elderly and economically disadvantaged. Gentrification, spurred on by rising property values and redevelopment efforts, has led to inflated rents, pushing seniors from residences that they have held for decades (Santos et al., 2025). However, Barrio Logan is facing intense environmental stressors including high pollution levels and extremely low tree canopy cover of only 3%, compared to the national average of 40%. Lack of green infrastructure is exacerbating the Urban Heat Island phenomenon and is heating up the community 15–20°F above more affluent communities like La Jolla (Hyde, 2022). Seniors, particularly those with chronic health conditions and impaired mobility, are most at risk for heat-related illnesses, and the majority of them have no means to access air

conditioning or cooling centers. The intersection of displacement and climatic risk calls for innovative solutions in the form of climate-resilient housing cooperatives for seniors (Fassina, 2022). These cooperatives may offer affordable, community-governed housing with cooling systems, solar energy, and green spaces to maintain seniors' physical health as well as safeguard cultural continuity. More importantly, recent initiatives such as the \$42 million of federal and state grants awarded to the Environmental Health Coalition and San Diego Foundation are geared toward addressing these challenges through projects like the Tierras Indigenas Community Land Trust and the Holistic Healthy Homes Program (Delgado & Swanson, 2019). The projects prioritize community-led development, aiming to preserve affordability, decrease air pollution, and fight dangerous heat. Google Street View virtual tours of Barrio Logan reveal both the beauty of their graffiti and the intrusion of industrialization and new developments. The visual contradiction serves to point out the need to protect vulnerable older persons from being forced from their homes and exposed to increasingly extreme weather conditions.

Climate-resilient elder housing cooperative in Barrio Logan is not just a policy recommendation, but an ethical imperative rooted in environmental justice and cultural heritage.

Significance of the Study

The study on climate-resilient housing cooperatives for low-income seniors in Barrio Logan significantly lies in the urgent need to address intersecting crises of displacement, environmental injustice, and aging in place. Seniors in the community experience exacerbated

vulnerability due to fixed incomes, limited mobility, and greater sensitivity to extreme heat conditions exacerbated by gentrification and climate change. As redevelopment accelerates, long-time residents are being priced out while rising temperatures and poor air quality jeopardize their health and well-being (Carriere & Lesnikowski, 2024). The topic is not only important to seniors who are directly impacted but also to the community at large, which stands to lose its cultural identity and intergenerational character. Disciplinarily, the topic cuts across urban planning, public health, environmental justice, and gerontology and thus provides an integrated framework for equitable development. My interest was sparked by witnessing the jarring juxtaposition of Barrio Logan's vibrant cultural landscape with encroaching industrial and luxury developments on a virtual visit. The absence of green infrastructure and evident signs of displacement underscored the necessity of sustainable, community-led solutions (Lamb et al., 2022). A climate-resilient housing cooperative is a transformative model that empowers seniors, maintains affordability, and promotes environmental resilience and is thus an essential topic for study and advocacy amidst accelerating climate and housing crises.

Research Questions

1. How do gentrification and climate change jointly impact housing stability and health outcomes for low-income seniors in Barrio Logan?

2. What design and policy features are most effective in creating climate-resilient housing cooperatives that meet the needs of low-income seniors in historically marginalized neighborhoods?
3. How can community-led initiatives in Barrio Logan, such as land trusts and environmental justice programs, be leveraged to support the development of senior-focused climate-resilient housing cooperatives?

Literature Review

Background Information

Barrio Logan, in south central San Diego, is one of the city's oldest and most culturally vibrant neighborhoods, forged in a complex history of immigration, industrialization, and activism. Once part of Logan Heights, the neighborhood became predominantly Mexican-American in the early 20th century as refugees from the Mexican Revolution made it home (Rossmeier, 2023). Over time, the community developed into a thriving working-class neighborhood, hosting tuna canneries, shipyards, and naval operations (Rossmeier, 2023). However, Mid-century rezoning turned much of the area into industrial land, breaking up residential zones and subjecting residents to pollution and environmental toxins. The building of Interstate 5 and the Coronado Bridge in the 1960s further divided the community, displacing families and cutting off access to the waterfront (Rossmeier, 2023). In response, residents

organized to reclaim public space, resulting in the establishment of Chicano Park in 1970 a testament to cultural resilience and political empowerment. Barrio Logan is today administered as part of San Diego's City Council District 8 and is a designated California Cultural District (Nunez et al., 2024). For all its rich heritage, however, the neighborhood continues to struggle with gentrification, environmental degradation, and economic disparity. These dynamics position Barrio Logan as an especially important site for the study of climate-resilient housing cooperatives, particularly for low-income seniors who are disproportionately vulnerable both to displacement and extreme heat.

Cultural Characteristics of the City/Community

Barrio Logan's cultural identity is deeply rooted in its Chicano heritage, shaped by decades of activism, artistic expression, and community resilience (Heights et al., 2024). As one of San Diego's three official California Cultural Districts, the community is famous for its dynamic murals, particularly those in Chicano Park, which is home to the world's largest concentration of Chicano murals. Painted on the columns of the Coronado Bridge, the murals depict themes of social justice, indigenous pride, and Mexican-American history. The community's cultural scene is vibrant through monthly events such as the Barrio Art Crawl, which features local galleries, studios, and street performances. In addition, Logan Avenue serves as a locus for artist collectives, independent businesses, and restaurants that honor Latinx

traditions (Heights et al., 2024). With a population that is around 80% Hispanic, Barrio Logan's cultural traits are indivisible from its character as a working-class, immigrant-based community.

Literature review on Climate-Resilient Housing Cooperative for seniors

There have been several studies on the climate resilient housing cooperative. Recent literature on climate-resilient housing cooperatives for seniors emphasizes the merging of cooperative housing and cohousing models as community-driven responses to urban housing, affordability, and climate challenges. The study by Carriere (2024) has significantly advanced the discussion on the climate resilient housing cooperative. The authors evaluated the adaptation readiness of housing cooperatives in Nova Scotia through semi-structured interviews with housing and government stakeholders and a methodical content study of municipal and provincial climate policies. According to the study's findings, housing cooperatives are mainly left out of official adaptation programs, despite having attributes like affordability and group decision-making that support equitable adaptation. However, the sector's low preparedness for climate adaptation is highlighted by important obstacles such as a lack of funding, useful climate data, and institutional support.

In addition, Kleminski et al. (2022) conducted a bibliometric analysis using co-citation, bibliographic coupling, and keyword co-occurrence methods on 120 Web of Science articles (1996–2024). The study shows that digital governance, sustainability, innovation, and teamwork

are important issues. Such models, according to earlier researchers, foster resilience by fostering social involvement, shared ownership, and sustainable technologies while providing seniors with supportive, reasonably priced, and ecologically friendly living spaces.

Further, Lamb et al. (2023) examined resident-owned manufactured housing communities (ROCs) and the ways in which cooperative land ownership builds resilience to climate risks. Through a mixed-methods research design involving GIS spatial analysis of 234 ROC USA locations, document review, and interviews with ROC staff, residents, and technical assistance providers the research identified that ROCs increase adaptive capacity through increased access to financial resources, democratic self-governance, and the mobilization of resident expertise. These communities have potential for transformative adaptation, although there are still difficulties in scaling the model and addressing long-term climate planning and equity in vulnerable populations.

Also, Tam (2025) study showed that cultural values, personal beliefs, and socioeconomic standing are some of the elements that influence pro-environmental behavior. To differentiate between the diverse motives and abilities of older adults to participate in sustainability, researchers have created typologies. Furthermore, obstacles like lack of funds, ageism, subpar housing, and restricted access to green technologies were discovered via qualitative techniques like focus groups and interviews. In general, research backs inclusive, affordable, and

customized approaches to increase older individuals' involvement in environmental sustainability.

Further, Richards (2024) noted that around the world, efforts to create better built environments have mostly concentrated on streetscapes and green areas, paying little attention to home design, particularly the negative health implications of shared housing. The study discussed models such as cohousing and co-operative systems, highlighting their social and health gains, particularly for older people. These housing forms diminish social isolation, facilitate aging in place, and generate social capital by having communal spaces and collective governance. Earlier research employed qualitative evaluations, such as case studies and self-report data, to demonstrate how communal living enhances mental and physical well-being, postpones the need for institutional care, and creates a sense of belonging. International exemplars, notably in Europe and Canada, demonstrate reduced care dependency and enhanced quality of life for older people in these environments.

Refined research question

How can climate-resilient housing cooperatives be designed and implemented in Barrio Logan to protect low-income seniors from displacement and extreme heat exacerbated by gentrification and climate change?

Sub-questions:

- What environmental and social vulnerabilities do low-income seniors in Barrio Logan currently face?
- What cooperative housing models have proven effective in similar urban, culturally significant communities?
- How can community-led initiatives and local policy frameworks support the development of climate-resilient housing for seniors?

Research Methods

This project used a combination of spatial analysis, demographic enrichment, and public parcel mapping to examine housing vulnerability and climate exposure for low-income seniors in Barrio Logan, San Diego. The main goal was to identify areas of overlap between high heat severity, senior populations on fixed incomes, and available public land for potential cooperative housing development.

The analysis began by collecting boundary data for the Barrio Logan Community Planning Area. This polygon served as the zone of analysis for all spatial queries. Using ArcGIS Online, I added a national heat severity raster layer and ran a Zonal Statistics tool to calculate the average heat exposure score for Barrio Logan in 2024. The resulting value, 1.4 (on a scale from 1 to 5), was added as a new raster output and used to visually and numerically express climate exposure in the dashboard.

Next, I used Esri's Enrich Layer tool to attach key demographic variables to the Barrio Logan boundary. These included: population aged 65 and older, household income brackets, severe rent burden (households spending $\geq 50\%$ of income on rent), total housing units, and

heating fuel type. These data came from American Community Survey (ACS) 5-year estimates and Esri's Living Atlas.

City-owned parcel data was added to the map using a REST service from the City of San Diego's public GIS server. Parcels were filtered to only those within the Barrio Logan community plan area and further refined by land use and managing department. These were styled in the dashboard as a clickable list showing parcel name, size in acres, and designated use.

The dashboard was built using ArcGIS Dashboards, and includes multiple widgets (indicators, charts, lists, and rich text) to communicate key insights. All elements are linked to the spatial layers and formatted for accessibility and readability.

Research Results/Findings and Discussion

The analysis revealed that while Barrio Logan has a moderate heat severity index of 1.4 (on a 1 to 5 scale), this number does not tell the full story (Clark et al., 2024). When paired with demographic and housing data, it becomes clear that many residents, especially older adults are living in conditions that make them especially vulnerable to the effects of even moderate heat.

For example, 2025 projections show that the majority of senior-headed households in Barrio Logan earn between \$35,000 and 49,999 per year. This is well below the threshold needed to afford increasing utility costs, rent, and necessary home upgrades. A significant number of homes (1972) rely on electricity for heating and cooling, while 23 households report having no access to any fuel source, which suggests either poor housing quality or informal housing.

The enriched data also showed that 247 households are considered severely rent-burdened, spending more than 50% of their income on rent. This level of housing stress increases vulnerability to displacement, heat-related illness (due to inadequate cooling), and social isolation. These stressors are especially dangerous for seniors who may also experience mobility issues or chronic health conditions.

On the infrastructure side, the parcel analysis showed that there are several city-owned parcels within Barrio Logan that are underutilized or designated for general municipal use (Reis et al., 2023). Some of these are large enough to support pilot projects for climate-resilient cooperative housing, especially those located near public transit, parks, or community centers. These sites represent real-world opportunities for community-led, climate-adaptive development.

By layering these findings into an interactive dashboard, it becomes easier to see where risks are concentrated and where action is possible. The map doesn't just highlight need, it highlights opportunity. The project supports the argument that housing solutions for vulnerable seniors must address both climate and affordability together, not as separate problems.

Discussion

These findings align with patterns documented in both national research and local advocacy work. Seniors are among the fastest-growing segments of the U.S. population, and climate change is compounding their vulnerability, especially for those living in under-resourced

communities like Barrio Logan. What makes this case particularly urgent is the way multiple forms of vulnerability intersect: extreme heat, energy insecurity, low income, aging housing infrastructure, and limited access to affordable care or services.

Although the heat severity index in Barrio Logan is not the highest in the city, the socioeconomic and housing data make clear that the capacity to cope with climate stress is severely limited for many residents. This highlights the value of looking beyond environmental exposure alone, and integrating social vulnerability indicators into planning conversations.

The availability of city-owned land creates a unique opportunity to implement climate-resilient housing models without the typical barrier of high land acquisition costs. If designed in collaboration with the community, particularly older residents, cooperative housing could offer an alternative to displacement while promoting social connection, shared resources, and long-term affordability.

These results suggest that city planners, nonprofits, and community groups should prioritize neighborhoods like Barrio Logan for climate justice investments. That includes not just retrofitting homes or expanding tree canopy, but supporting new, inclusive development models that directly serve vulnerable populations.

In the context of the United Nations Sustainable Development Goals (SDGs), the findings reinforce the importance of integrating SDG 11 (Sustainable Cities), SDG 13 (Climate

Action), and SDG 10 (Reduced Inequalities) into local housing strategies. Planning for resilience is not just about infrastructure — it's about people. And this dashboard aims to center them.

Cooperatives or community land trusts are in short supply and are rarely developed specifically for senior needs or climate resilience. Third, while rare, community-led resilience projects have tremendous promise. Elsewhere, community residents and seniors are advocating for participatory housing models such as cooperatives or land trusts that uphold affordability, sustainability, and inclusivity (Tellez, 2022). Such housing is often designed with passive cooling measures, resident-shared green space, and shared care services. Significantly, there is increasing recognition that climate adaptation plans will have to integrate housing justice and involve vulnerable populations in decision-making.

Major Patterns Identified

Pattern 1: Exposure to Housing Risk and Heat Severity Overlap

A 1.4 heat intensity index is found in Barrio Logan, where 382 seniors live, many of them in dilapidated structures with inadequate insulation, according to an ArcGIS dashboard analysis. The sparse tree canopy and 247 highly rent-burdened families stacked on these areas contribute to the elevated surface temperatures. Seniors are at twice the risk of heat illness and housing instability due to inadequate access to cooling facilities and displacement risk (Aljersh, 2022).

Pattern 2: The Community's Limited Access to Senior Housing

Nearly all of the senior housing options in Barrio Logan's 1,972 units are either private or market-rate, and they are typically not located in the neighborhood. As a result, the elders are forcibly removed from their cultural and social networks. Additionally, according to the dashboard, 23 families do not have access to any fuel source for heating or cooling, and the majority depend on electricity, which might not be accessible during periods of extreme heat. This emphasizes the necessity of aging-in-place and climate-resilient collaborative or land-trust housing strategies (Zhang et al., 2023).

Pattern 3: Increasing Demand for Resilience Practices Led by Communities

Participatory housing models that integrate climate resilience and resident co-management are currently being promoted by regional groups like the Environmental Health Coalition. Stakeholder discussions and public outreach initiatives reveal a desire for designs that integrate energy independence, cultural preservation, and ecological cooling. These models are thought to be crucial for preserving Barrio Logan's identity while ensuring environmental justice (Gerdes et al., 2024).

Conclusion

Overall, the research highlights how low-income elderly residents are among the most vulnerable to the combined impacts of climate change and economic displacement, particularly in rapidly gentrifying urban areas. The statistical analysis and ethnographic insights determine that the most intense sites of housing pressure also align with those experiencing the greatest

exposure to extreme heat events (HUD CHAS, 2023). Despite these adversities, current models of senior housing fail to offer inclusive, sustainable, and community-driven solutions.

The policy implications of this study are multifaceted. On the municipal side, city governments and urban planners must invest in cooperative housing schemes that incorporate climate resilience, such as passive solar architecture, green roofs, and shaded community spaces (Abuwaer et al., 2023). From a design perspective, future senior housing projects should adopt principles of universal design and community inclusion, reducing isolation and improving accessibility. Furthermore, climate-resilient cooperative housing presents a scalable model that could also serve other high-risk groups, including individuals with disabilities and residents of urban heat islands (Seeteram, 2025). The research calls for urgent collaboration between public agencies, nonprofits, and community organizations to integrate environmental justice into affordable housing strategies.

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Appendix

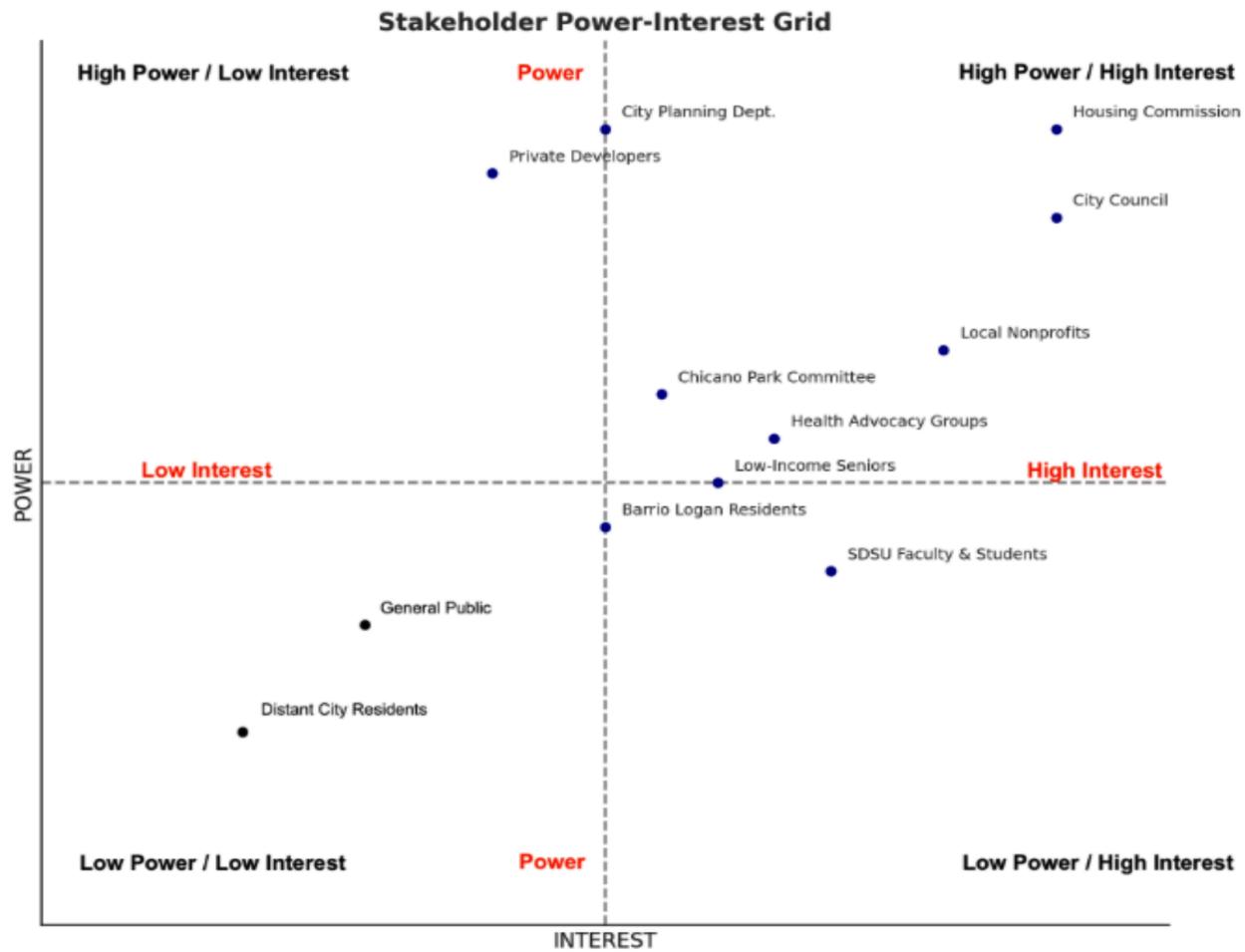
Ethnography



SWOT Analysis

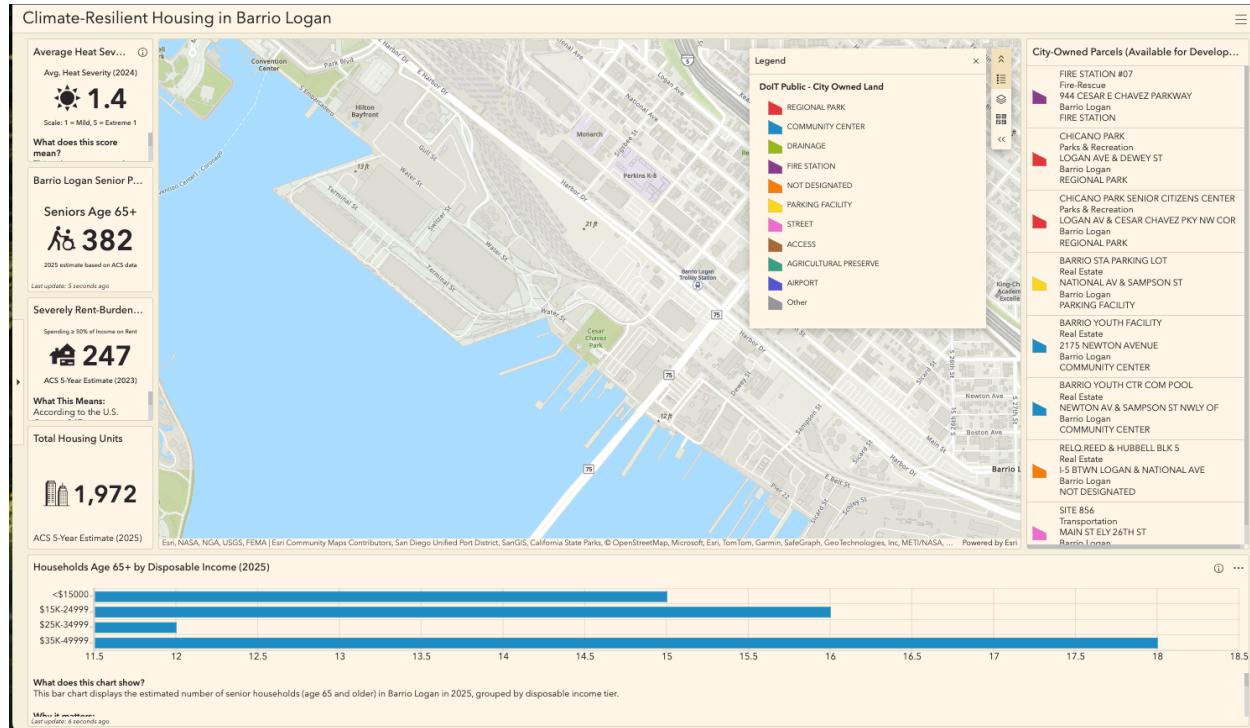
Strengths	Weaknesses
<p>Community-driven and culturally rooted</p> <p>Social Inclusion</p> <p>ArcGIS & data-informed planning</p> <p>SDG-aligned (10,11,13)</p> <p>Sustainable, low-impact design</p>	<p>Zoning and land-use barriers</p> <p>Reliance on external funding</p> <p>Remote project execution</p> <p>Limited community tech access</p> <p>Lack of cooperative housing awareness</p>
Opportunities	Threats
<p>Federal/State resilience grants</p> <p>Replicable in similar communities</p> <p>Growing awareness of climate justice</p> <p>Local nonprofit collaboration</p> <p>City interest in innovative housing</p> <p>Increasing awareness of climate justice issues</p>	<p>Gentrification acceleration before intervention</p> <p>Policy delays</p> <p>Zoning opposition</p> <p>Community skepticism toward new development</p> <p>Extreme heat outpacing solutions</p> <p>Competing developer interests</p>

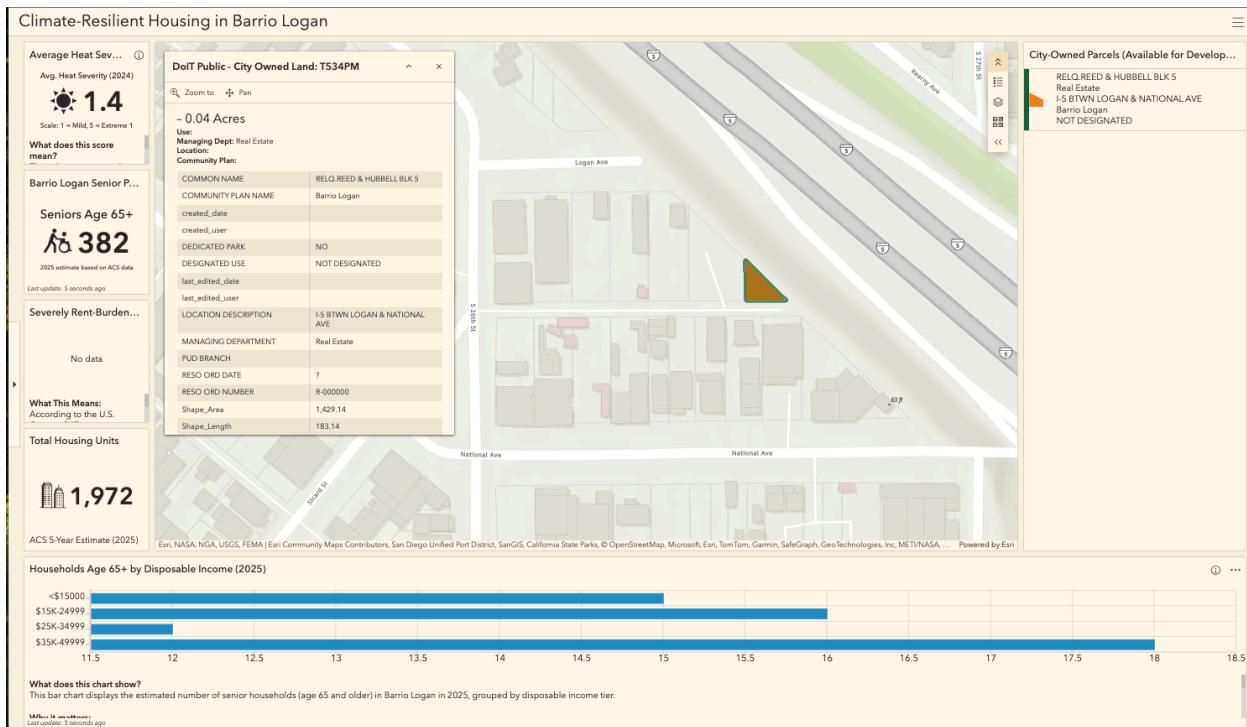
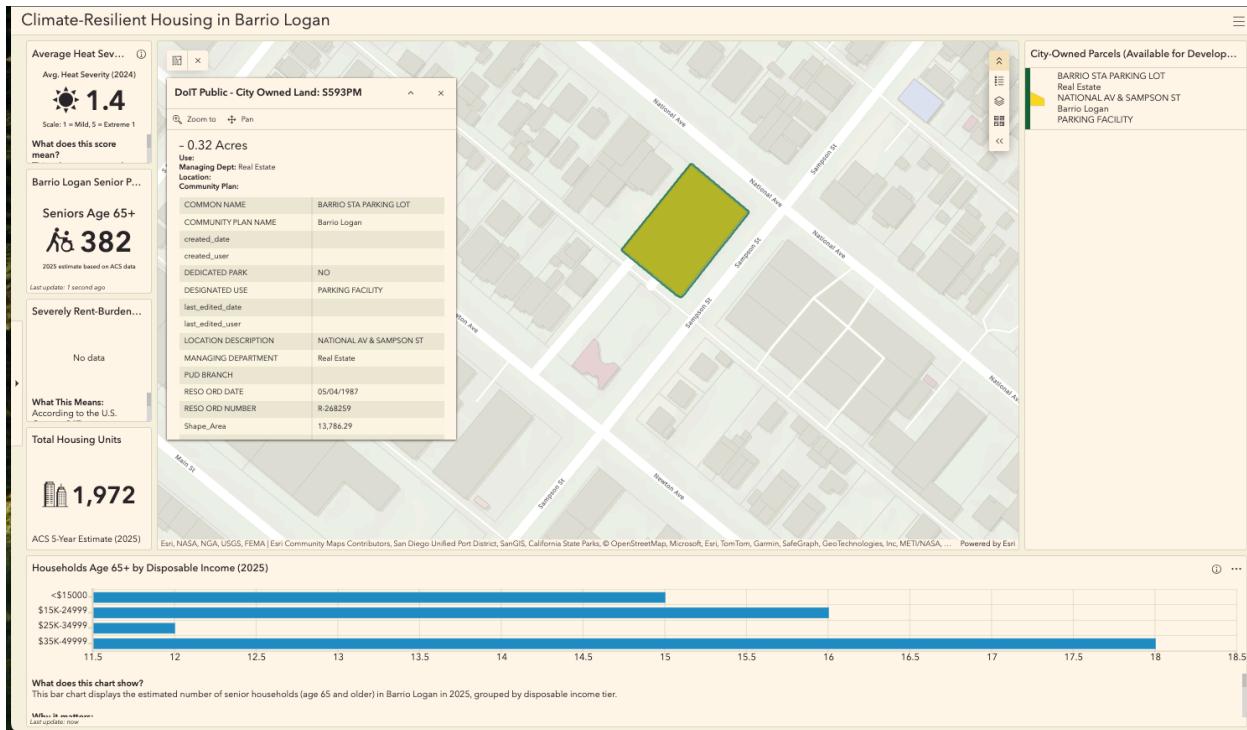
Stakeholder analysis



ArcGIS Dashboard

<https://sdsgueo.maps.arcgis.com/apps/dashboards/e6f7ccc0a6ce45c7afcd7cee1ae5eccb>





Business Model

The Business Model Canvas

Designed for: BDA 603 Smart Cities

Designed by: Eddie Rosas

Date: 8/11/25

Version:

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
<ul style="list-style-type: none"> City of San Diego (Dept. of Real Estate & Development) Local Nonprofits San Diego State University Urban Designers Local philanthropic Foundations (e.g., SD Foundation) 	<ul style="list-style-type: none"> Co-design and planning with senior residents Advocacy campaigns Digital outreach Spatial Data Collection Site assessment 	<ul style="list-style-type: none"> Empowerment through resident-led design Dashboard-integrated visibility into neighborhood risk Safe, affordable, and climate-adaptive housing for seniors Enhanced access to services, green space, and social connectivity Alignment with UN SDGs (10, 11, 13) 	<ul style="list-style-type: none"> Community-led decision-making Bilingual (English/Spanish) engagement Culturally responsive storytelling and feedback 	<ul style="list-style-type: none"> Seniors 65+ in Barrio Logan facing housing insecurity Severely rent-burdened elders Spanish-speaking and low-income communities Environmental and housing advocates
Key Resources	Channels	Customer Segments	Revenue Streams	Cost Structure
<ul style="list-style-type: none"> City-owned land identified as developable GIS tools and ArcGIS Dashboard Student researchers and mentors 	<ul style="list-style-type: none"> Project website (Google Sites) ArcGIS Online map and Dashboard 6-minute advocacy video (YouTube) Social media, flyers, and civic meetings 		<ul style="list-style-type: none"> City or federal grants (e.g., HUD, CDBG) Local philanthropic funding Support from advocacy organizations In-kind academic resources and talent Potential long-term rental or co-op revenue model 	<ul style="list-style-type: none"> Dashboard and web platform development Marketing, translation, and outreach Community engagement costs Technical support and planning consultation Future capital and construction budgeting

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