THE DEVELOPMENT OF AN ASSET-BASED FRAMEWORK FOR

RESILIENCE HUB PLANNING IN O‘AHU, HAWAI‘I

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAI‘I AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER

IN

URBAN AND REGIONAL PLANNING

AUGUST 2022

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Keywords: Climate Change, Community Resilience Hubs, Community Assets, Asset-Based Community Development Approach, O‘ahu, Hawai‘i

To my friends and family

To my GES and YMCA ʻŌhana

To my DURP classmates, professors, and mentors

Thank you all very much for your guidance and support

Throughout my time at UH Mānoa.

ACKNOWLEDGEMENTS

The completion of this rigorous thesis and program was not possible without the loving support of my family, friends, professors, and mentors I met throughout my undergraduate and graduate studies at the University of Hawai‘i at Mānoa. I would like to thank my friends who pushed me to graduate and go beyond what I am capable of. I would like to thank the Department of Urban and Regional Planning faculty, staff, and my classmates for their friendship and wisdom throughout the past three years. I would like to thank the City and County of Honolulu Office of Climate Change, Sustainability, Resiliency and Kapi‘olani Community College’s Center for Resilient Neighborhoods for their expertise and mentorship. I would like to thank my committee, Dr. Suwan Shen, Dr. Robert Franco, and Dr. Dan Milz for paving the path to a successful thesis project. Lastly, I would like to thank my mother, father, and sister for their unconditional love and support to achieve success in everything that I do. With this extraordinary support system, I became the first in my family to receive a graduate degree, let alone a Master in Urban and Regional Planning.

ABSTRACT

In Hawai‘i, as climate change intensifies and induces more disasters, a greater demand for understanding and strengthening community resilience is necessary. In recent years, resilience hubs have been introduced across the United States to support community resilience efforts against climate change. The Asset-Based Community Development approach was utilized to compare the role of different community assets, i.e., physical, human, and social assets, in promoting community resilience and resilience hub development between urban and rural communities. Four community resilience elements were used for analysis: Community Networks and Relationships, Teamwork and Leadership, Information and Communications, and Training and Education. Different site factors for resilience hub development between urban and rural communities were also analyzed. Two-way analysis of variance tests and post hoc Tukey HSD tests were performed to compare the quantitative and qualitative data from roughly 300 online survey responses between two study areas, the Primary Urban Center and Ko‘olauloa, in O‘ahu, Hawai‘i. Overall, rural residents ranked their physical, human, and social assets significantly higher than urban residents in promoting community resilience. Resilience hub development between urban and rural residents can differ based on the availability, weight, and utilization of community assets. Lastly, urban and rural residents shared similar perspectives on resilience hub site selection for several factors: trust and acceptance, ease of access, programmatic offerings, service to groups, and community-based facility preferences. However, urban residents emphasized more on transportation accessibility compared to rural residents.

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1.0 INTRODUCTION

Pacific island communities have become more threatened by natural disasters as climate change intensifies in the upcoming decades (Hawai‘i Climate Change Mitigation and Adaptation Commission, 2017). In Hawai‘i, rising sea levels, increasing tropical storms, extreme flooding and heat, and other climate-related hazards (Ola O‘ahu Resilience Strategy, 2019) can result in serious loss of life, economic instability, environmental damages, and the disruption of daily activities (Courtney et al., 2019). As climate change induces more natural disasters, Hawai‘i’s remote geographical location makes the transport of emergency supplies from the continental United States difficult, unpredictable, and time-consuming (De Roode, Martinac, and Kayo, 2019). Hawai‘i’s diverse communities may need to rely on themselves in a post-disaster situation before government support is reestablished (Ola O‘ahu Resilience Strategy, 2019). Therefore, new strategies should be developed to promote community resilience from the inside out.

In recent years, the term “resilience hub” has risen in popularity across the United States. Resilience hubs are community-led, community-based facilities that provide a variety of resources and services in response to climate change (Sandoval, n.d.; Ola O‘ahu Resilience Strategy, 2019). Following the trend, the City and County of Honolulu will create a Resilience Hub Action Plan in upcoming years for O‘ahu, Hawai‘i. The goal of the Resilience Hub Action Plan is to identify primary and alternative resilience hub sites in each of the eight development plan areas on O‘ahu (Ola O‘ahu Resilience Strategy, 2019) (Figure 1.1).

Previously published literature (e.g., Veil and Bishop, 2012; Freitag, Abramson, Chalana, and Dixon, 2014) suggests that community assets can play an important role in promoting community resilience. Since assets can differ between urban and rural communities (Tracy, O’Sullivan, Lane, Guy, and Courtemanche, 2017; Ross and Clay, 2018), this study attempts to

pinpoint the role of different types of community assets, i.e., physical, human, and social assets, in promoting community resilience in these two environments. Furthermore, this study understands the role of community assets in resilience hub development and key factors in selecting resilience hub sites in both urban and rural communities.

In particular, this study aims to answer two research questions:

1. How do different types of community assets influence community resilience in urban and rural communities?
2. How does the influence of community assets and site factors affect resilience hub development in urban and rural communities?

This study utilizes the Asset-Based Community Development (ABCD) approach by Kretzmann and McKnight (1993) to develop an initial framework for resilience hub planning for the island of O‘ahu. Due to time constraints, only the first two steps of the ABCD approach were applied (Scott, Smith, and Schaedler, 2018) and leaves the remaining four steps for future studies. Currently, no study analyzes the application of community assets for urban and rural community resilience hub development. Additionally, there are limited studies comparing the role of community assets in promoting community resilience and comparing site factors for resilience hub development between urban and rural communities. This study addresses such research gaps regarding community assets, community resilience, and resilience hub development.

1.1 Study Area

The island of Oʻahu is divided into eight development plan areas (City and County of Honolulu Planning and Permitting, n.d.). Data will be collected and analyzed from two development plan areas: the Primary Urban Center (PUC) and Koʻolauloa for similarities and differences. The PUC development plan area comprises urban communities with around 440,000 residents (pucdp.com, 2020). Meanwhile, the Koʻolauloa development plan area is made of rural communities (Koʻolauloa Sustainable Communities Plan, 1999) with approximately 20,000 residents (American Community Survey, 2019). Notably, Koʻolauloa is the only development plan area on Oʻahu that does not have a proposed emergency shelter. Additionally, only one major highway, Kamehameha Highway, runs parallel along the shoreline through Koʻolauloa (Ola Oʻahu Resilience Strategy, 2019).

Figure 1.1. Map of Oʻahu island and the division of the eight development plan areas (City and County of Honolulu Planning and Permitting, n.d.)

2.0 LITERATURE REVIEW

2.1 Resilience Hub Concept and Applications

According to Urban Sustainability Directors Network (USDN) (2019), resilience hubs are building structures and their associated grounds that provide services to support and enhance residents' quality of life. Resilience hubs are primarily managed by residents and community members but supported by local government and other partners (Ola O'ahu Resilience Strategy, 2019; USDN, 2019). Each hub is designed differently based on the surrounding community's goals and needs (Sandoval, n.d.). For instance, resilience hubs can operate as a community resource during normal times while also having the ability to serve as a center for aid and relief during and immediately following disaster events (De Roode and Martinac, 2020a). Overall, resilience hubs are flexible and scalable, which is one of the most powerful aspects when adapting to climate change (Sandoval, n.d.).

Examples of resilience hubs can be found on Hawai'i island and in the cities of Seattle, Baltimore, Miami, San Francisco, and Washington D.C. Resilience hubs on Hawai'i Island were launched during the COVID-19 pandemic, in which grassroots organizations supplied digital access, distributed prepared meals and produce bags, and provided resources and education to more than thirty communities across the island (Vibrant Hawai'i, n.d.). Hubs in Seattle consist of separate neighborhoods networked together to collect information on local needs and conduct activities to prepare for future disasters. The Community Resiliency Hub Program in Baltimore is made up of fifteen non-profit organizations throughout the city's districts to provide resources for vulnerable neighbors to gather in times of emergency (Baltimore Office of Sustainability, n.d.). The Neighborhood Empowerment Network in San Francisco consists of twelve upcoming hubs run by residents, neighborhood associations, nonprofits, and faith-based organizations.

Each hub consists of three core actors: anchor institutions, hub partners, and block champions. Anchor institutions are centers used to manage everyday events or during disasters. Hub members serve the community through a variety of preparedness and recovery activities. Finally, block champions connect Hub activities with residents and coordinate with the Hub in times of need (City and County of San Francisco, n.d.). Resilience hubs are currently in development in Miami (Henseler, n.d.) and Washington D.C. (Department of Energy and Environment, n.d.).

Recent studies suggest the types of services that could be available in a Resilience hub. Resilience hubs may provide important community functions such as education, public engagement, critical service, or housing in normal times (Sandoval, n.d.). Hubs can assist in the equitable access to and distribution of material-based and information-based resources (De Roode and Martinac, 2020a). The City and County of Honolulu's Ola O'ahu Resilience Strategy (2019) mentioned that resilience hubs could be used to distribute vital information and resources during or immediately following disasters, which help reduce the burden on and interference with local emergency response. Hubs may also facilitate communication between different agencies and departments and the public through, e.g., emergency and non-emergency telecommunication, internet access and connectivity, and emergency and nonemergency informational bulletins and advisories (De Roode and Martinac, 2020a). Other critical services of resilience hubs may include backup power supply, potable water, telecommunications, medical resources, and food provisions as complements to other support systems (De Roode and Martinac, 2020a).

Finally, in response to climate change preparedness and ongoing needs to mitigate the drivers of climate change, hubs may provide low carbon or carbon neutral services that mitigate greenhouse gas emissions (De Roode and Martinac, 2020a). Whenever possible, and in addition

to other energy efficiency and renewable energy generation measures, hubs could incorporate on-site carbon sequestration services, e.g., tree planting, regenerative community-based agriculture, and aerobic composting (De Roode and Martinac, 2020a).

Resilience hubs may either be newly constructed or retrofitted from existing community-serving facilities (Sandoval, n.d.). Sites that are well-utilized and have cultural and community significance for the surrounding residents are overall great candidates to consider (Sandoval, n.d.). Typical factors involved in selecting a site include topography, geological type, slope, and vegetation coverage (Geng, Hou, and Zhang, 2020). Other considerations include the site's existing and future functions, current site conditions, the ability to enhance the current programmatic offerings to further community cohesion, and hazard risks in the surrounding area (French, Birchall, Landman, and Brown, 2019; Tsioulou, Walker, Lo, and Yore, 2020; De Roode and Martinac, 2020b). It is critical to assess the potential vulnerabilities and level of exposure to various hazards that a prospective site may be exposed to, given its geographic and topographic location (De Roode and Martinac, 2020b). Transportation accessibility is another critical factor to consider for both the public and those with reduced mobility (Tsioulou, Walker, Lo, and Yore, 2020).

2.2 Community Resilience

This study adopts Ola O'ahu Resilience Strategy (2019)'s definition of resilience: "the ability to survive, adapt, and thrive regardless of what shocks or stresses come…" (pp. 20). Normally, the term resilience is used to describe the ability of communities to recover from a disaster (Norris et al. 2008). During a disaster, residents will rapidly deploy an ad-hoc disaster response system of disaster response to coordinate the distribution of supplies, power, and information among themselves (Al-Akkad, 2016). However, despite using an ad-hoc system,

communities are still vulnerable to future disasters that may be of greater magnitude and size due to a lack of preparation and planning (Sury et al., 2016). Instead, this study focuses on resilience on a year-round basis. Compared to the ad-hoc system, focusing on year-round resilience places opportunities for communities to create plans to prepare for threats that may occur during normal times and disasters.

Criticisms arise on how resilience is defined based on the unit of analysis (Norris et al. 2008). In this study, the unit of analysis refers to the term "community". According to Shaffer et al. (2004), community is described by three definitions: i) a physical space such as a region, county, or municipality, ii) a group of people who share a common interest, and iii) a logical decision-making unit that may or may not incorporate space. Shaffer et al. (2004)'s first definition is adopted in this study to label a development plan area as a physical space.

Still, the meaning of community resilience remains unclear as Fainstein (2018), DeVerteuil & Golubchikov (2016), and Norris et al. (2008) describe. Norris et al. (2008) argued that community resilience varies with how residents view the boundary of their community. Fainstein (2018) discussed the role of individualism and neoliberalism in influencing community resilience based on the notion that individuals are solely responsible for their safety and wellbeing and should not rely on the government or other outside entities. DeVerteuil and Golubchikov (2016) mentioned that whole community decisions are commonly made by wealthy residents or externally by powerful institutions.

Community resilience has evolved to consider the differences in power among residents (Fainstein, 2018). Also, efforts to increase community resilience are more customized to the community's local contexts and is not a "one size fits all" strategy (Cutter, Ash, and Emrich, 2016). Norris et al. (2018) emphasizes the importance of convening and engaging residents with

different levels of socioeconomic statuses to build collective resilience. Re-imagining community resilience as an active and internally produced process enables all residents to meet, address concerns, and mobilize themselves based on their individual and group strengths (DeVerteuil and Golubchikov, 2016). Maximizing community participation and inclusion brings different perspectives to brainstorm and strategize ways to increase resilience (National Research Council, 2011).

Patel, Rogers, Amlot, and Rubin (2017) conducted a publication search and identified 57 unique definitions of community resilience. From those definitions, several elements were identified as critical to the concept of community resilience. This study adopts the four community resilience elements described in Patel et al. (2017): Community Networks and Relationships, Teamwork and Leadership, Information and Communications, and Training and Education. Community networks and relationships are defined as the formal and informal ties between residents and outside connections. Teamwork and leadership refer to the ability of residents to work together to tackle community issues. Information and communications refer to the distribution and flow of information and communication. Lastly, training and education are activities provided to create opportunities for residents to gain new knowledge and skills (Patel et al. 2017). This study analyzes the importance of each type of community asset in promoting these four community resilience element.

2.3 Challenges of Resilience in Urban and Rural Communities

In the United States, current research on rural communities' vulnerabilities to natural disasters is far less known than on urban communities, yet rural communities are far more vulnerable to disasters than urban communities (Kapucu, Hawkins, and Rivera, 2013; Cutter, Ash, and Emrich, 2016). For instance, rural communities more than often do not have the

financial resources to recover timely from a disaster (Kapucu, Hawkins, and Rivera, 2013). Rural communities also struggle to maintain government and business operations before and after a disaster due to a lack of physical and social infrastructure (Cutter, Ash, and Emrich, 2016). Since rural communities rely on a single-sector economy, such as agriculture, losing a significant core function in a disaster extends the time to recover (Kapucu, Hawkins, and Rivera, 2013). Besides, rural communities do not typically rely on government support during disasters because of the government's long and unreliable response time (Kapucu, Hawkins, and Rivera, 2013). Instead, residents learn to rely on each other in times of crisis (Madsen and O'Mullan, 2016).

On the other hand, urban communities present distinct challenges for resilience (Kresge Foundation, 2015). The United States holds a vast majority of its population in urban cities, and it is estimated by 2050, another 100 million Americans will become urban settlers (Kresge Foundation, 2015). Most of this urban growth will occur near the coast, where residents are threatened by coastal hazards exacerbated by climate change (Kresge Foundation, 2015). Meanwhile, the urban poor, consisting of residents living in low-lying areas, lack the resources to rebuild or flee because the distribution of resources is not spatially equal in cities (Kresge Foundation, 2015). Communities of color are especially vulnerable to disaster from being underinsured and disenfranchised (Kresge Foundation, 2015). Furthermore, factors that promote community resilience, such as a conventional sense of community, placed-based knowledge, ties to natural resources, and strong social networks, are less present in urban areas than in rural communities (Cutter, Ash, and Emrich, 2016).

2.4 Community Assets

There are various definitions for community assets in which Haines (2009) summarized. For instance, Sherraden (1991) defines assets as the stock of wealth in a household or other unit.

Kretzmann and McKnight (1993) describe assets as the "gifts, skills, and capacities" of "individuals, associations, and institutions" (pp. 25). More recently, Green and Haines (2007) identified seven forms of assets: physical, human, social, financial, environmental, cultural, and political.

This study adopts the three types of assets described in Haines (2009): physical capital, human capital, and social capital. Physical capital consists of roads, buildings, infrastructure, and natural resources within a community. Typically, natural resources are a separate form of assets. In this case, because natural resources also shape the built environment, they are part of a community's physical characteristics and assets. Human capital is defined as "the skills, talents, and knowledge of community members" (pp. 41). Human capital can include labor market skills, leadership skills, education backgrounds, and others. Human capital changes over time because residents move in and out of communities. Social capital refers to the social relationships within a community. There are different forms of social capital, such as informal and formal. Informal social capital refers to connections established through personal relationships, while formal social capital relates to ties based on organizations and service clubs.

Historically, the ABCD approach, which focuses on utilizing existing community assets, has been used to improve community conditions (Kretzmann and McKnight, 1993). Residents can map their community to determine each asset's location and usage (Kretzmann and McKnight, 1993). Mapping also enables residents to discover unique ways to use their assets in the future to solve community problems and overall increase community resilience (Kretzmann and McKnight, 1993). The ABCD approach allows the community development process to be "internally focused" and "relationship-driven" (Kretzmann and McKnight, 1996, pp. 27).

Kretzmann and McKnight (1993) argued that an asset-based approach is more effective in rebuilding struggling communities than the traditional needs-driven approach. Contrary to the ABCD approach, the needs-driven approach focuses on a community's needs and problems and is the conventional way for government institutions and community organizations to offer solutions through deficiency-oriented policies and programs. Although the needs-driven approach is utilized more, its helpful intentions to provide external resources harm the community's ability to build internal capacity. For instance, residents may depend on outside experts' help instead of relying on their neighbors. As a result, neighbors' opportunities to build support links and capitalize on existing community resources are weakened (Kretzmann and McKnight, 1996).

According to Scott, Smith, and Schaedler (2018), the ABCD approach is made up of six steps (Figure 2.1). The approach begins with residents collecting stories and forming a core group. This initial step allows residents to introduce each other and gain their perspectives of living in the same community. The second step involves residents mapping out their assets to figure out their individual and collective strengths. The other four steps focus on residents mobilizing to connect with partners, build a vision and plan for their community, and leverage community resources and knowledge for future investment. This study primarily utilized the second step of the ABCD approach, although the first step was used to help residents to initiate discussion prior to data collection.

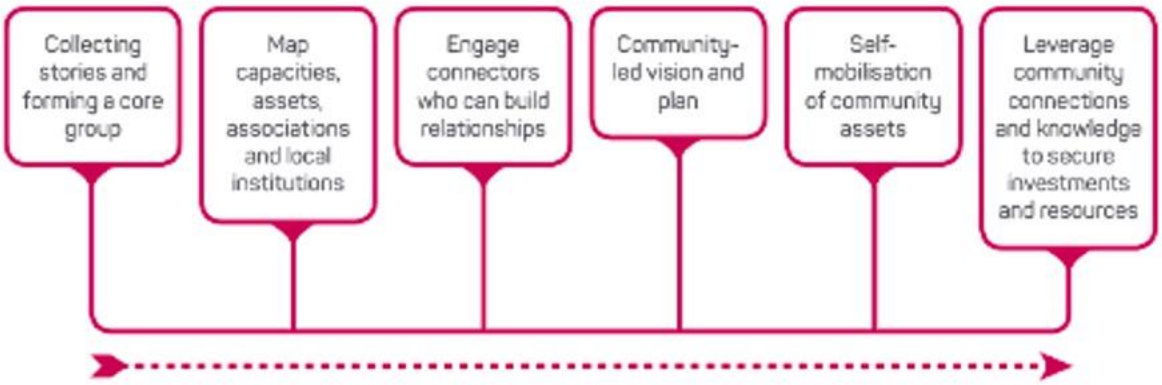


Figure 2.1. One representation of the Asset-Based Community Development Approach (Scott, Smith, and Schaedler, 2018)

The ABCD approach is often challenging since finding consensus and making compromises among residents is often difficult, time-consuming, and costly. Other challenges include maintaining residents' active involvement over time, establishing community leadership roles, and pushing for marginalized groups' participation in the decision-making and planning process. Although the ABCD approach drives positive change in communities, internal community action alone cannot solve significant community problems such as poverty and, thus, require broad and systematic changes (DeFilippis, Fisher, and Shragge, 2010). However, through the ABCD approach, residents can come together to push for these changes (DeFilippis, Fisher, and Shragge, 2010).

2.5 Summary

Pacific communities in the Oceania region like Hawai‘i are severely threatened by future natural disasters and climate change. Resilience hubs are a unique community-led, community-based strategy that cities across the United States have begun implementing to adapt to climate change. The first two steps of the ABCD approach are used to understand the role of community

assets in developing a strategy like a resilience hub that is relied on community inclusivity. The ABCD approach allows residents to use the asset mapping tool to locate and assess each asset's current and potential usage. In this study, three types of community assets, i.e., physical, human, and social assets, within urban and rural communities are identified and ranked on their importance in promoting community resilience. Afterward, the community assets are analyzed quantitively and qualitatively to understand their influence in developing a community resilience hub for urban and rural communities. This study contributes significantly to the literature surrounding community assets, community resilience, and resilience hub development, as well as to the creation of a Resilience Hub Action for Oʻahu, Hawaiʻi.

3.0 DATA AND METHODS

An online and anonymous survey was distributed to residents living in both study areas (i.e., the PUC and Koʻolauloa development plan areas) to collect qualitative and quantitative data relevant to this study's research questions. Two online workshops were conducted in Summer 2021, which several Neighborhood Board members in each development plan area participated to pre-test the survey and provided feedback. Neighborhood Board members were targeted because they are residents who have a sufficient understanding of their community and serve on an elected board. The first community workshop covered four Neighborhood Boards within the PUC: Waialae-Kahala, Waikīkī, Kaimuki, and Diamond Head/Kapahulu/St. Louis. The second community workshop involved the Koʻolauloa Neighborhood Board, the only Neighborhood Board within Koʻolauloa. Afterward, the survey was revised according to the Neighborhood Board members' feedback on the readability and length of the survey.

The finalized survey was disseminated using the snowball sampling method to all the Neighborhood Boards in both study areas by email. The Neighborhood Boards were asked to complete the survey and then to distribute the survey to their personal and professional networks.

The survey was posted online for a month between September and October 2021. Due to time and resource limitations, a minimum quota of 50 returned surveys was pursued in both study areas for a total of 100 surveys. At least 250 or more survey invites were sent out in both study areas to reach the minimum quota. City councilmembers, Senate and House representatives, and City government agencies were also contacted by email to participate in the survey. The survey was advertised using the following online recruitment platforms: social media, mass e-mail, and personalized e-mail. The consent form can be found in Appendix B and survey questions in Appendix C.

3.1 Survey Design

The survey had a total of three sections. The first section asked for general demographic information on zip code, length of occupancy on O‘ahu, age, race, ethnicity, and total average annual household income. A question on whether participants perceive their community as urban or rural was also collected.

The second section provided multiple-choice questions for residents to identify existing physical, human, and social assets from a list of provided examples. The data on physical capital were collected on the following: education facilities (i.e., schools, universities, community colleges, early learning centers), medical facilities and clinics, government buildings (i.e., libraries, fire stations, police stations, State and City Departments), non-government buildings (i.e., food banks, nonprofit organizations), community spaces (i.e., parks, community facilities, recreational centers, churches), cultural features (i.e., gardens, monuments, temples), and public attractions (i.e., theaters, museums, entertainment venues, markets). The data on human capital were collected on the following: residents with skills in building construction, crafts, home improvement, and other manual labor jobs, residents who are knowledgeable in farming or gardening, residents who are knowledgeable in Native Hawaiian practices (i.e., medicinal plants, hula and chanting, kalo and fishpond farming and management), residents with special skills (i.e., medical training such as survival skills or martial arts), residents with strong leadership, organizational, and communication qualities, and residents with extensive knowledge of the community and the members within. The data on social capital consisted of residents who are friendly and bond with other households on their street, residents who provide physical and emotional support to other households in times of need, residents who frequently gather and share information with other households, residents who frequently organize neighborhood events

(i.e., cleanups, watch parties, planning meetings), residents with close connections or work within the government system (i.e., City Council, Department worker, House or State representative), and residents with close connections or work within a community-based organization (i.e., neighborhood associations, church groups, nonprofits).

Residents also ranked how important each asset was in promoting the four community resilience elements: Community Networks and Relationships, Teamwork and Leadership, Information and Communications, and Training and Education. Residents ranked the community assets using a Likert scale ranging from the following levels of importance: Not at all Important, Low Importance, Neutral, Very Important, and Extremely Important. Residents were allowed to rank different assets in the same level of importance if desired. The elements were constructed clearly for residents to interpret and respond to in the survey. Then, residents were asked open-ended questions on how they would utilize their community assets to adapt to disasters.

In the third section, residents answered Likert scale questions to rank five types of site factors for resilience hub development. Three site factors were taken from De Roode and Martinac (2020b)'s methodology of selecting resilience hub sites: 1) the degree of trust and acceptance of the site by residents, 2) the ease of access to the site for pedestrians and cars, and 3) the current programmatic offerings of the site, and the ability to enhance those offerings in the future. The other two factors, the site's intent to serve all groups or specific groups and types of community-based facilities, were chosen based on criteria from existing literature on siting community-based facilities such as Tsioulou et al. (2020); De Roode and Martinac (2020a), and French et al. (2017). Six types of community-based facilities will be compared: non-government buildings, government buildings, education facilities, community gathering spaces, recreation & cultural facilities, and if the site is in a residential area. The Likert scale ranged from Not at all

Important, Low Importance, Neutral, Very Important, and Extremely Important. A ranking question was provided to ask residents to rank the six community-based facilities from one to six for their preference in resilience hub location, which one is the least preferred location and six is the most preferred location. No two options could have the same ranking.

Lastly, two pairwise comparison questions were created to compare the importance between physical, human, and social assets in general and the importance of different site factors. The first pairwise comparison question asked residents to judge pairs of community assets: physical assets vs human assets, physical assets vs social assets, and human assets vs social assets. The second pairwise comparison question asked residents to judge the following pairs of site factor options: trusted and accepted site vs well-known site, accessible to pedestrians and cyclists vs available space for parking, planned functions vs easily changed functions, and serves populations in special need vs. serves public. Populations in special need are defined as populations that disproportionately experience economic, health, and climate vulnerabilities i.e., characterized as low-income households, people experiencing houselessness, people of color, the elderly, the chronically ill and disabled, and non-English speakers (National Research Council, 2011; City and County of Honolulu Resolution 20-206).

3.2 Quantitative Analysis Method

Quantitative data from the survey was analyzed through different statistical methods. Data on zip codes were collected to determine the residence of the survey participants. Surveys from residents located outside the study areas were not analyzed. Other demographic information such as length of occupancy on O‘ahu, age, race, ethnicity, and total household income were collected to compare between the study areas. Survey questions that were not answered correctly

were not analyzed. Additionally, ranking questions that were answered with "N/A" were given a score of zero for analysis purposes.

3.2.1 Two-way Analysis of Variance

Two-way analysis of variance (ANOVA) tests was used to quantitatively compare the importance of each community asset and site factor in resilience hub development. The Statistical Package for Social Sciences software was used to run the ANOVA tests. A total of seventeen ANOVA tests were run: four tests were run for each type of community asset, equaling twelve tests, four tests comparing all the assets simultaneously, and one test was run for each resilience hub site selection factor (Table 3.1).

Because the Likert scale in this study is constructed at the quasi-interval scale: Not at all Important, Low Importance, Neutral, Very Important, and Extremely Important (Carifio, 2007), parametric statistics such as ANOVA are applied to analyze the results. The following scores were given for this study's item categories to calculate the mean of groups: Not Important =1, Slightly Important = 2, Moderately Important = 3, Very Important = 4, and Extremely Important = 5.

The two-way ANOVA tests will determine if there is a statistically significant difference between the average importance ranking scores of each community asset and between the means of each factor for resilience hub site selection. Because an ANOVA test cannot determine which community asset or which resilience hub site factor rankings are significant from each other, a post hoc Tukey HSD test was run afterward to determine significance. ANOVA tests were run and analyzed separately for residents located in both study areas. Later, the results for both areas will be compared for similarities and differences in an urban-rural context.

Table 3.1. Seventeen two-way ANOVA tests that were run in this study

ANOVA Test	Group 1 (Independent Variable)	Group 2 (Independent Variable)	Dependent Variable
1	Physical Asset	Community Networks and Relationships	Average ranking scores
2	Physical Asset	Teamwork and Leadership	Average ranking scores
3	Physical Asset	Information and Communications	Average ranking scores
4	Physical Asset	Training and Education	Average ranking scores
5	Human Asset	Community Networks and Relationships	Average ranking scores
6	Human Asset	Teamwork and Leadership	Average ranking scores
7	Human Asset	Information and Communications	Average ranking scores
8	Human Asset	Training and Education	Average ranking scores
9	Social Asset	Community Networks and Relationships	Average ranking scores
10	Social Asset	Teamwork and Leadership	Average ranking scores
11	Social Asset	Information and Communications	Average ranking scores
12	Social Asset	Training and Education	Average ranking scores
13	Physical, Human, Social Assets	Community Networks and Relationships	Average ranking scores
14	Physical, Human, Social Assets	Teamwork and Leadership	Average ranking scores
15	Physical, Human, Social Assets	Information and Communications	Average ranking scores
16	Physical, Human, Social Assets	Training and Education	Average ranking scores
17	Site Factors	Resilience Hub Site Selection	Average ranking scores

3.2.2 Analytic Hierarchy Process Calculator

This study used an Analytic Hierarchy Process (AHP) calculator by Goepel (2018) to quantify which community asset or site factor had a greater importance in adapting to disasters in the pairwise comparison questions. The AHP calculator produced the weights of each community asset and site factor using eigenvalues. All the responses for both study areas were put in the calculator as a pairwise comparison matrix and adjusted to make sure the consistency ratio is less than 10%. The weights of each community asset and site factor were calculated for each response to estimate the average value and confidence intervals.

An inferential analysis for the weights was not conducted in this study. In future studies, a one-way ANOVA analysis comparing the weights of individual assets and site factors or a two-way ANOVA analysis comparing the weights between urban and rural communities can be pursued.

3.3 Qualitative Data Coding

Both deductive and inductive coding was used to analyze the open-ended questions about how physical, human, and social assets can be used to adapt to disasters. The codebook began with a predefined set of codes (Table 3.2) that was determined by previous research studies on resilience hubs, asset mapping, and urban and rural community challenges facing natural disasters. Several codes were created to represent the allocation of community resources during normal times (Ola O‘ahu Resilience Strategy, 2019) and disasters (De Roode and Martinac, 2020a; Pew, 2020; USDN, 2019). Other codes were created to describe potential resilience hub functions like skills education, knowledge sharing, and relationship building as a form of community resilience (Freitag, R. C., Abramson, D. B., Chalana, M., & Dixon, M., 2014). Lastly, some codes were created to illustrate that the collaborative process of resilience hub

development between government agencies and community organizations (De Roode and Martinac, 2020b).

The deductive approach is beneficial in saving time to capture codes. However, one drawback in deductive coding is bias in the predefined codes, which leads to missing other valuable codes in the data. So, inductive coding was implemented to add new codes to the pre-defined codes by examining the keywords and phrases more closely for each open-ended question.

Table 3.2. Pre-defined codes

Physical Assets	**Human Assets**	**Social Assets**
Meeting Space	Enhance New Skills	Encourage Community Participation
Resource Distribution	Place-Based Learning	Establish Planning Teams
Temporary Shelter	Develop Cultural Awareness	Organize Community Events
Training and Programming	Improve Community Disaster Preparedness	Integrate Community Organizations and Government Entities

4.0 RESULTS

218 surveys from the PUC and 86 surveys from Koʻolauloa were completed and analyzed. A map highlighting survey responses by zip code in each development plan area is displayed in Figure 4.1. A summary of the results for both quantitative and qualitative data is reported below.

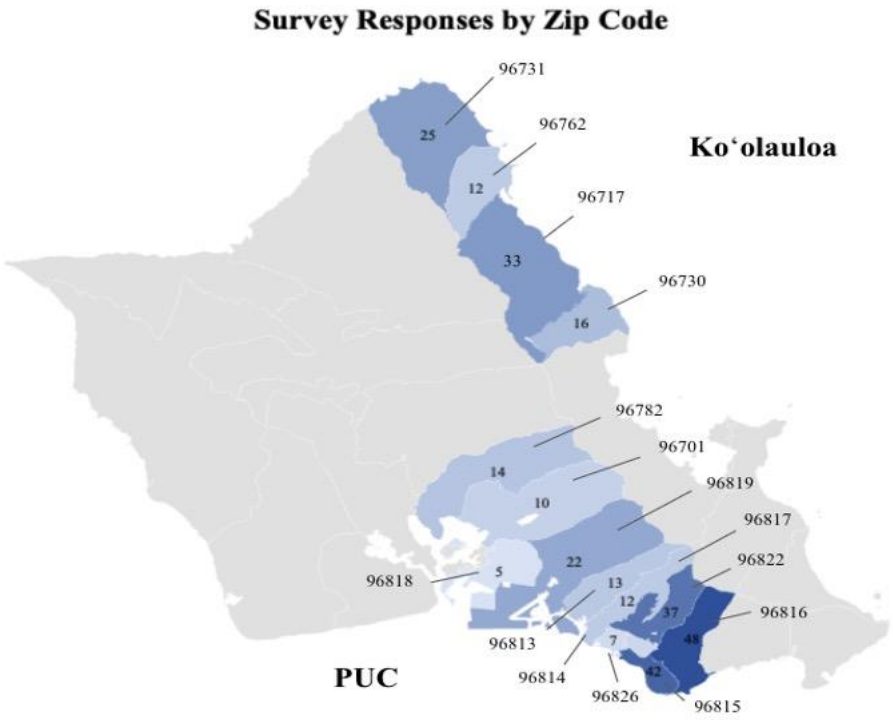


Figure 4.1. Map displaying survey responses by zip code in the PUC and Koʻolauloa

4.1 Summary of Questionnaire Responses

The gender of the survey participants in the PUC were roughly equally distributed: 110 residents were female and 105 were male. Meanwhile, 64 females and 20 males participated in Koʻolauloa. Three residents in the PUC and two residents in Koʻolauloa did not mention their gender (Figure 4.2).

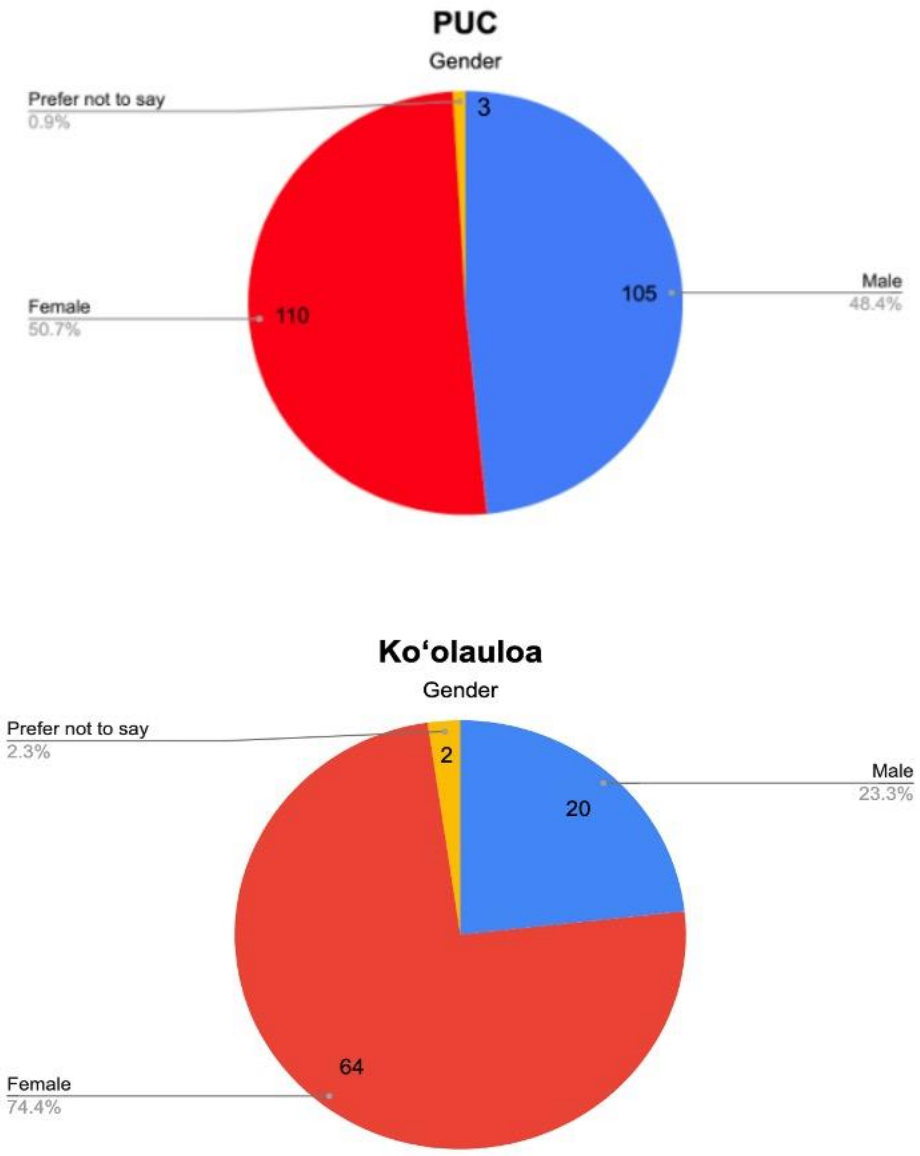
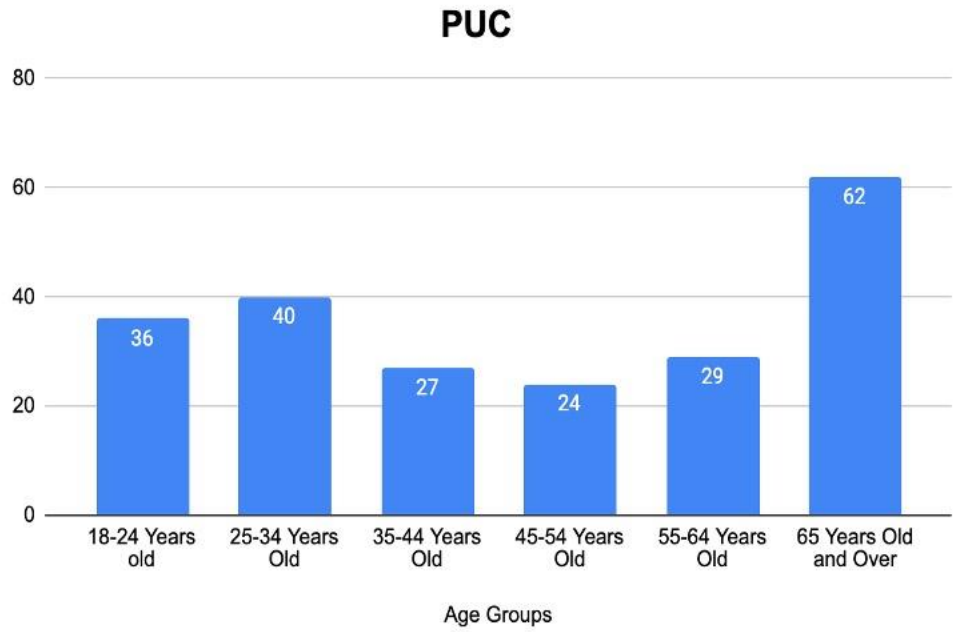


Figure 4.2. Gender distribution of PUC and Ko‘olauloa residents

Majority of the age groups of the survey participants in both the PUC and Ko‘olauloa were 65 years and older (Figure 4.3).



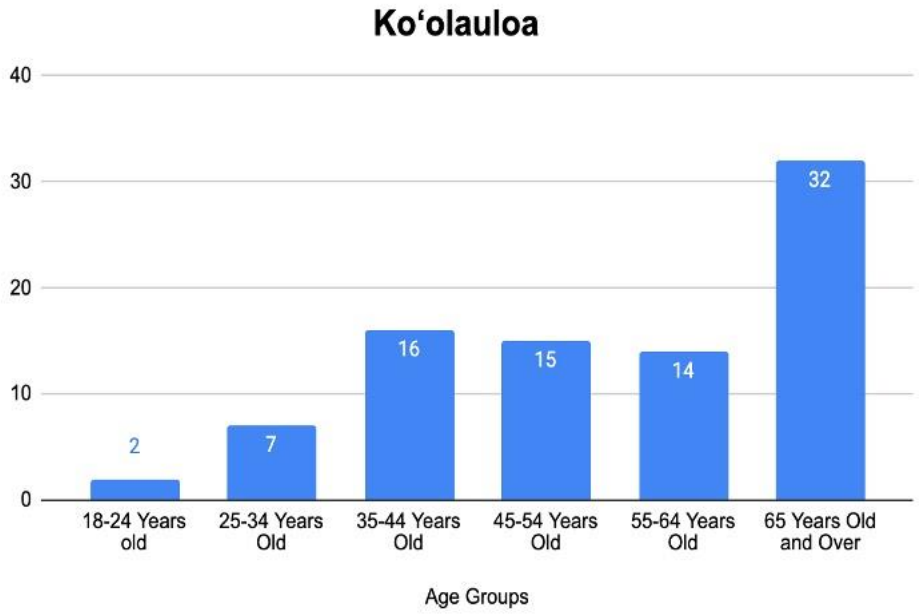


Figure 4.3. Age distribution of PUC and Ko‘olauloa residents

In terms of race and ethnicity, Asian (50.5%) and White (33%) made up many of the survey participants in the PUC. For Koʻolauloa, White (41.9%) and Native Hawaiian (29.1%) made up most of the survey participants (Figure 4.4).

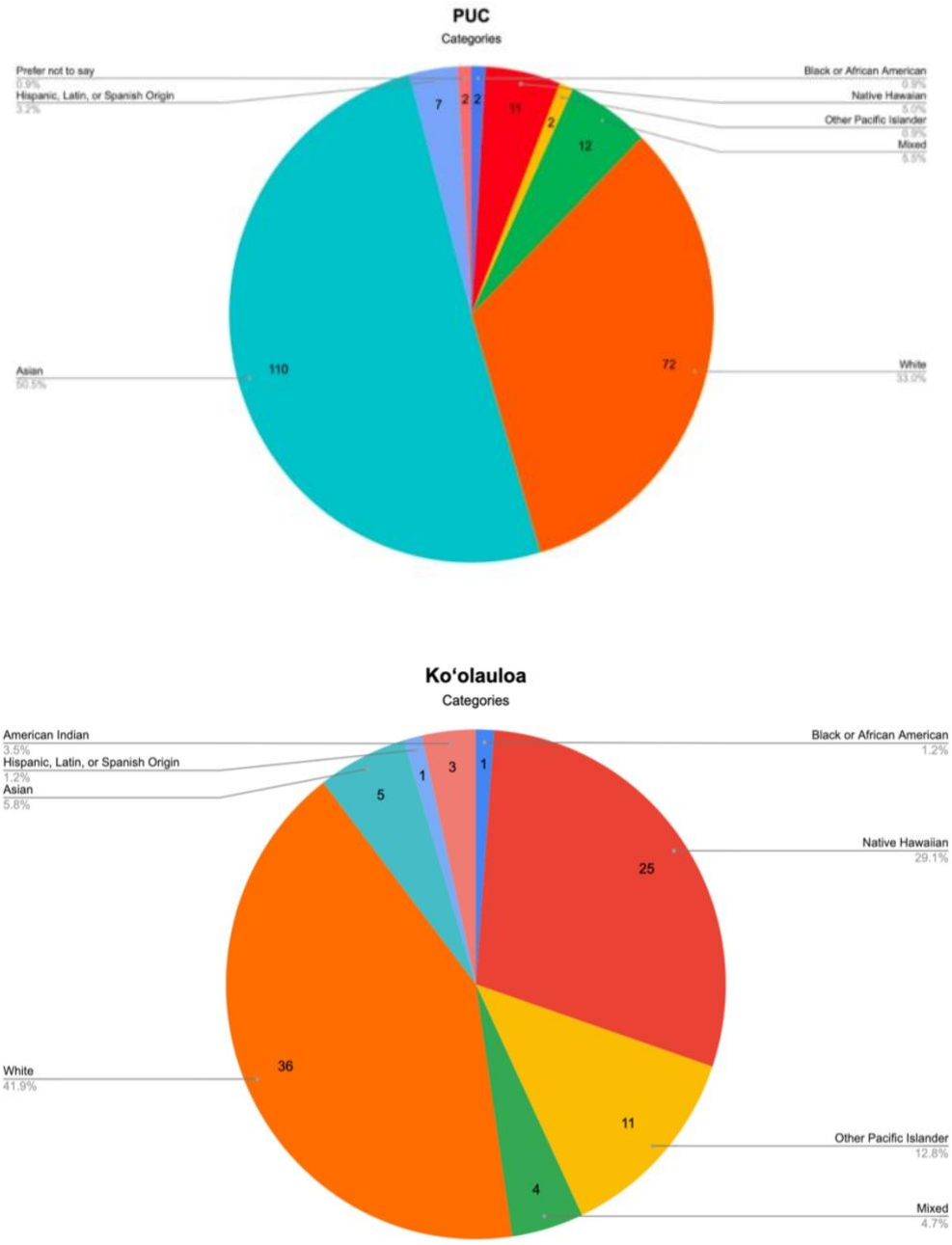


Figure 4.4. Race and ethnicity distribution of PUC and Koʻolauloa residents

For average annual household income, the $100,001 or over income group made up of most survey participants in the PUC. For Koʻolauloa, the $80,001 to $100,000 income group made up of most survey participants (Figure 4.5).

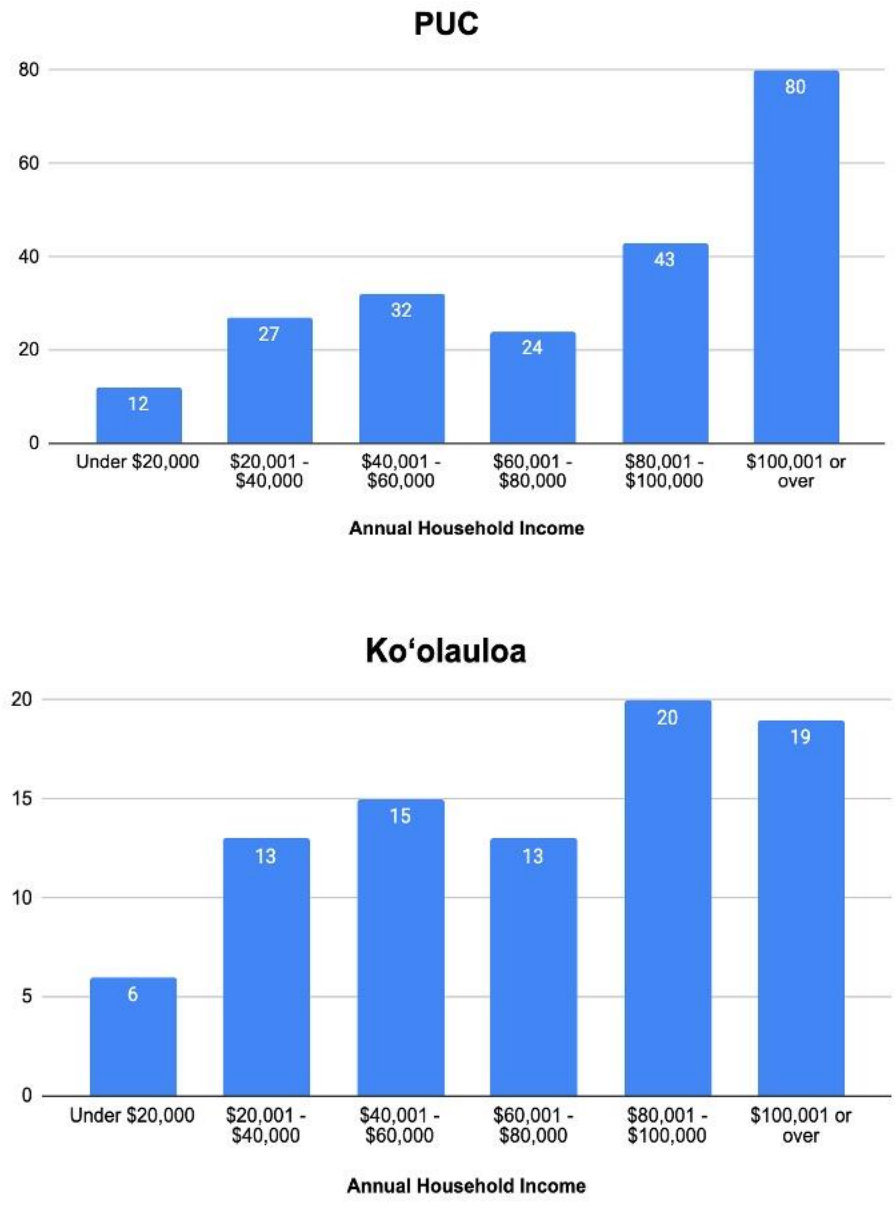


Figure 4.5. Annual household income distribution of PUC and Koʻolauloa residents

Lastly, for community perception, many of the survey participants in the PUC answered that their community is urban (94.5%) and for Koʻolauloa, most survey participants answered that their community is rural (87.2%) (Figure 4.6).

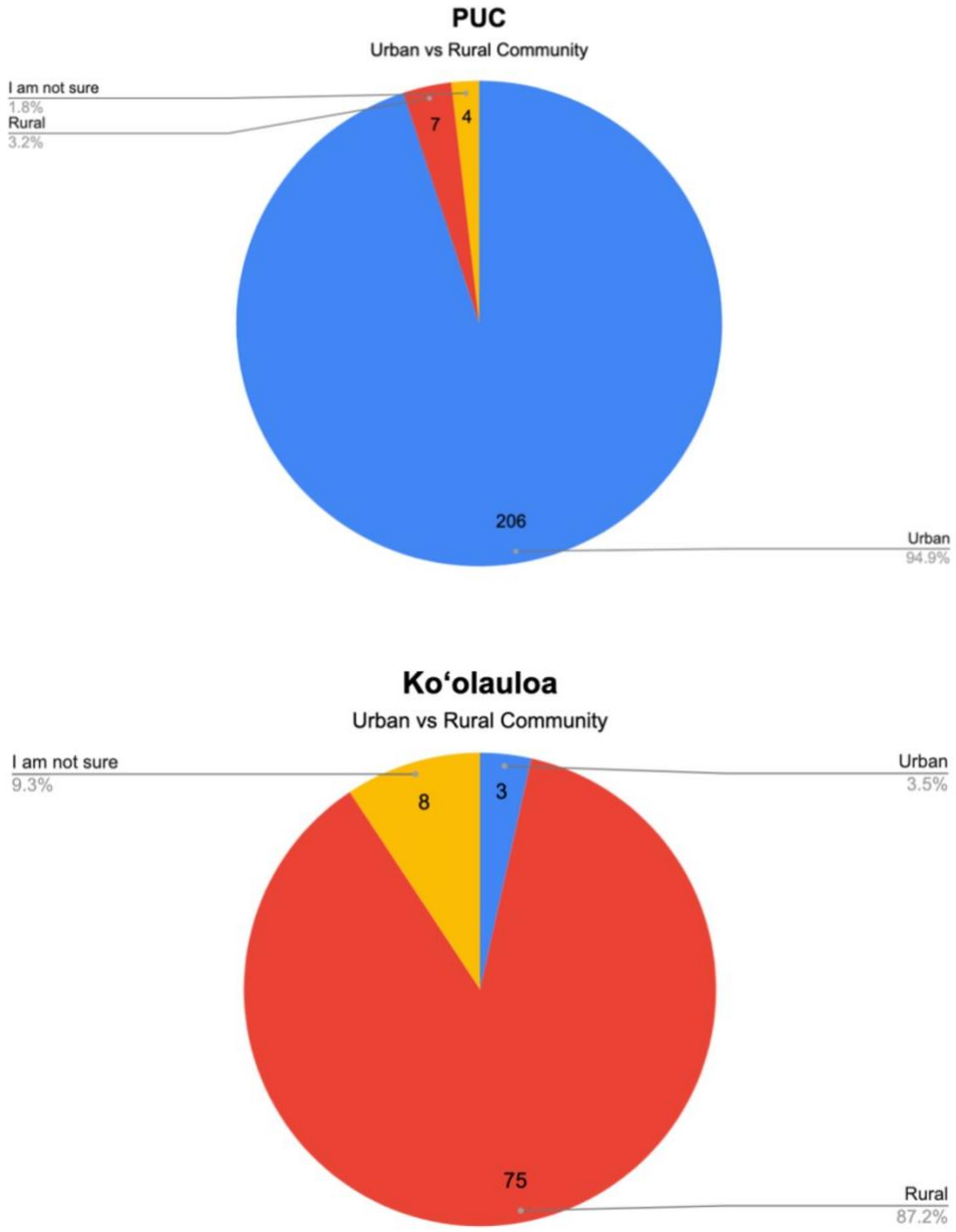


Figure 4.6. Community perception of PUC and Koʻolauloa residents

4.2 Identified Community Assets in Urban and Rural Communities

Urban and rural residents identified the types of physical, human, and social assets that they perceived are available in their community. The percentages of each identified asset found in Figures 9-11 represent the percent of the total number of residents in each study area who responded (i.e., 218 responses for PUC and 86 responses for Koʻolauloa).

In the PUC, residents identified the following percentages of physical assets in their community: community spaces (96.8%), education facilities (93.1%), medical facilities (76.6%), cultural features (65.6%), government buildings (85.3%), non-government buildings (47.3%), public attractions (76.6%), and mass transit hubs (49.5%)

Meanwhile, in Koʻolauloa, community spaces (87.2%), education facilities (91.9%), medical facilities (79.9%), cultural features (66.3%), government buildings (83.7%), non-government buildings (58.1%), public attractions (57.1%), and mass transit hubs (17.4%) were identified by residents. Community spaces, public attractions, and mass transit hubs were substantially greater in the PUC, while non-government buildings were substantially greater in Koʻolauloa (Figure 4.7).

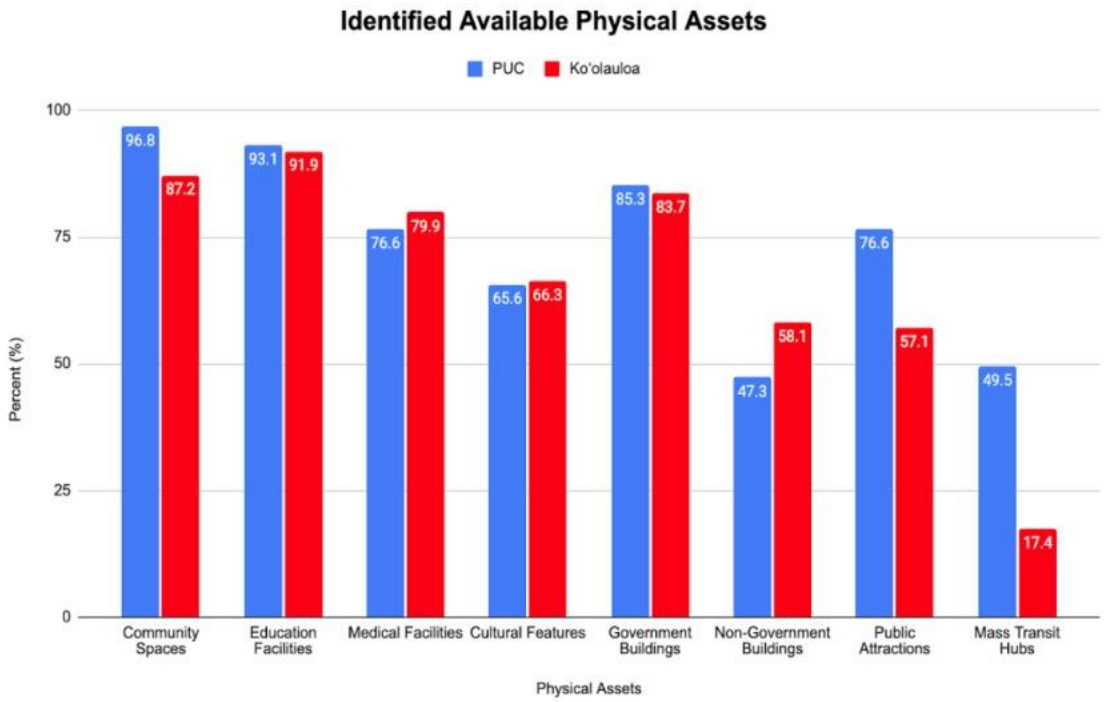


Figure 4.7. Comparison of identified available physical assets between the PUC and Koʻolauloa

In the PUC, the following percentages of human assets were identified: residents with extensive knowledge of the community and the members within (46.3%), residents with strong leadership, organizational, and communication qualities (47.7%), residents with special skills (45%), residents with skills in manual labor jobs (49.5%), residents who are knowledgeable in farming and gardening (38.5%), and residents who are knowledgeable in Native Hawaiian practices (17.9%).

In Koʻolauloa, the percentages of identified human assets were substantially greater for every example: residents with extensive knowledge of the community and the members within (68.6%), residents with strong leadership, organizational, and communication qualities (68.6%), residents with special skills (65.1%), residents with skills in manual labor jobs (75.6%), residents

who are knowledgeable in farming and gardening (74.4%), and residents who are knowledgeable in Native Hawaiian practices (64%) (Figure 4.8).

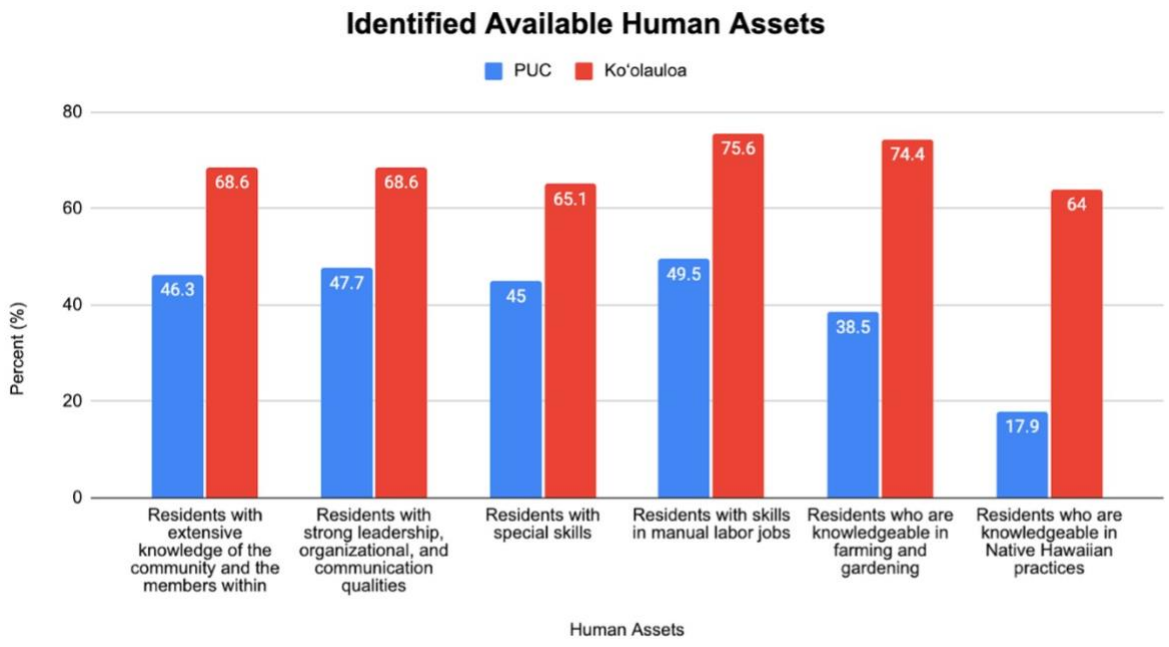


Figure 4.8. Comparison of identified available human assets between the PUC and Koʻolauloa

In Koʻolauloa, the percentages of identified social assets were substantially greater for five out of the six examples: residents who are friendly and bond with other households on their street (59.3%), residents who frequently gather and share information to other households (47.7%), residents who provide physical and emotional support to other households in times of need (47.7%), residents who frequently organize neighborhood events (37.2%), and residents with close connections or work within a community-based organization (57%). Meanwhile, residents with close connections or work within the government system were substantially greater in the PUC (39.9%) (Figure 4.9).

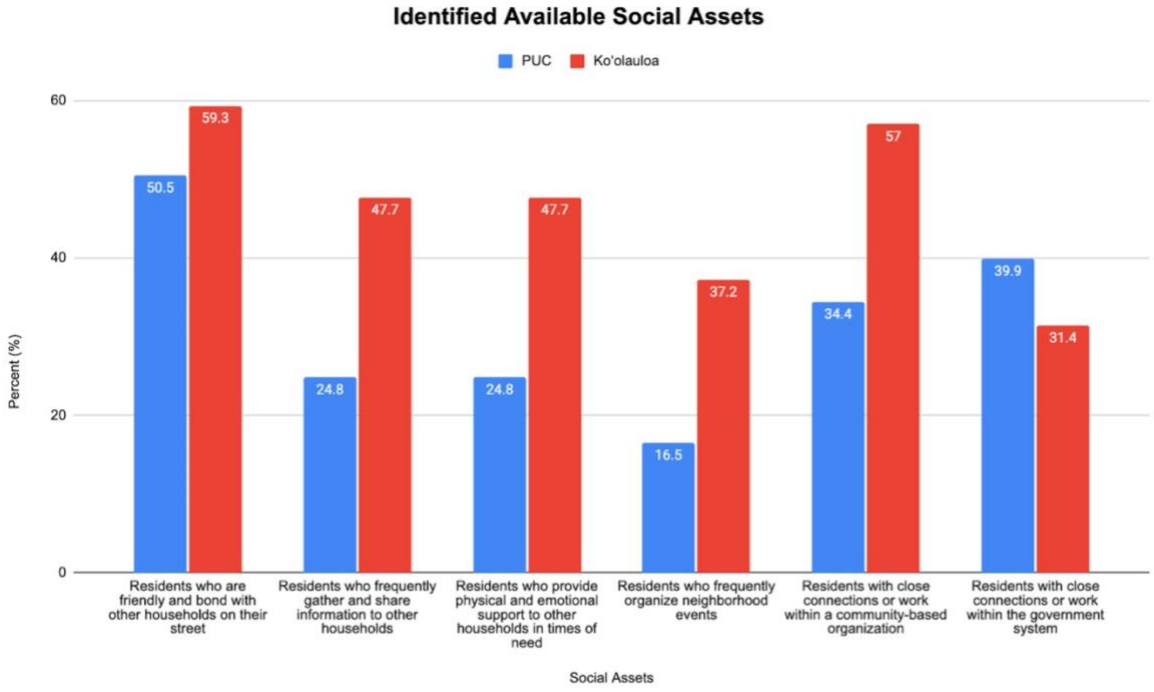


Figure 4.9. Comparison of identified available social assets between the PUC and Koʻolauloa

4.3 Comparing the Importance of Community Assets for Community Resilience

In the PUC, the following average weights were calculated: physical assets (32.70 ± 5.57%), human assets (32.58 ± 5.47%), and social assets (34.71 ± 6.16%). Koʻolauloa had the following average weights: physical assets (41.18 ± 7.96%), human assets (30.96 ± 6.50%), and social assets (27.23 ± 4.69%). Urban residents weighed each type of asset similarly. This could mean that urban residents may have different perspectives on the types of assets that are important to them because of how ethnically diverse the PUC is.

Meanwhile, rural residents weighed physical assets the highest by a large percentage, which may be because physical assets such as medical facilities and community spaces, although present, are not as accessible in their community as in the PUC (Figure 4.10).

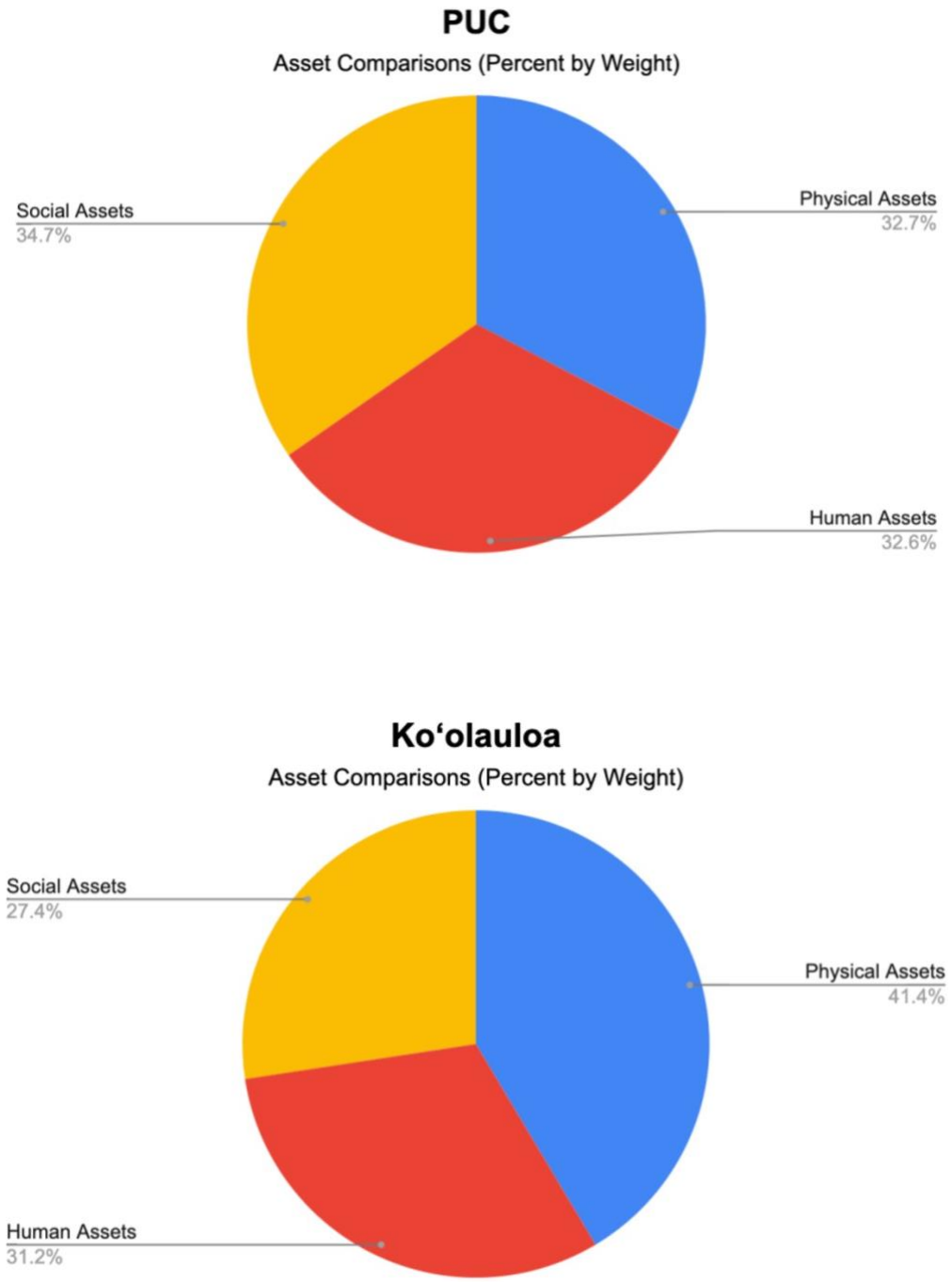


Figure 4.10. Judgement of assets in adapting to disasters between the PUC and Ko‘olauloa

4.4 Comparing the Importance of Site Factors for Resilience Hub Development

In the PUC, the following average weights were calculated: trusted and accepted site (34.48%) vs. well known site (65.52%), accessible to pedestrians and cyclists (41.44%) vs. available space for parking (58.56%), planned functions (38.47%) vs. easily changed functions (61.53%), and serves populations in special need (40.53%) vs serves the general public (59.47%). The average weights in Koʻolauloa were the following: trusted and accepted site (32.39%) vs. well-known site (67.61%), accessible to pedestrians and cyclists (48.89%) vs. available space for parking (51.11%), planned functions (39.84%) vs. easily changed functions (60.16%), and serves populations in special need (39.40%) vs. serves general public (60.60%). In terms of transportation accessibility, the need for available parking space is ranked lower in Koʻolauloa (51.11%) compared to PUC (58.56%) (Figure 4.11).

Comparing the study areas, the weights for all site factors were similar except for one. In terms of transportation accessibility, the need for available parking space is ranked lower in Koʻolauloa compared to PUC which may be due to different reasons. First, there may be an over-reliance on private vehicles in the PUC that triggers the need for more parking spaces for new development projects. Typically, rural areas are more automobile dependent because there are limited modes of transportation and transportation routes. However, in this case, rural residents may feel that not much parking space is needed as they would rather travel using other modes of transportation or repurpose the area into green space, which can also be used as parking. Second, since there is one major road in Koʻolauloa that could be impacted by traffic or roadblocks, rural residents may feel better sheltering in place rather than transit elsewhere. During normal times, when there is no need to shelter, the space can be planned and operated by residents to build community resilience. Third, parking may be more available and inexpensive in rural areas than

in urban centers because there is a smaller population in rural communities. Thus, rural residents may not feel that more parking is necessary.

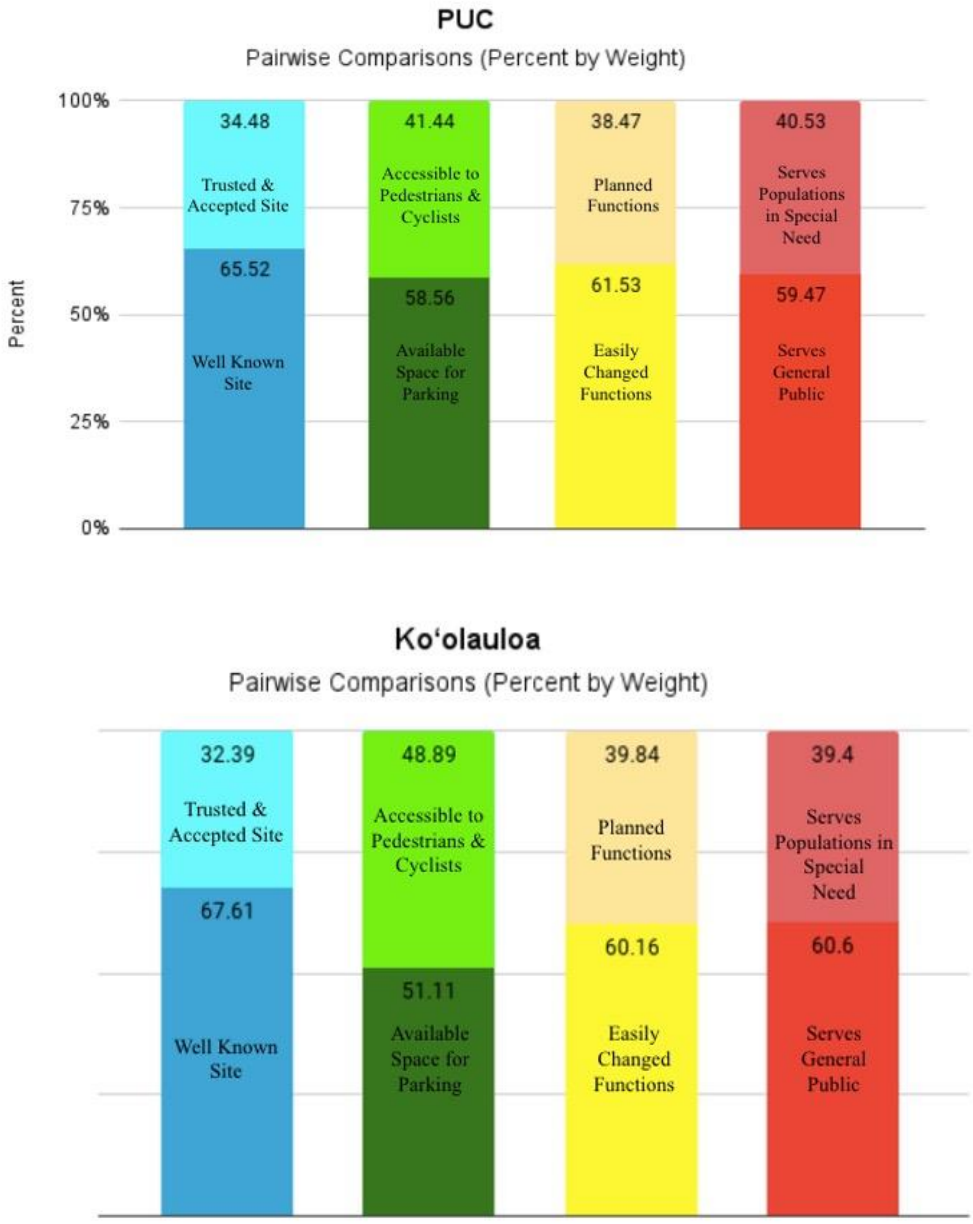


Figure 4.11. Importance of resilience hub site selection factors between the PUC and Koʻolauloa

Lastly, residents ranked the importance of different potential resilience hub sites. The weighted averages of each factor were calculated and are summarized in Figure 4.12. All weighted averages are out of a total of five. In the PUC, the following average weights were calculated: non-government building (2.59), government building (2.63), education facility (3.79), recreational & cultural use (4), residential area (4.32), community gathering space (4.70). Koʻolauloa had the following weighted averages: non-government building (2.28), government building (2.58), education facility (3.12), recreational & cultural use (4.31), residential area (4.75), community gathering space (4.86). Between the two, education facilities were ranked substantially greater in the PUC while residential areas were ranked substantially greater in Koʻolauloa.

Education facilities were ranked substantially higher in the PUC because there may be a greater number of schools that have adequate space for gathering and temporary sheltering. On the other hand, residential areas were ranked higher in Koʻolauloa possibly because residents are more closely connected to each other in their neighborhood.

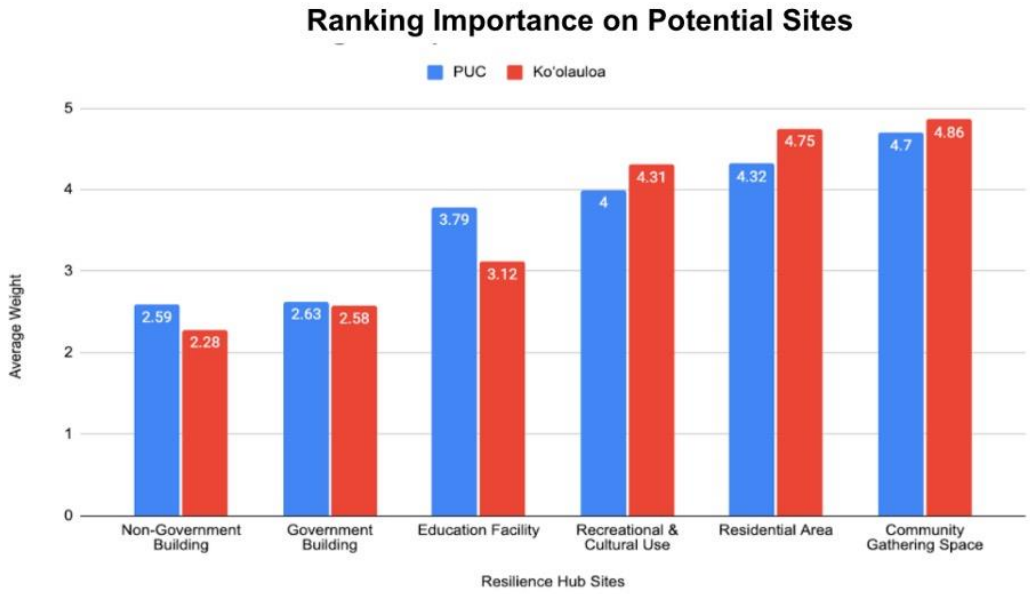


Figure 4.12. Comparison of potential resilience hub sites between the PUC and Koʻolauloa

4.5 Codebook

From the PUC, 144 responses for the first open-ended question, 119 responses for the second open-ended question, and 97 responses for the third open-ended question were received. Meanwhile, from Koʻolauloa, 62 responses, 54 responses, and 47 responses were received.

A codebook was then made and was organized by three different questions aimed to address community needs and functions for community resilience. These questions were generated based on the types of responses received. Overall, different codes were found among residents such as providing aid and relief, strengthening relationships, educating and encouraging participation, prioritizing local food production, partnering with government and community organizations, and others. Lastly, these codes provide clues of assets that are important in developing a resilience hub, which will be discussed later (Table 4.1 and 4.2)

Table 4.1. Codes and their descriptions organized by questions addressing community resilience

Questions	Code	Description
What types of functions should be fostered for community resilience?	Informal Volunteering Among Residents	The action for residents to aide other residents through informal volunteering during a disaster and post-disaster
	Strong Resident Relationships	The action to build upon already existing strong resident relationships to create neighborhood solutions for future disasters
	Outreach and Participation	The action to increase neighborhood outreach efforts on disaster preparedness and to encourage residents to participate in neighborhood-wide planning
	Account for all Populations	The action to engage and inform all resident groups of a neighborhood especially groups with a high vulnerability to disasters
What are examples of needs for community resilience?	Safe Gathering Space	The use of a safe and trusted physical space for residents to gather and discuss neighborhood solutions for disaster preparedness
	Increase Urban Forestry	The action to increase urban forestry efforts to mitigate impacts from future disasters
	Stream Restoration	The action to restore urban streams to mitigate future floods and protect the health of watersheds
	Strengthen Resident Relationships	The action to strengthen relationships among residents as an essential step to build conversations on neighborhood solutions for future disasters
	Community-Wide Food Production	The action to increase urban forestry efforts to mitigate impacts from future disasters
	Alternative Access	The action to designate alternative transportation routes if main routes usually taken are impassable in the event of a disaster

Table 4.2. Codes and their descriptions organized by questions addressing community resilience continued

Questions	Code	Description
What are examples of future resilience hub functions for community resilience?	Disaster Relief Services	The action to distribute food, water, medical aid, and other necessary services post-disaster in a rapid and efficient response
	Community Education	The action to provide new knowledge and skills to residents through trainings, workshops, and hands-on experiences
	Collaboration Across Sectors	The action for neighborhoods to collaborate with different sectors to develop disaster recovery plans, coordinate services and activities, and distribute information
	Neighborhood Mapping	The action to identify and map the unique knowledge, skills, and specific vulnerabilities of residents for disaster preparedness
	Indigenous Knowledge and Practices	The action to apply Native Hawaiian knowledge and practices to prepare and adapt to future disasters such as understanding site history
	Strategic Planning Among Residents	The action to conduct meetings, form committees, and implement neighborhood disaster plans among residents

Many of the codes were identical from survey responses between residents from the PUC and Koʻolauloa. The first question, "What types of neighborhood functions should be fostered for community resilience?" created four codes, which all the codes were examples of social assets. In the PUC, the code Outreach and Participation occurred the highest (30.2%), followed by Informal Volunteering Among Residents (19.8%), and lastly, both Strong Resident Relationships and Account for all Populations (9.3%) occurred the least. In Koʻolauloa, the code Outreach and Participation occurred the highest (39.3%), followed by Strong Resident Relationships (11.5%), Account for all Populations (8.2%), and Informal Volunteering Among Residents (6.6%).

The second question, "What are examples of community needs for community resilience?" created six codes. Five of the codes were examples of physical assets and one was an example of a social asset. In the PUC, the code Strengthen Resident Relationships occurred the highest (46.5%), followed by Community-Wide Food Production (32.2%), Safe Gathering Space (14.4%), Stream Restoration (3.3%), and Increase Urban Forestry (2.2%). The code Alternative Access was not created from responses in the PUC. For Koʻolauloa, the code Safe Gathering Space (28.8%), Community-Wide Food Production (21.9%), Strengthen Resident Relationships (4.9%), Stream Restoration (4.1%), and Alternative Access (2.7%). The code Increase Urban Forestry was not created from responses in the Koʻolauloa.

The third question, "What are examples of future resilience hub functions for community resilience?" created six codes. Five of the codes were examples of human assets and one was an example of a social asset. In the PUC, the code Disaster Relief Services occurred the highest (47.8%), followed by Collaboration Across Sectors (45.3%), Strategic Planning Among Residents (41.7%), Neighborhood Mapping (27.2%), Community Education (26.2%), and

Indigenous Knowledge and Practices (3.9%). In Koʻolauloa, Strategic Planning Among Residents (48.6%), Disaster Relief Services (42.5%), Community Education (31.4%), Collaboration Across Sectors (29.5%), Neighborhood Mapping (11.4%), and Indigenous Knowledge and Practices (8.6%).

Table 4.3 and 4.4 summarizes the code frequencies in each study area for the three research questions. If several types of codes were present in a response, each code was counted only once for each response that the code appeared. The codes were organized by the type of asset the code best represents: physical (P), human (H), and social (S) assets. Each code was summed up by the number of times the code was mentioned in responses from the PUC and Koʻolauloa. Percentages of the frequency of each code were then calculated.

Table 4.3. The codes are organized by questions related to community resilience and organized by the type of asset the code best represents: physical (P), human (H), and social (S) assets

PUC			**Koʻolauloa**		
What kinds of functions should be fostered for community resilience?					
Code	**Count**	**Percentage**	**Code**	**Count**	**Percentage**
Informal Volunteering Among Residents (S)	17	28.8%	Informal Volunteering Among Residents (S)	4	10%
Strong Resident Relationships (S)	8	13.6%	Strong Resident Relationships (S)	7	17.5%
Outreach and Participation (S)	26	44.1%	Outreach and Participation (S)	24	60%
Account for all Populations (S)	8	13.6%	Account for all Populations (S)	5	12.5%
What are examples of needs for community resilience?					
Code	**Count**	**Percentage**	**Code**	**Count**	**Percentage**
Safe Gathering Space (P)	13	14.9%	Safe Gathering Space (P)	21	46.7%
Increase Urban Forestry (P)	2	2.3%	Increase Urban Forestry (P)		
Stream Restoration (P)	3	3.3%	Stream Restoration (P)	3	6.7%
Strengthen Resident Relationships (S)	40	46%	Strengthen Resident Relationships (S)	3	6.7%
Community-Wide Food Production (P)	29	33.3%	Community-Wide Food Production (P)	16	35.6%
Alternative Access (P)			Alternative Access (P)	2	4.4%

Table 4.4. The codes are organized by questions related to community resilience and organized by the type of asset the code best represents: physical (P), human (H), and social (S) assets continued

PUC			**Ko‘olauloa**		
What are examples of future resilience hub functions for community resilience?					
Code	**Count**	**Percentage**	**Code**	**Count**	**Percentage**
Disaster Relief Services (H)	43	23.4%	Disaster Relief Services (H)	31	26.1%
Community Education (H)	27	14.7%	Community Education (H)	22	18.4%
Collaboration Across Sectors (S)	39	21.2%	Collaboration Across Sectors (S)	18	15.1%
Neighborhood Mapping (H)	28	15.2%	Neighborhood Mapping (H)	8	6.7%
Indigenous Knowledge and Practices (H)	4	2.2%	Indigenous Knowledge and Practices (H)	6	5.0%
Strategic Planning Among Residents (H)	43	23.4%	Strategic Planning Among Residents (H)	34	28.6%

Urban residents and rural residents expressed that outreach and participation is most important to foster. Both areas may share a similar mindset that continuing awareness for community resilience is a high priority, despite the type of community that they live in.

Urban residents expressed that strengthening resident relationships and community-wide food production is most needed. Meanwhile, rural residents expressed that having a safe gathering space and community-wide food production is most needed. Urban residents may have a strong urge to strengthen their relationships within their community and expand their social

networks. On the other hand, rural residents may believe that there is not an existing space where they feel safe enough to gather. However, both areas want to address the lack of local food production and the concerns of supply shortage when a natural disaster strikes in the future.

Lastly, urban residents expressed that collaborating with different sectors is an important resilience hub function. Urban and rural residents both expressed that strategic planning among residents and disaster relief services were important functions, meaning that urban residents may collaborate with different sectors because they may not have the trust in themselves to manage the resilience hub and want external guidance. Finally, both areas want to organize within their community to plan strategies together.

4.6 Comparison of Urban versus Rural Community Responses

The following responses, organized by code, briefly compare the differences of responses between urban and rural residents. A description summarizing the findings of the responses is attached to each code belonging to a question. Direct quotes of residents are shown below to highlight the differences in responses for each study area. Codes without direct quotes represent that there are no variable differences in responses.

4.6.1 What types of neighborhood functions should be fostered for community resilience?

Informal Volunteering Among Residents

Urban and rural residents both mentioned that they would check in with their neighbors and help each other in the event of a disaster. Examples of responses included pooling resources to share, making sure residents are not critically injured or in need of medical aid, coordinating

supply runs, contacting local emergency officials, and reaching out to neighbors with certain skills and knowledge for their expertise e.g., healthcare professionals.

Strong Resident Relationships

> *"We are a very close knit community, we have to be because we are alone out here. Other than fire and police department services we are total dependent on one another. "*
>
> – Resident from Koʻolauloa

Residents in both study areas agreed similarly that keeping connections within the community, even if infrequent, is important in making unified decisions on community resilience in the future. Checking in occasionally or having a shared interest in protecting their homes and communities can aid in holding relations with other residents. Rural residents responded differently by stating that strong relationships are crucial because they live in an isolated community, and hence, need to be dependent on each other for survival.

Outreach and Participation

Urban and rural residents urged that there should be a continuous way to inform and distribute information to the community about disaster preparedness. Residents suggest the promotion of signing up for local electronic mailing lists for up-to-date information and emergency announcements or place more emphasis on engaging the community to begin conversations on how to collectively prepare for future disasters. Responses in both areas comprise residents stating either that there is currently no engagement in their community or that there is engagement but only in certain areas.

Account for all Populations

> *"We are sensitive to the need of the most vulnerable and want to teach them to be fishermen and not just give them some fish."* – Resident from PUC

Urban and rural residents both wrote that populations who are underserved or who are most vulnerable to climate change should be prioritized more on. An urban resident responded differently by stating that it is more worthwhile to teach those who are vulnerable with the appropriate skills and training to survive than to do it for them.

4.6.2 What are examples of community needs for community resilience?

Safe Gathering Space

> *"We have been neglected for far too long without a lot of the same amenities that other city neighborhoods have. Our youth deserve to have the same access to facilities that other communities have."* – Resident from Koʻolauloa

Residents from both study areas believe that community facilities that focus on disaster planning and resilience currently do not exist. On the other hand, community centers or popularly known gathering spaces should be retrofitted to adapt to certain disasters. A rural resident mentioned that Koʻolauloa does not have access to the same amenities and facilities as other communities on Oʻahu, implying that there is a critical need for these types of resources in the immediate future.

Increase Urban Forestry

> *"A far greater emphasis on our urban forest needs to take place (i.e., planting new trees and preserving mature ones). In doing so, the impacts of disasters (particularly natural ones) can be significantly mitigated."* – Resident from PUC

Urban residents emphasized the need to expand the urban forestry as a mitigation and protection measure against future disasters. One strategy mentioned by a resident is for the State of Hawai‘i to invest in a program that allows residents to be paid in exchange for forest restoration or other urban farm work. Rural residents did not have a similar response.

Stream Restoration

Urban and rural residents stated that stream restoration practices, in the form of cleaning up trash and debris and restoring the water table, should be implemented to mitigate life and property damage from severe flash floods.

Strengthen Resident Relationships

> *"My neighborhood is very diverse with many types of people from various backgrounds. My neighborhood is transitioning from a close-knit community of older folks to a more diverse mix of people. My neighborhood could use these existing relationships by passing on these neighborly relationships from the older generations to the younger generations to maintain and hopefully grow these relationships."* – Resident from PUC

> *"I believe that we would utilize our friend group to respond and adapt to a disaster. My relationships with my immediate neighbors (the folks who live on the same floor of my apartment building) are much less strong."* – Resident from PUC

Urban and rural residents both described the necessity for residents to strengthen community relationships to mobilize and help each other in the future. Ways to strengthen residents include checking up with neighbors periodically and gathering in a meeting to introduce each other. Urban residents responded differently by mentioning to utilize friend groups to expand connections with other neighbors and grow connections between the older and younger generation.

Community-Wide Food Production

Residents in both study areas described the need to designate agricultural space to produce food through community gardens. In the event of a disaster, grocery stores are potentially overwhelmed. Additionally, Hawaii is dependent on imported goods. If the supply chain of imported goods is compromised by a disaster, designating and protecting areas for food production is crucial.

Alternative Access

> *"The windward side is abandoned during heavy water/mud incidents because of only one main road at perimeter ocean-side of island. Perhaps there is a way to link at least walking trails to get to a safe building instead of roadway which will be dangerous and impassable."* – Resident from Koʻolauloa

Rural residents urged the need to find alternative vehicle and pedestrian routes if a disaster causes the main roadway to be impassable. Urban residents did not have a similar response.

4.6.3 What are examples of future resilience hub functions for community resilience?

Disaster Relief Services

> *"We have been working very hard for 11 years to prepare for a disaster with very little help from our government in Honolulu… There's no place for people to go on this area of the island."* – Resident from Koʻolauloa

Urban and rural residents both stated that disaster relief services should be prioritized in the future. Examples of services include developing evacuation shelters that are disaster-proof, organizing community-wide food pantries, preparing food, water, clothing, and other essential supplies for emergency distribution, and installing backup power. A rural resident mentioned that Koʻolauloa has received little support from the government, suggesting that disaster relief services will need to be established within the community in the future.

Community Education

Urban and rural residents both stated comments on creating workshops and trainings to transfer a wide range of skills and knowledge from residents to other residents in the community. Examples of skills and knowledge include farming, fishing, Native Hawaiian practices, basic survival skills, construction, and medical training. Residents would organize themselves and assign skills and education workshops to the people with the appropriate knowledge to teach the community.

Collaboration Across Sectors

> *"We are extremely underserved by our government. They have told us that in a disaster we are all on our own so figure out how you are going to survive for at least 30 days. So, we are*

doing that, but it would be nice if the government would help us financially to build a community building in a safe area." – Resident from Koʻolauloa

Urban and rural residents discussed the establishment of partnerships with government agencies, community-based organizations, and private companies to provide services to the community, distribute information related to disaster preparedness and recovery, and create a recovery plan. Community-based organizations like associations and churches and government-affiliated neighborhood boards were frequently discussed by urban and rural residents to begin creating connections. A rural resident stated that being that Koʻolauloa is already underserved, financial assistance from the government is needed to support building a resilient community space. This potentially could aid the community in surviving for 30 days post-disaster.

Neighborhood Mapping

Urban and rural residents suggested to identifying and mapping the strengths of their community in terms of individual skills, abilities, and knowledge. Residents who possess survival tools could also be identified. A database could be created to organize and assess this information for future disaster events.

Indigenous Knowledge & Practice

Urban and rural residents commented on utilizing and sharing information regarding Native Hawaiian cultural practices and survival skills as well as the community's history to adapt to future disasters.

Strategic Planning Among Residents

> *"Adapting to disasters is properly a function of the government, not individuals. Thus, residents should encourage the city and state, via voting, campaigning, and lobbying, for to do the disaster prep."* – Resident from PUC

Urban and rural residents suggested designating leadership committees or groups to plan and coordinate preparedness and recovery systems in place when disasters strike their community. An urban resident mentioned that residents could unite to place pressure on the government to prioritize community resilience for all communities on Oʻahu.

By focusing on the codes that are most mentioned in each of the three questions, the codebook can be interpreted differently to understand specifically how each type of community asset are important in developing a resilience hub. In the PUC, social assets were found to be the most important, followed by human assets and then physical assets. In Koʻolauloa, human assets were found to be the most important, followed by physical assets and then social assets. Using this information, urban residents must first focus on strengthening their social and human assets to develop a resilience hub. Meanwhile, rural residents have the human and social capacities to develop a hub, but they need to acquire more physical assets and guidance to fully utilize their social assets.

4.7 Comparison of the importance of assets by community resilience element

Tables 4.5-4.8 provide different examples of physical, human, and social assets, along resilience hub site factors. Two-way ANOVA tests were conducted comparing each asset to being an important contributor to a community resilience element: Community Networks and

Relationships, Training and Education, Information and Communications, and Teamwork and Leadership. Afterward, all the assets were compared with one another for each element. Mean differences (M) and total average ($\bar{x}$) were calculated for each asset from the survey responses. Tables A.1-A.7 in Appendix A summarize the findings from the seventeen two-way ANOVA tests.

4.7.1 Physical Assets

Table 4.5. Comparison of physical assets in each development plan area

Study Areas	Physical Assets
Primary Urban Center (Urban)	• Education Facilities • Medical Facilities • Government Buildings • Non-Government Buildings • Community Spaces • Cultural Features • Public Attractions • Mass Transit Hubs
Koʻolauloa (Rural)	

Community Networks and Relationships

A two-way ANOVA was conducted that examined the ranking of the importance of different physical assets in promoting community networks and relationships for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.13). In total, there was a statistically significant difference between the physical assets, $F(7, 2026) = 28.014$, $p < 0.001$. Community spaces ($\bar{x} = 4.18$) and education facilities ($\bar{x} = 4.10$) ranked the highest, followed by cultural features ($\bar{x} = 3.84$). They significantly weighed higher than non-government buildings ($\bar{x} = 3.47$), public

attractions ($\bar{x}$ = 3.46), and medical facilities ($\bar{x}$ = 3.31). Government buildings ($\bar{x}$ = 3.25) ranked significantly higher than mass transit hubs ($\bar{x}$ = 2.89), which ranked the lowest.

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical assets, $F(7, 2026) = 6.619$, $p < 0.001$. Koʻolauloa ranked higher in importance in six of the eight physical assets than the PUC except for public attractions and mass transit hubs. The closest and insignificant rankings between the two study areas were education facilities (M = 0.210), community spaces (M = 0.165), public attractions (M = 0.241), and mass transit hubs (M = 0.140). Medical facilities (M = 1.078), government buildings (M = 0.652), non-government buildings (M = 0.574), and cultural features (M = 0.427) were statistically greater in Koʻolauloa.

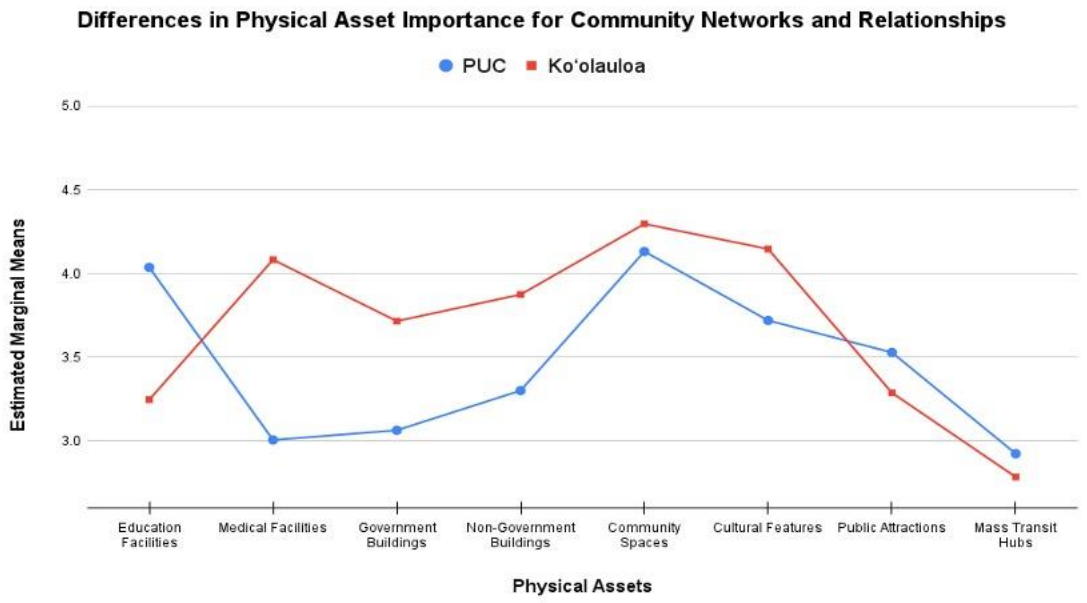


Figure 4.13. The comparison of physical asset rankings to Community Networks and Relationships

Training and Education

A two-way ANOVA was conducted that examined the ranking of the importance of different physical assets in promoting training and education for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.14). In total, there was a statistically significant difference between the physical assets, $F(7, 1858) = 32.396$, $p < 0.001$. Education facilities significantly ranked the highest ($\bar{x} = 4.37$) among the other assets: community spaces ($\bar{x} = 3.66$), cultural features ($\bar{x} = 3.64$), government buildings ($\bar{x} = 3.60$), medical facilities ($\bar{x} = 3.47$), non-government buildings ($\bar{x} = 3.34$), public attractions ($\bar{x} = 3.08$), and mass transit hubs ($\bar{x} = 2.51$). Non-government buildings and public attractions ranked significantly higher than mass transit hubs.

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical assets, $F(7, 1858) = 3.758$, $p < 0.001$. Koʻolauloa ranked higher in importance in seven of the eight physical assets than the PUC except for public attractions. The closest and insignificant rankings between the two study areas were education facilities ($M = 0.020$), public attractions ($M = 0.020$), and mass transit hubs (0.318). Medical facilities ($M = 0.802$), government buildings ($M = 0.472$), non-government buildings ($M = 0.925$), community spaces ($M = 0.763$), and cultural features ($M = 0.633$) were significantly higher in Koʻolauloa.

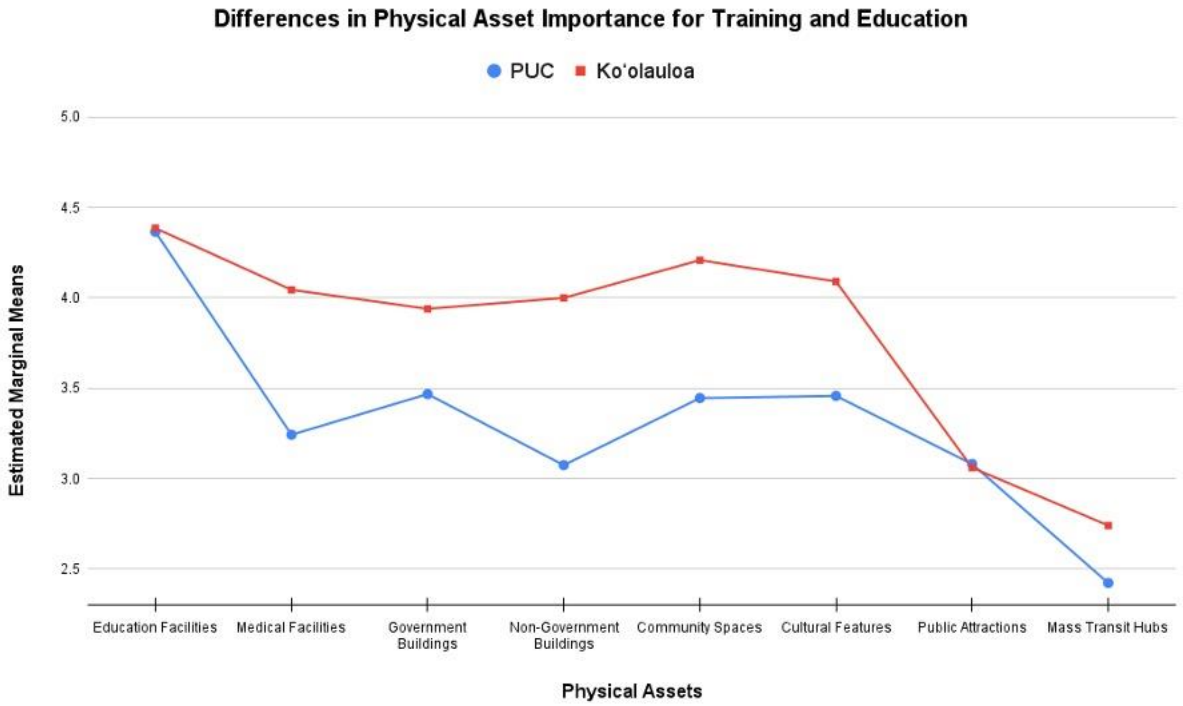


Figure 4.14. The comparison of physical asset rankings to Training and Education

Information and Communications

A two-way ANOVA was conducted that examined the ranking of the importance of different physical assets in promoting information and communication for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.15). In total, there was a statistically significant difference between the physical assets, $F(7, 1967) = 16.317$, $p < 0.001$. Education facilities significantly ranked the highest ($\bar{x} = 4.08$) among the other assets: government buildings ($\bar{x} = 3.67$), community spaces ($\bar{x} = 3.61$), medical facilities ($\bar{x} = 3.54$), non-government buildings ($\bar{x} = 3.42$), cultural features ($\bar{x} = 3.22$), public attractions ($\bar{x} = 3.13$), and mass transit hubs ($\bar{x} = 2.98$).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical assets, $F(7, 1967) = 4.368$, $p < 0.001$. Koʻolauloa ranked higher in importance in seven of the eight physical assets than the PUC except for mass transit hubs. The closest and insignificant rankings between the two study areas were government buildings ($M = 0.119$), public attractions ($M = 0.102$), and mass transit hubs ($M = 0.008$). Medical facilities ($M = 0.820$), non-government buildings ($M = 0.916$), community spaces ($M = 0.686$), and cultural features ($M = 0.862$) were significantly higher in Koʻolauloa.

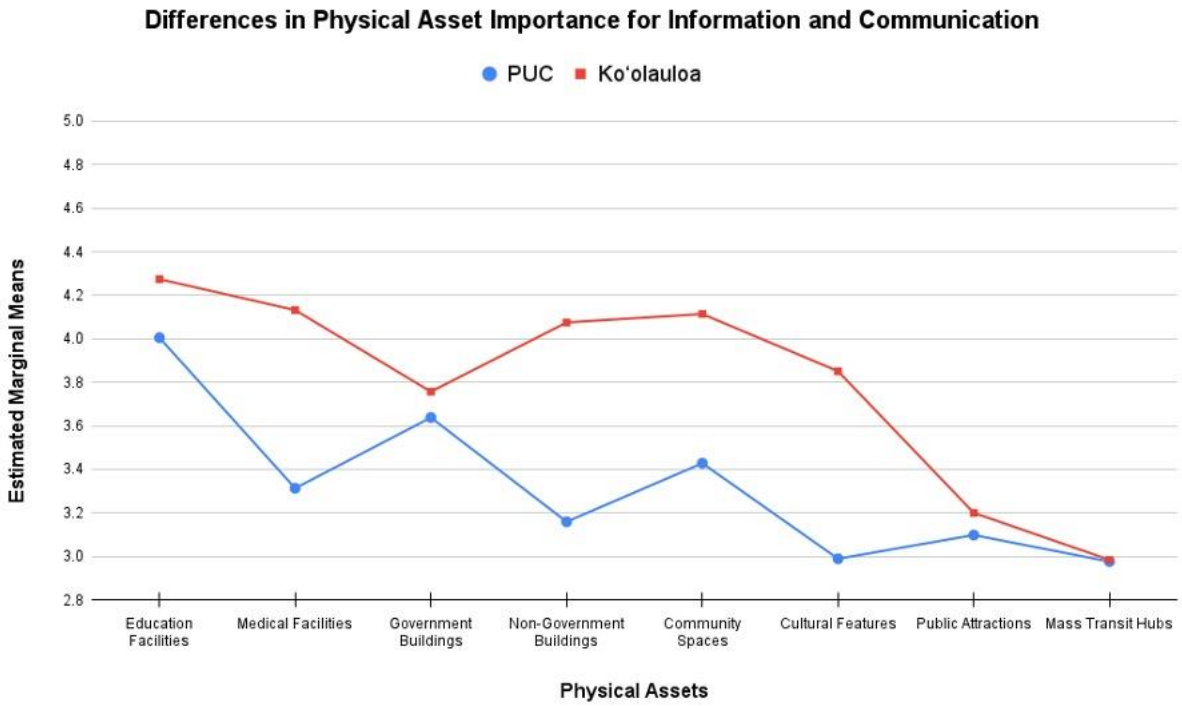


Figure 4.15. The comparison of physical asset rankings to Information and Communication

Teamwork and Leadership

A two-way ANOVA was conducted that examined the ranking of the importance of different physical assets in promoting teamwork and leadership for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.16). In total, there was a statistically significant difference between the physical assets, $F(7, 2173) = 28.224$, $p < 0.001$. Community spaces ($\bar{x} = 4.25$) and education facilities ($\bar{x} = 4.17$) significantly ranked the highest among the other assets: medical facilities ($\bar{x} = 3.87$), cultural features ($\bar{x} = 3.79$), government buildings ($\bar{x} = 3.62$), non-government buildings ($\bar{x} = 3.50$), public attractions ($\bar{x} = 3.29$), and mass transit hubs ($\bar{x} = 3.22$).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical assets, $F(7, 2173) = 6.203$, $p < 0.001$. Koʻolauloa ranked higher in importance in six of the eight physical assets than the PUC except for public attractions and mass transit hubs. The closest and insignificant rankings between the two study areas were education facilities ($M = 0.263$) and public attractions ($M = 0.077$). Medical facilities ($M = 0.633$), government buildings ($M = 0.588$), non-government buildings ($M = 0.774$), and cultural features ($M = 0.481$) were significantly higher in Koʻolauloa. Meanwhile, mass transit hubs ($M = 0.414$) were significantly higher in the PUC.

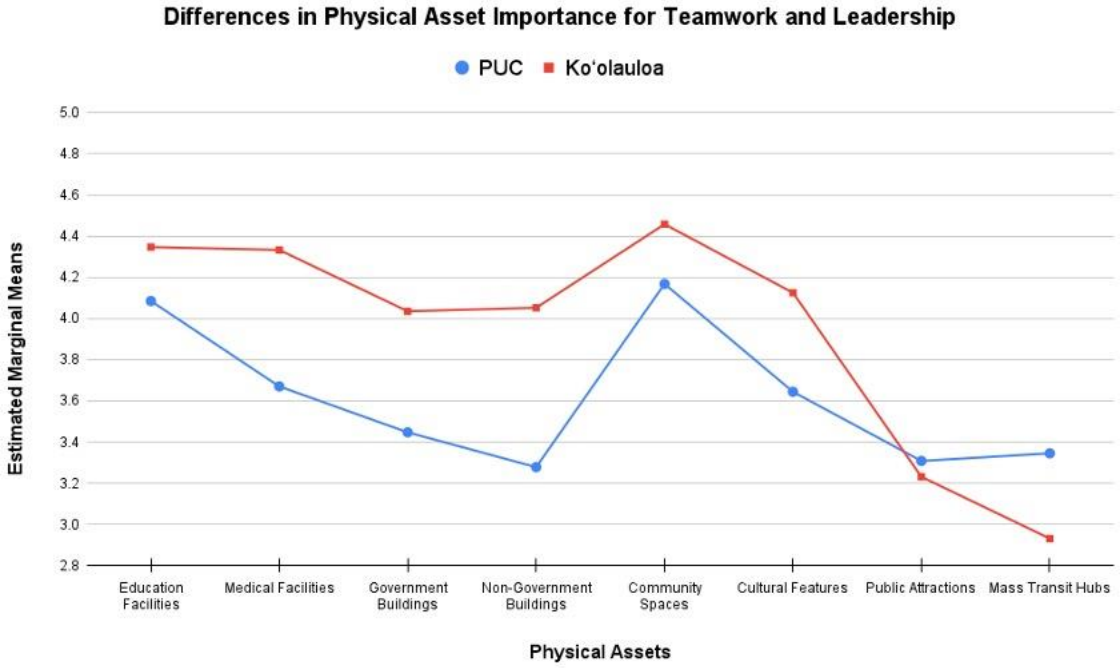


Figure 4.16. The comparison of physical asset rankings to Teamwork and Leadership

4.7.2 Human Assets

Table 4.6. Comparison of human assets in each development plan area

Study Areas	Human Assets
Primary Urban Center (Urban)	• Residents with strong leadership, organizational, and communication qualities • Residents with extensive knowledge of the community and the members within • Resident with special skills • Residents who are knowledgeable in farming and gardening • Residents with skills in manual labor jobs • Residents who are knowledgeable in Native Hawaiian practices
Ko'olauloa (Rural)	

Community Networks and Relationships

A two-way ANOVA was conducted that examined the ranking of the importance of different human assets in promoting community networks and relationships for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.17). In total, there was a statistically significant difference between the human assets, $F(5, 1258) = 16.064$, $p < 0.001$. Residents with extensive knowledge of the community and the members within ($\bar{x} = 4.29$) and residents with strong leadership, organizational, and communication qualities ($\bar{x} = 4.24$) significantly ranked the highest among the other assets: residents with special skills ($\bar{x} = 3.74$), residents who are knowledgeable in farming and gardening ($\bar{x} = 3.57$), residents with skills in manual labor jobs ($\bar{x} = 3.50$), and residents who are knowledgeable in Native Hawaiian practices ($\bar{x} = 3.47$).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different human assets, $F(5, 1258) = 2.376$, $p = 0.037$. Although the rankings of the two study areas did not intersect, there was a wide enough gap between the rankings to produce a significant interaction. Koʻolauloa ranked higher in importance in all six human assets than the PUC. There was not a single asset that was close in ranking between the two study areas. Residents with skills in manual labor jobs ($M = 0.784$), residents who are knowledgeable in farming and gardening ($M = 0.930$), residents who are knowledgeable in Native Hawaiian practices ($M = 0.858$), residents with special skills ($M = 0.511$), residents with strong leadership, organizational, and communication qualities ($M = 0.353$), and residents with extensive knowledge of the community and the members within ($M = 0. 374$) were significantly higher in Koʻolauloa.

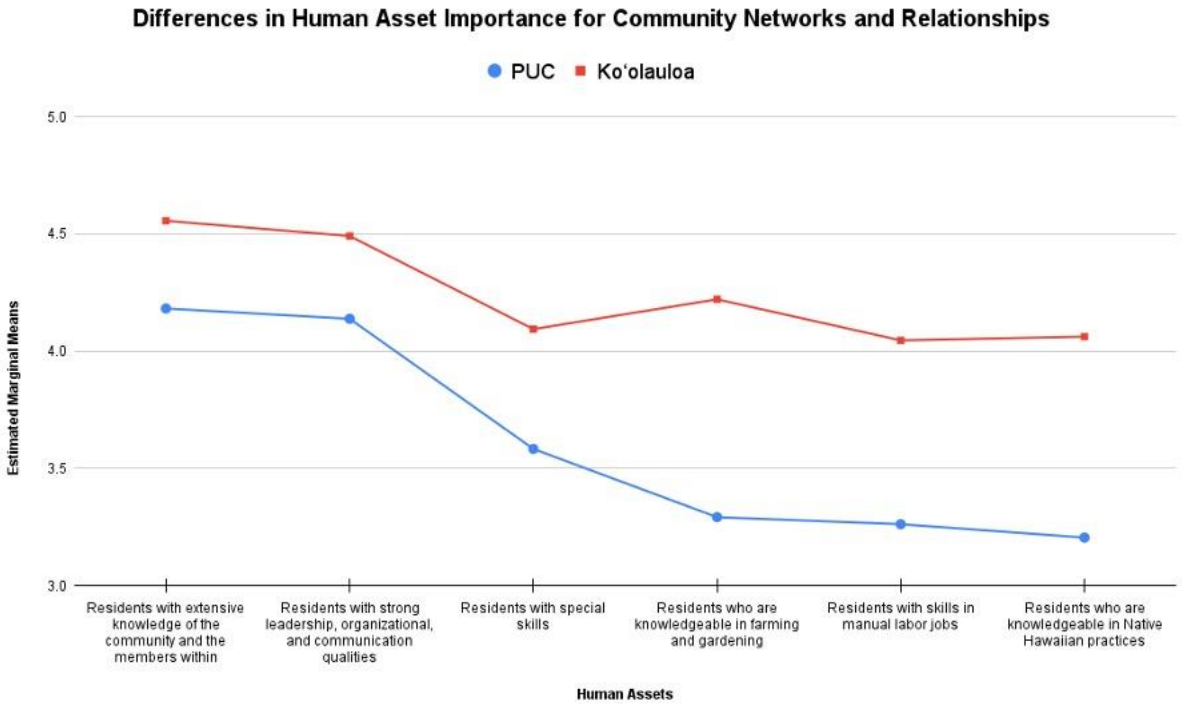


Figure 4.17. The comparison of human asset rankings to Community Networks and Relationships

Training and Education

A two-way ANOVA was conducted that examined the ranking of the importance of different human assets in gaining new knowledge and skills for the PUC and Koʻolauloa. In total, there was a statistically significant difference between the human assets, $F(5, 1203) = 3.533$, $p = 0.004$. Residents with strong leadership, organizational, and communication qualities ranked the highest ($\bar{x} = 4.11$), followed by residents with extensive knowledge of the community and the members within ($\bar{x} = 4.05$), residents with special skills ($\bar{x} = 3.96$), residents who are knowledgeable in farming and gardening ($\bar{x} = 3.78$), residents with skills in manual labor jobs ($\bar{x} = 3.75$), and residents who are knowledgeable in Native Hawaiian practices ($\bar{x} = 3.64$). There

was not a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different human assets, $F (5, 1203) = 0.565$, $p = 0.727$.

Information and Communications

A two-way ANOVA was conducted that examined the ranking of the importance of different human assets in promoting information and communication for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.18). In total, there was a statistically significant difference between the human assets, $F (5, 1203) = 31.942$, $p < 0.001$. Residents with extensive knowledge of the community and the members within ($\bar{x} = 4.30$) and residents with strong leadership, organizational, and communication qualities ($\bar{x} = 4.27$) significantly ranked the highest among the other assets: residents with special skills ($\bar{x} = 3.56$), residents who are knowledgeable in farming and gardening ($\bar{x} = 3.22$), residents who are knowledgeable in Native Hawaiian practices ($\bar{x} = 3.17$), and residents with skills in manual labor jobs ($\bar{x} = 2.99$). Residents with special skills ranked significantly higher than residents who are knowledgeable in Native Hawaiian practices.

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different human assets, $F (5, 1203) = 2.225$, $p = 0.05$. Although the rankings of the two study areas did not intersect, there was a wide enough gap between the rankings to produce a significant interaction. Koʻolauloa ranked higher in importance in all six human assets than the PUC. The closest ranking between the two study areas are residents with strong leadership, organizational, and communication qualities ($M = 0.277$). Residents with skills in manual labor jobs ($M = 0.825$), residents who are knowledgeable in farming and gardening ($M =$

0.766), residents who are knowledgeable in Native Hawaiian practices (M = 1.001), residents with special skills (M = 0.668), and residents with extensive knowledge of the community and the members within (M = 0.373) were significantly higher in Koʻolauloa.

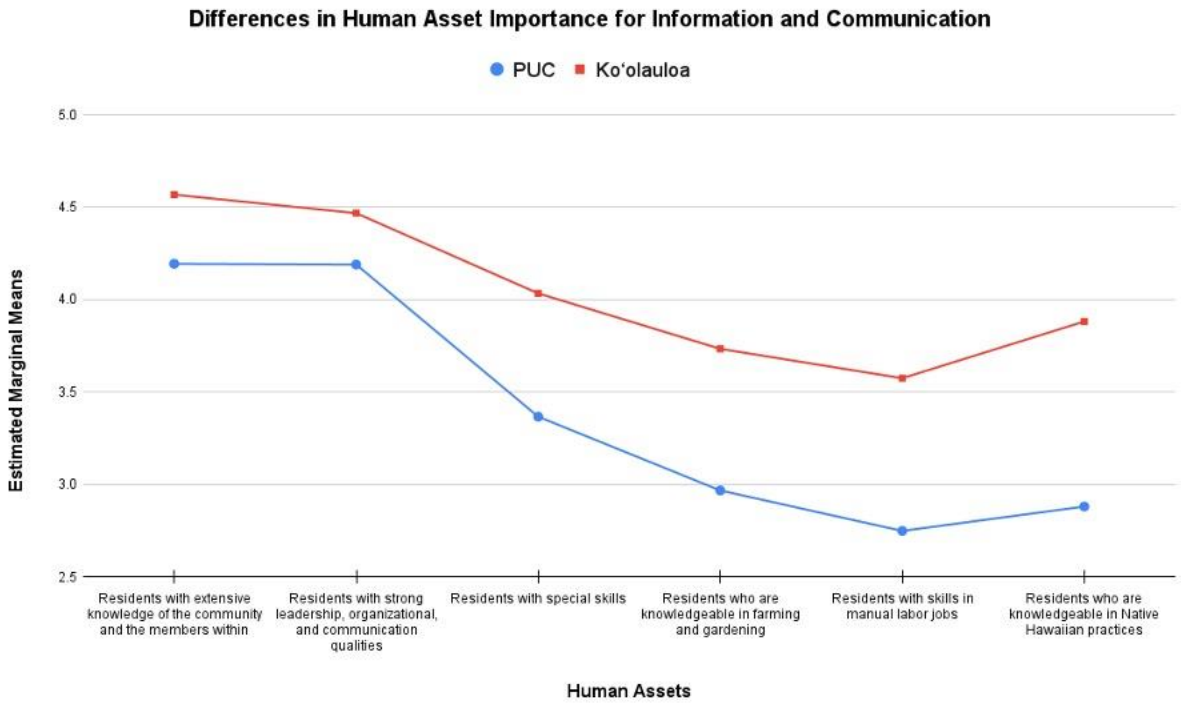


Figure 4.18. The comparison of human asset rankings to Information and Communication

Teamwork and Leadership

A two-way ANOVA was conducted that examined the ranking of the importance of different human assets in promoting teamwork and leadership for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.19). In total, there was a statistically significant difference between the human assets, $F (5, 1282) = 13.332$, $p < 0.001$. Residents with strong leadership, organizational,

and communication qualities ($\bar{x}$ = 4.39) and residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.35) significantly ranked the highest among the other assets: residents with special skills ($\bar{x}$ = 4.01), residents with skills in manual labor jobs ($\bar{x}$ = 3.87), residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.80), and residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.51). Residents with skills in manual labor jobs were significantly higher than residents who are knowledgeable in Native Hawaiian practices.

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different human assets, $F(5, 1282) = 3.748$, $p = 0.002$. Although the rankings of the two study areas did not intersect, there was a wide enough gap between the rankings to produce a significant interaction. Koʻolauloa ranked higher in importance in all six human assets than the PUC. There was not a single asset that was close in ranking between the two study areas. Residents with skills in manual labor jobs (M = 0.770), residents who are knowledgeable in farming and gardening (M = 0.996), residents who are knowledgeable in Native Hawaiian practices (M = 1.021), residents with special skills (M = 0.574), residents with strong leadership, organizational, and communication qualities (M = 0.329), and residents with extensive knowledge of the community and the members within (M = 0.379) were significantly higher in Koʻolauloa.

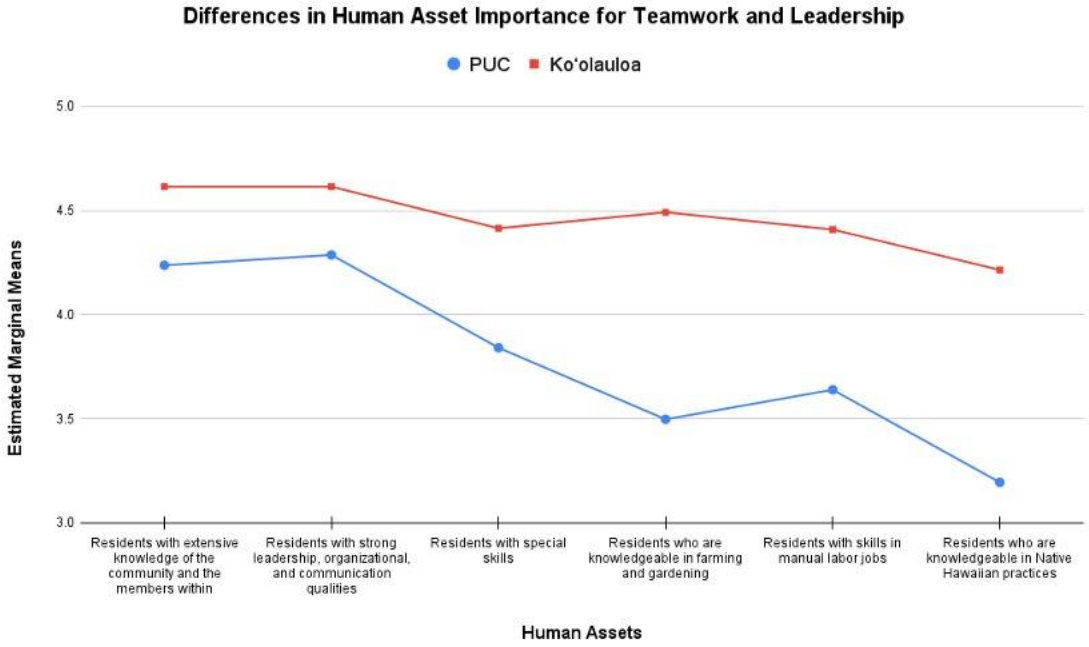


Figure 4.19. The comparison of human asset rankings to Teamwork and Leadership

4.7.3 Social Assets

Table 4.7. Comparison of social assets in each development plan area

Study Areas	Social Assets
Primary Urban Center (Urban)	• Residents with close connections or work within a community-based organization • Residents who frequently organize neighborhood events • Residents who are friendly and bond with other households on their street • Residents who frequently gather and share information to other households • Residents with close connections or work within the government system • Residents who provide physical and emotional support to other households in times of need
Ko'olauloa (Rural)	

Community Networks and Relationships

A two-way ANOVA was conducted that examined the ranking of the importance of different social assets in promoting community networks and relationships for the PUC and Koʻolauloa. In total, there was a statistically significant difference between the social assets, $F(5, 1131) = 3.663$, $p = 0.003$. Residents who are friendly and bond with other households on their street ranked the highest ($\bar{x} = 4.27$), followed by residents who frequently gather and share information to other households ($\bar{x} = 4.06$), residents who provide physical and emotional support to other households in times of need ($\bar{x} = 4.01$), residents who frequently organize neighborhood events ($\bar{x} = 4.00$), residents with close connections or work within a community-based organization ($\bar{x} = 3.97$), and residents with close connections or work within the government system ($\bar{x} = 3.67$). There was not a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different social assets, $F(5, 1131) = 1.297$, $p = 0.263$.

Training and Education

A two-way ANOVA was conducted that examined the ranking of the importance of different social assets in promoting training and education for the PUC and Koʻolauloa. There was a statistically significant difference between the social assets, $F(5, 1096) = 3.372$, $p = 0.005$. Residents with close connections or work within a community-based organization ranked the highest ($\bar{x} = 4.03$), followed by residents who frequently organize neighborhood events ($\bar{x} = 3.86$), residents who are friendly and bond with other households on their street ($\bar{x} = 3.81$) and residents who frequently gather and share information to other households ($\bar{x} = 3.81$), residents with close connections or work within the government system ($\bar{x} = 3.71$), and lastly, residents

who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.49). There was not a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different social assets, F (5, 1096) = 0.742, p = 0.592.

Information and Communications

A two-way ANOVA was conducted that examined the ranking of the importance of different social assets in promoting information and communication for the PUC and Koʻolauloa. In total, there was a statistically significant difference between the social assets, F (5, 1319) = 2.248, p = 0.048. Residents who frequently gather and share information to other households ($\bar{x}$ = 4.10) ranked the highest, followed by residents who are friendly and bond with other households on their street ($\bar{x}$ = 4.09) and residents with close connections or work within a community-based organization ($\bar{x}$ = 4.09), residents who frequently organize neighborhood events ($\bar{x}$ = 3.95), residents with close connections or work within the government system ($\bar{x}$ = 3.90, and lastly, residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.70). There was not a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different social assets, F (5, 1319) = 1.061, p = 0.381.

Teamwork and Leadership

A two-way ANOVA was conducted that examined the ranking of the importance of different social assets in promoting teamwork and leadership for the PUC and Koʻolauloa. In total, there was not a statistically significant difference between the social assets, F (5, 1173) = 1.395, p = 0.223. There was not a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different social assets, F (5, 1173) = 1.011, p = 0.410.

4.8.4 Physical, Human, and Social Assets

Community Networks and Relationships

A two-way ANOVA was conducted that examined the ranking of the importance of different physical, human, and social assets in promoting community networks and relationships for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.20). In total, there was a statistically significant difference between the three types of assets, $F(19, 4415) = 21.185$, $p < 0.001$. Residents with extensive knowledge of the community and the members within ranked the highest ($\bar{x} = 4.29$), followed by residents who are friendly and bond with other households on their street ($\bar{x} = 4.27$), residents with strong leadership, organizational, and communication qualities ($\bar{x} = 4.24$), community Spaces ($\bar{x} = 4.18$), education facilities ($\bar{x} = 4.10$), residents who frequently gather and share information to other households ($\bar{x} = 4.06$), residents who provide physical and emotional support to other households in times of need ($\bar{x} = 4.01$), residents who frequently organize neighborhood events (4.00), residents with close connections or work within a community-based organization ($\bar{x} = 3.97$), cultural Features ($\bar{x} = 3.84$), residents with special skills ($\bar{x} = 3.74$), residents with close connections or work within the government system ($\bar{x} = 3.67$), residents who are knowledgeable in farming and gardening ($\bar{x} = 3.57$), residents with skills in manual labor jobs ($\bar{x} = 3.50$), residents who are knowledgeable in Native Hawaiian practices ($\bar{x} = 3.47$), non-government buildings (3.47), public attractions ($\bar{x} = 3.46$), medical Facilities ($\bar{x} = 3.31$), government buildings ($\bar{x} = 3.25$), and lastly, mass transit hubs ($\bar{x} = 2.89$).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical, human, and social assets, $F(19, 4415) = 4.176$, $p < 0.001$. Koʻolauloa ranked higher in importance in 18 of the 20 physical assets than the PUC except for

public attractions and mass transit hubs. The closest and most insignificant rankings between the two study areas were education facilities (M = 0.210), community spaces (M = 0.165), public attractions (M = 0.241), mass transit hubs (0.140), residents who are friendly and bond with other households on their street (M = 0.109), and residents who frequently gather and share information to other households (M = 0.231).

Medical facilities (M = 1.078), government buildings (M = 0.652), non-government buildings (M = 0.574), cultural features (M = 0.427), residents with skills in manual labor jobs (M = 0.784), residents who are knowledgeable in farming and gardening (M = 0.930), residents who are knowledgeable in Native Hawaiian practices (M = 0.858), residents with special skills (M = 0.511), residents with strong leadership, organizational, and communication qualities (M = 0.353), residents with extensive knowledge of the community and the members within (M = 0.374), residents who frequently organize neighborhood events (M = 0.371), residents who provide physical and emotional support to other households in times of need (M = 0.497), residents with close connections or work within the government system (M = 0.565), and residents with close connections or work within a community-based organization (M = 0.593) were statistically greater in Koʻolauloa.

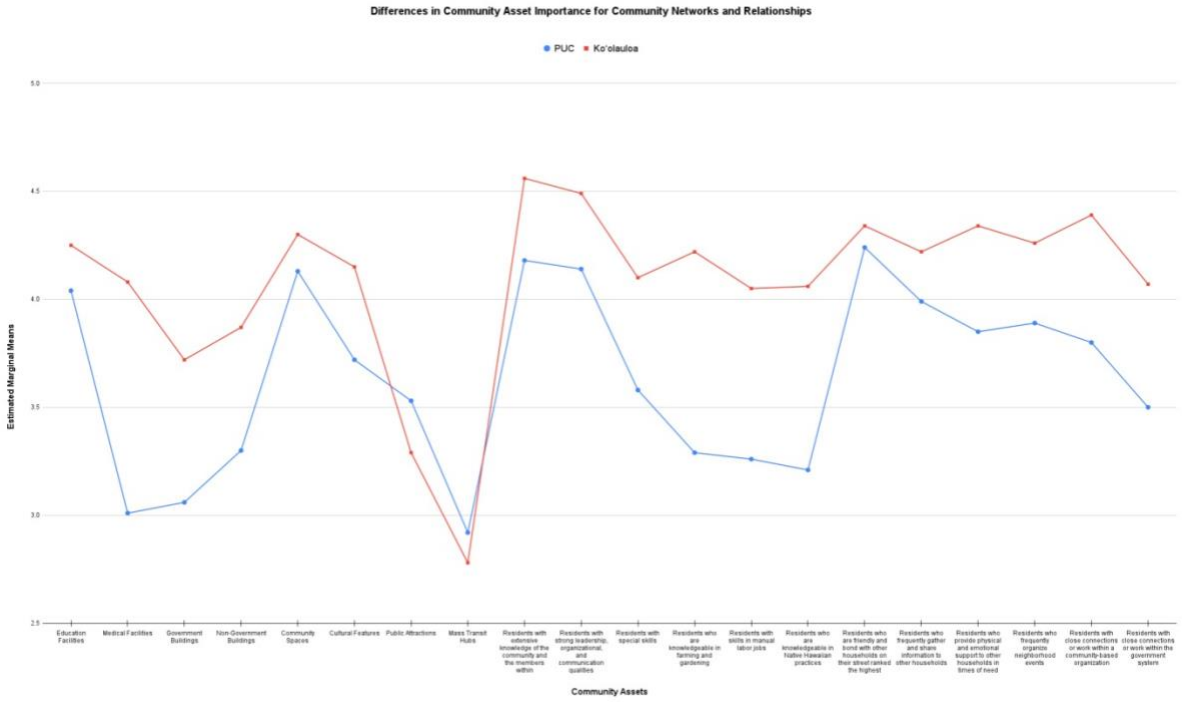


Figure 4.20. The comparison of community asset rankings to Community Networks and Relationships

Training and Education

A two-way ANOVA was conducted that examined the ranking of the importance of different physical, human, and social assets in promoting training and education for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.21). In total, there was a statistically significant difference between the three types of assets, $F(19, 4157) = 18.634$, $p < 0.001$. Education facilities ranked the highest ($\bar{x} = 4.37$), followed by residents with strong leadership, organizational, and communication qualities ($\bar{x} = 4.11$), residents with extensive knowledge of the community and the members within ($\bar{x} = 4.05$), residents with close connections or work within a community-based organization ($\bar{x} = 3.97$), residents with special skills ($\bar{x} = 3.96$),

residents who frequently organize neighborhood events ($\bar{x}$ = 3.86), residents who are friendly and bond with other households on their street ($\bar{x}$ = 3.81), residents who frequently gather and share information to other households ($\bar{x}$ = 3.81), residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.78), residents with skills in manual labor jobs ($\bar{x}$ = 3.75), residents with close connections or work within the government system ($\bar{x}$ = 3.71), community spaces ($\bar{x}$ = 3.66), residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.64), cultural features ($\bar{x}$ = 3.64), government buildings ($\bar{x}$ = 3.60), residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.49), medical facilities ($\bar{x}$ = 3.47), non-government buildings ($\bar{x}$ = 3.34). Public attractions ($\bar{x}$ = 3.08) ranked significantly higher than mass transit hubs, which is the lowest ($\bar{x}$ = 2.51).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical, human, and social assets, $F(19, 4157) = 1.838$, $p = 0.015$. Koʻolauloa ranked higher in importance in 18 of the 20 physical assets than the PUC except for education facilities and public attractions. The closest and insignificant rankings between the two study areas were education facilities (M = 0.020), public attractions (M = 0.020), mass transit hubs (M = 0.318), residents with special skills (M = 0.322), and residents who frequently gather and share information to other households (M = 0.330). Medical facilities ($\bar{x}$ = 0.802), government buildings ($\bar{x}$ = 0.472), non-government buildings ($\bar{x}$ = 0.925), community spaces ($\bar{x}$ = 0.763), cultural features ($\bar{x}$ = 0.633), residents with skills in manual labor jobs ($\bar{x}$ = 0.406), residents who are knowledgeable in farming and gardening ($\bar{x}$ = 0.626), residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 0.652), residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 0.373), residents with extensive knowledge of the community and the members within ($\bar{x}$ = 0.520), residents who are friendly and bond with

other households on their street ($\bar{x}$ = 0.419), residents who frequently organize neighborhood events ($\bar{x}$ = 0.501), residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 0.742), residents with close connections or work within the government system ($\bar{x}$ = 0.393), residents with close connections or work within a community-based organization ($\bar{x}$ = 0.634) were significantly higher in Koʻolauloa.

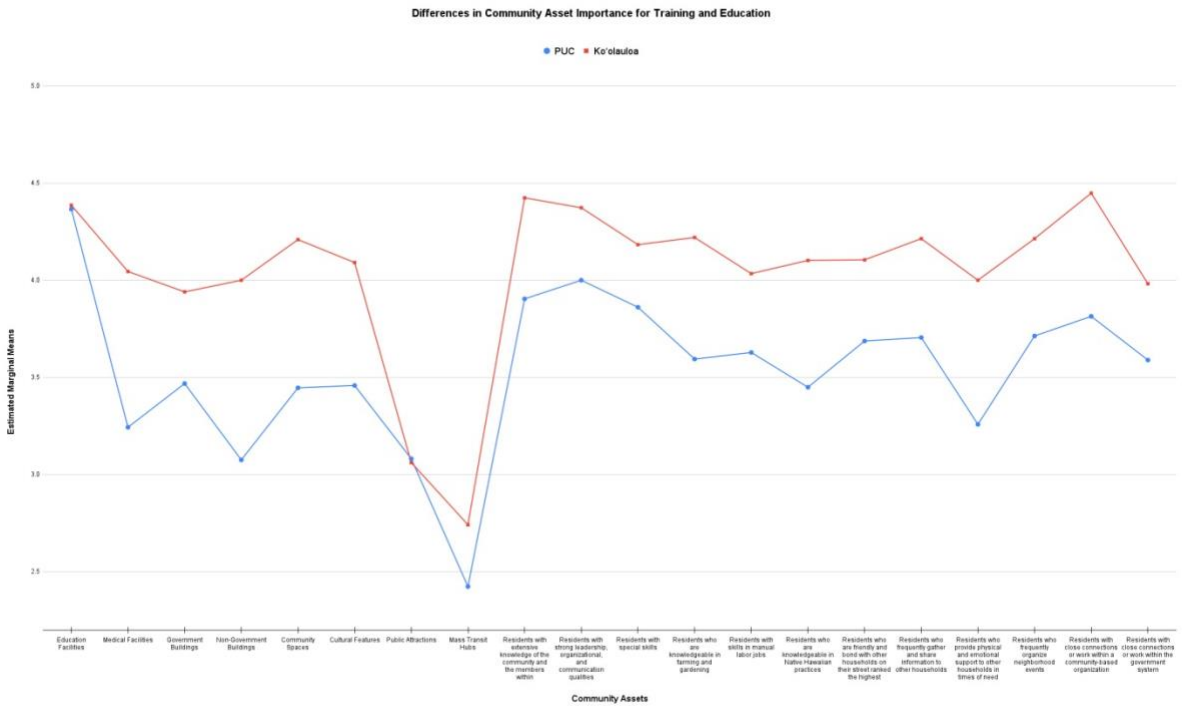


Figure 4.21. The comparison of community asset rankings to Training and Education

Information and Communications

A two-way ANOVA was conducted that examined the ranking of the importance of different physical, human, and social assets in promoting information and communication for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.22). In total, there was a statistically

significant difference between the three types of assets, $F(19, 4292) = 20.220$, $p < 0.001$. Residents with extensive knowledge of the community and the members within ranked the highest ($\bar{x} = 4.30$), followed by residents with strong leadership, organizational, and communication qualities ($\bar{x} = 4.27$), residents who frequently gather and share information to other households ($\bar{x} = 4.10$), residents with close connections or work within a community-based organization ($\bar{x} = 4.09$), residents who are friendly and bond with other households on their street ($\bar{x} = 4.09$), education facilities ($\bar{x} = 4.08$), residents who frequently organize neighborhood events ($\bar{x} = 3.95$), residents with close connections or work within the government system ($\bar{x} = 3.90$), residents who provide physical and emotional support to other households in times of need ($\bar{x} = 3.70$), government buildings ($\bar{x} = 3.67$, community spaces ($\bar{x} = 3.61$), residents with special skills ($\bar{x} = 3.56$), medical facilities (3.54), non-government buildings ($\bar{x} = 3.42$), cultural features ($\bar{x} = 3.22$), residents who are knowledgeable in farming and gardening ($\bar{x} = 3.22$), residents who are knowledgeable in Native Hawaiian practices ($\bar{x} = 3.17$), public attractions ($\bar{x} = 3.13$) , residents with skills in manual labor jobs ($\bar{x} = 2.99$), and lastly, mass transit hubs ($\bar{x} = 2.98$).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical, human, and social assets, $F(19, 4292) = 2.882$, $p < 0.001$. Koʻolauloa ranked higher in importance in 19 of the 20 physical assets than the PUC except for public attractions. The closest and insignificant rankings between the two study areas were education facilities ($M = 0.269$), government buildings ($M = 0.119$), public attractions ($M = 0.102$), mass transit hubs ($M = 0.008$), residents with strong leadership, organizational, and communication qualities ($M = 0.277$), residents who are friendly and bond with other households on their street ($M = 0.250$), residents who frequently gather and share information to other

households (M = 0.259), and residents with close connections or work within the government system (M = 0.248).

Medical facilities (M = 0.820), non-government buildings (M = 0.916), community spaces (M = 0.686), cultural features (M = 0.862), residents with skills in manual labor jobs (M = 0.825), residents who are knowledgeable in farming and gardening (M = 0.766), residents who are knowledgeable in Native Hawaiian practices (M = 1.001), residents with special skills (M = 0.668), residents with extensive knowledge of the community and the members within (M = 0.373), residents who frequently organize neighborhood events (M = 0.473), residents who provide physical and emotional support to other households in times of need (M = 0.700), and residents with close connections or work within a community-based organization (M = 0.473) significantly ranked higher in Koʻolauloa.

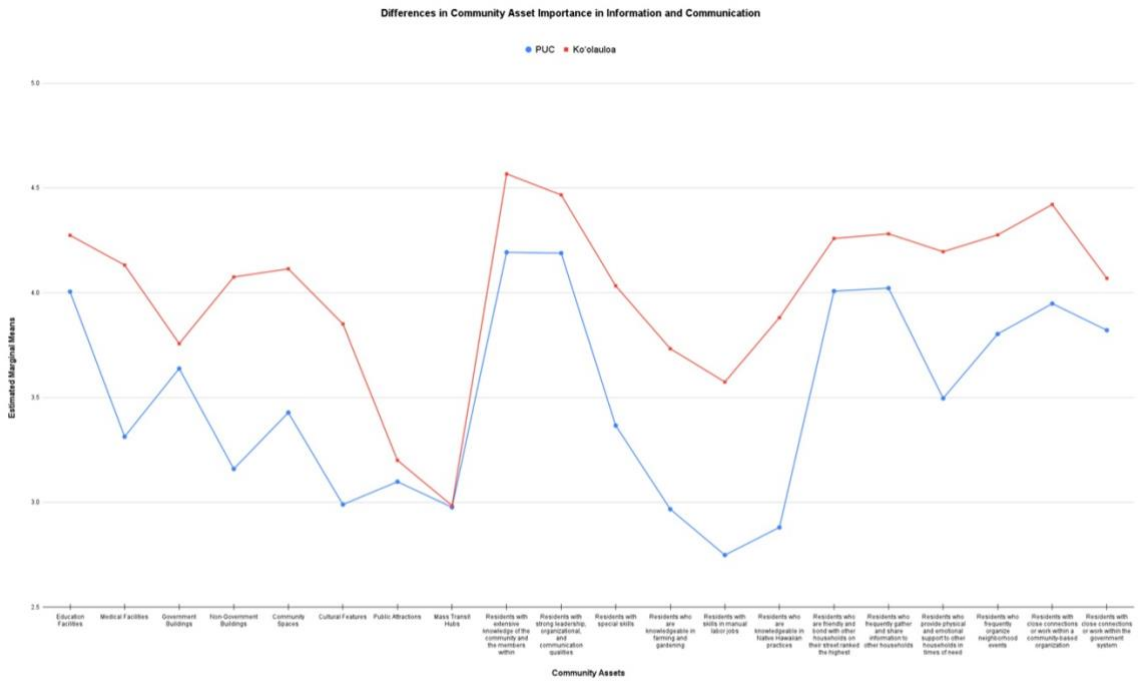


Figure 4.22. The comparison of community asset rankings to Information and Communications

Teamwork and Leadership

A two-way ANOVA was conducted that examined the ranking of the importance of different physical, human, and social assets in promoting teamwork and leadership for the PUC and Koʻolauloa. An estimated marginal means graphic was created to highlight and compare the average rankings in each study area (Figure 4.23). In total, there was a statistically significant difference between the three types of assets, $F(19, 4628) = 18.331$, $p < 0.001$. Residents with strong leadership, organizational, and communication qualities ranked the highest ($\bar{x} = 4.39$), followed by residents with extensive knowledge of the community and the members within (4.35), community spaces ($\bar{x} = 4.25$), education facilities ($\bar{x} = 4.17$), residents who are friendly and bond with other households on their street ($\bar{x} = 4.13$), residents with close connections or work within a community-based organization ($\bar{x} = 4.07$), residents who frequently gather and share information to other households ($\bar{x} = 4.02$), residents with special skills ($\bar{x} = 4.01$), residents who frequently organize neighborhood events ($\bar{x} = 3.98$), residents with skills in manual labor jobs ($\bar{x} = 3.87$), medical facilities ($\bar{x} = 3.87$), residents who provide physical and emotional support to other households in times of need ($\bar{x} = 3.86$), residents with close connections or work within the government system ($\bar{x} = 3.85$), residents who are knowledgeable in farming and gardening ($\bar{x} = 3.80$), cultural features ($\bar{x} = 3.79$), government buildings ($\bar{x} = 3.62$), residents who are knowledgeable in Native Hawaiian practices ($\bar{x} = 3.51$), non-government buildings ($\bar{x} = 3.50$), public attractions ($\bar{x} = 3.29$), and lastly, mass transit hubs ($\bar{x} = 3.22$).

There was a statistically significant interaction between residents living in the PUC and Koʻolauloa and the different physical, human, and social assets, $F(19, 4628) = 4.507$, $p < 0.001$. Koʻolauloa ranked higher in importance in 18 of the 20 physical assets than the PUC except for

public attractions and mass transit hubs. The closest and insignificant rankings between the two study areas were education facilities (M = 0.263), public attractions (M = 0.077), residents who are friendly and bond with other households on their street (M = 0.239), residents who frequently gather and share information to other households (M = 0.262), and residents with close connections or work within the government system (M = 0.244).

Medical facilities (M = 0.663), government buildings (M = 0.588), non-government buildings (M = 0.774), community spaces (M = 0.290), cultural features (M = 0.481), residents with skills in manual labor jobs (M = 0.770), residents who are knowledgeable in farming and gardening (M = 0.996), residents who are knowledgeable in Native Hawaiian practices (M = 1.021), residents with special skills (M = 0.574), residents with strong leadership, organizational, and communication qualities (M = 0.329), residents with extensive knowledge of the community and the members within (M = 0.379), residents who frequently organize neighborhood events (M = 0.452), residents who provide physical and emotional support to other households in times of need (M = 0.685), and residents with close connections or work within a community-based organization (M = 0.428) significantly ranked higher in Koʻolauloa. Mass transit hubs (M = 0.414) significant ranked higher in the PUC.

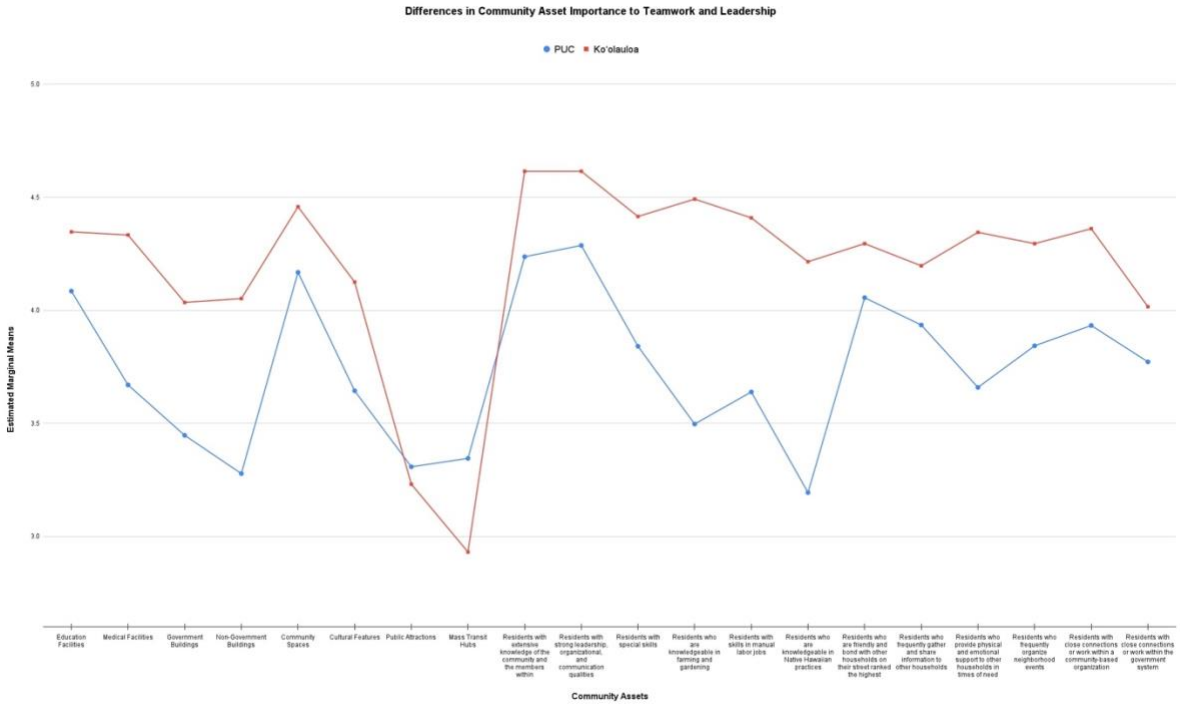


Figure 4.23. The comparison of community asset rankings to Teamwork and Leadership

In summary, urban residents primarily ranked their physical, human, and social assets significantly lower than rural residents at promoting each of the four elements of community resilience. This conclusion is supported by the findings of the two-way ANOVA tests. The results suggest that urban residents may not fully understand the capabilities of utilizing their physical, human, and social assets to increase community resilience. On the other hand, rural residents may understand the capabilities, but need guidance to fully utilize their social assets.

4.8 Resilience Hub Site Selection

Table 4.8. Comparison of resilience hub site factors in each development plan area

Study Areas	Resilience Hub Site Factors
Primary Urban Center (Urban)	• The site is trusted and accepted by local residents • The site's location is easily accessible • The site can provide multiple functions • The site has the potential to change functions easily in the future
Koʻolauloa (Rural)	

A two-way ANOVA was conducted that examined the ranking of the importance of several factors in resilience hub site selection for the PUC and Koʻolauloa. In total, there was a statistically significant difference between the factors, $F(3, 778) = 5.466$, $p < 0.001$. Easy accessibility to the site ($\bar{x} = 4.50$) ranked the highest, followed by the ability of the site to provide multiple functions ($\bar{x} = 4.36$), a trusted and accepted site ($\bar{x} = 4.22$), and the site's potential to change functions easily in the future ($\bar{x} = 4.12$). Easy accessibility to the site ranked significantly higher than a trusted and accepted site. The ability of the site to provide multiple functions ranked significantly higher than the site's potential to change functions easily in the future.

There was not a statistically significant interaction between residents living in the PUC and Koʻolauloa and the factors, $F(3, 778) = 1.268$, $p = 0.284$. The findings suggest that both study areas have similar views in siting a resilience hub development, except for the type of community-based facility the hub should be housed in.

5.0 CONCLUSION AND DISCUSSION

This study revealed potential in utilizing the ABCD approach to contribute to the currently limited research surrounding resilience hub development. Specifically, the ABCD approach was utilized to understand the role of community assets in promoting community resilience. It provided critical information on how urban and rural communities could utilize their assets to develop resilience hubs. From this study's findings, it is recommended that the ABCD approach to be used as an initial step in resilience hub development. Researchers can use the ABCD approach to grasp how a community currently operates and utilizes its assets. However, the ABCD approach can only serve as a catalyst for community change — residents must take action to bring about these improvements as the next step.

Several conclusions were drawn to answer this study's research questions. First, urban and rural communities have different physical, human, and social assets with differing availability, weight, and utilization that influence community resilience. From this study, urban residents have more physical assets while rural residents substantially have more human and social assets. Furthermore, rural residents ranked their physical, human, and social assets significantly higher than urban residents in promoting community resilience. Second, the establishment of a resilience hub necessitates that urban and rural communities are aware of their existing assets to anticipate how the hub will work. It is beneficial for urban and rural communities to create opportunities together to capitalize on their strongest assets and strengthen other assets that are less developed for resilience hub development. If asset adjustments are unable to be made, resilience hub development could potentially be delayed or even canceled. Lastly, site factors differ between urban and rural communities and must be adequately understood when developing a resilience hub. This study found that urban and rural residents

have similar perspectives on resilience hub site selection for the studied factors. However, urban residents emphasize transportation accessibility more than rural residents.

Regarding the role of community assets in fostering community resilience, several insights were gained. First, urban and rural communities can have certain advantages depending on the availability of their assets. For example, the findings suggest that urban residents have various physical assets to use but lack human and social assets. The availability of physical assets allows urban residents to promote community resilience through different avenues like utilizing different organizations for resources, identifying potential resilience hub sites from diverse facilities, and traveling using various modes of transportation. On the other hand, rural residents identified having substantially more human and social assets than urban residents. The availability of human and social assets allows rural residents to promote community resilience by expanding their social network and relationships, identifying the skills and knowledge other rural residents have, and managing a resilience hub while having collective goals in mind.

Second, urban and rural communities can also have disadvantages. With a lack of human and social assets, urban residents may be unable to regard other residents in a considerable way, identify other residents who can support each other in times of need, and come together as a team to solve existing and future community problems. On the other hand, rural residents may be unable to use any facility as a safe gathering space, designate suitable roads or trails as emergency evacuation routes, and access basic resources to survive. However, it is important to note from the findings that the percentages of identified physical assets from both study areas were similar, meaning that Koʻolauloa may not entirely lack physical assets but lack access to specific types of physical assets instead. This finding is relatable to the development of other

rural communities, where public resources are developed and distributed due to population size and not by necessity.

Additionally, the role of community assets in developing resilience hubs in urban and rural communities was better understood in this study. Specifically, in regards to future resilience hub functions, the open-ended responses revealed that Strategic Planning among Residents and Disaster Relief Services appeared the most from urban and rural residents. Both of the codes best represent a human asset. Strategic Planning among Residents requires management and organizational skills to conduct meetings and implement plans. On the other hand, Disaster Relief Services calls for residents who have emergency preparedness, medical training, and leadership skills. A third code that most appeared from urban residents was Collaboration across Sectors. Collaboration across Sectors best represents a social asset because residents need to be able to build relationships with potential partners from the public and private sector. Additionally, residents may need to convince external organizations why they should be partnered up together, especially with private businesses searching to create a profit. Negotiations may need to take place to balance different priorities in the process. If successful, residents and outside organizations can work together to build long-term resilience for the community or communities and at the same time, provide a benefit to the external organization. It is important to raise support and enhance these needed assets in the process of resilience hub development.

The following recommendations were made to address resilience hub development in urban and rural communities by utilizing the ABCD approach. Firstly, urban residents can strengthen their community's human and social assets by holding community events for all types of residents to learn from each other and build relationships. Facilities that are frequently used or

trusted such as education facilities should be evaluated to host these events. As discussed before, Collaboration Across Sectors appeared as one of the most recurring codes in the PUC, meaning that urban residents may depend largely on external support, like the needs-driven approach. Therefore, partnering up with outside organizations, groups, or government agencies to facilitate community events may be necessary since urban residents may not have the confidence to organize themselves. By strengthening human and social assets, urban residents may further build the trust to mobilize themselves to tackle projects like developing a resilience hub.

Secondly, rural residents can maximize usage of the community's social assets by forming teams or committees. From the codebook, Strategic Planning Among Residents appeared as one of the most recurring codes in Koʻolauloa while Collaboration Across Sectors did not. For that reason, the teams or committees should be made up of rural residents, neighborhood board members, and trusted community organizations because external support is not as wanted as in the PUC. The teams or committees can plan and execute community events and activities related to disaster preparedness and recovery. The events and activities can be scheduled at different locations and times so that rural residents from different backgrounds can be informed and participate. As the events and activities become more frequent, more and more rural residents will participate actively over time, which may eventually lead in creating larger community projects such as the development of a resilience hub.

Overall, this study provided vital information for creating an asset-based framework for resilience hub planning in Oʻahu, Hawaiʻi. In the face of global climate change, new solutions must be implemented to increase community resilience. Resilience hubs offer a unique way to increase community resilience in urban and rural areas using a bottom-up approach. Through a hub, residents can empower themselves and learn different ways to utilize their community's

assets to build resilience for their community. Given Hawai‘i’s isolated geographical location and over-reliance on imported goods and services, increasing community resilience may be necessary to pursue in the near future. The development of resilience hubs may serve as a viable strategy to increase community resilience, as demonstrated in this study. The findings can support communities, government agencies, and other collaborative organizations to develop customized support to accommodate the specific needs of resilience hub development in both urban and rural communities for the island of O‘ahu. Findings from this study could be helpful for other coastal communities that share some of the same characteristics.

5.1 Limitations

Three limitations were identified in this study. First, the survey was only distributed in an online format to reflect the safety concerns of the COVID-19 pandemic. Residents with limited knowledge and access to or with disabilities affecting computer usage had difficulty in either obtaining or completing the survey. Face-to-face data collection methods could be pursued for future projects such as scheduling one-on-one or focus group interviews with residents, conducting activities in a workshop setting, and carrying out surveys at community events or meetings. A face-to-face approach is beneficial because researchers can connect personally with residents as they tell their stories and experiences.

Second, more elderly residents participated in the survey, which is not necessarily a bad thing, but participation and interest from younger people, vulnerable populations, and minority groups in such a topic must be boosted in the future. Input from a diverse pool of residents promotes different ideas for developing resilience hubs, provides unique perspectives of current neighborhood functions, and allows the identification and mapping of existing community assets that have not been well documented or known to the public.

Lastly, the findings from this study may be too specific to Hawai‘i, thus further research is needed to understand how it can be generalized to other Pacific island communities and other parts of the world. This study analyzed survey responses by area and did not consider other requirements for analysis. Future studies include comparing responses by zipcode, neighborhood boundaries, or different types of demographics. This same study can also be conducted on the other main Hawaiian islands, and afterwards, a comparative analysis can be pursued between O‘ahu and a neighboring island. More studies about the differences in specific resilience hub designs between urban and rural communities could be pursued in the future.

APPENDIX A: TWO-WAY ANOVA TEST SUMMARY TABLES

Table A.1. Summary of the comparison between PUC and Koʻolauloa of physical assets to each community resilience element

	Community Networks &Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Significant interaction?	Yes, $p < 0.001$	Yes, $p < 0.001$	Yes, $p < 0.001$	Yes, $p < 0.001$
What assets ranked significantly higher in the Primary Urban Center?	None	None	None	Mass transit hubs (M = 0.414)
What assets ranked significantly higher in Koʻolauloa?	Medical facilities (M = 1.078) Government buildings (M = 0.652) Non-government buildings (M = 0.574) Cultural features (M = 0.427)	Medical facilities (M = 0.802) Government buildings (M =0.472) Non-government buildings (M = 0.925) Community spaces (M = 0.763) Cultural features (M = 0.633)	Medical facilities (M = 0.119) Non-government buildings (M = 0.916) Community spaces (M = 0.686) Cultural features (M = 0.862)	Medical facilities (M = 0.633) Government buildings (M = 0.588) Non-government buildings (M = 0.744) Cultural features (M = 0.481)
Significant differences among assets?	Yes, $p < 0.001$	Yes, $p < 0.001$	Yes, $p < 0.001$	Yes, $p < 0.001$

Table A.2. Summary of the comparison between PUC and Koʻolauloa of physical assets to each community resilience element continued

	Community Networks &Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Total average ranks of assets?	Community spaces ($\bar{x}$ = 4.18) Education facilities ($\bar{x}$ = 4.10) Cultural features ($\bar{x}$ = 3.84) Non-Government buildings ($\bar{x}$ = 3.47) Public attractions ($\bar{x}$ = 3.46) Medical facilities ($\bar{x}$ = 3.11) Government buildings ($\bar{x}$ = 3.25) Mass transit hubs ($\bar{x}$ = 2.89)	Education facilities ($\bar{x}$ = 4.37) Community spaces ($\bar{x}$ = 3.66) Cultural features ($\bar{x}$ = 3.64) Government buildings ($\bar{x}$ = 3.60) Medical facilities ($\bar{x}$ = 3.47) Non-government buildings ($\bar{x}$ = 3.34) Public attractions ($\bar{x}$ = 3.08) Mass transit hubs ($\bar{x}$ = 2.51)	Education facilities ($\bar{x}$ = 4.08) Government buildings ($\bar{x}$ = 3.67) Community spaces ($\bar{x}$ = 3.61) Medical facilities ($\bar{x}$ = 3.54) Non-government buildings ($\bar{x}$ = 3.42) Cultural features ($\bar{x}$ = 3.22 Public attractions ($\bar{x}$ = 3.13) Mass transit hubs ($\bar{x}$ = 2.98)	Community spaces ($\bar{x}$ = 4.25 Education facilities ($\bar{x}$ = 4.17) Medical facilities ($\bar{x}$ = 3.87) Cultural features ($\bar{x}$ = 3.79) Government buildings ($\bar{x}$ = 3.62) Non-government buildings ($\bar{x}$ = 3.50) Public attractions ($\bar{x}$ = 3.29) Mass transit hubs ($\bar{x}$ = 3.22)

Table A.3. Summary of the comparison between PUC and Koʻolauloa of human assets to each community resilience element

	Community Networks & Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Significant interaction?	Yes, p = 0.037	No, p = 0.727	Yes, p = 0.05	Yes, p = 0.002
What assets significantly ranked higher in the Primary Urban Center?	None	None	None	None
What assets significantly ranked higher in Koʻolauloa?	Residents with skills in manual labor (M = 0.784) Residents who are knowledgeable in farming and gardening (M = 0.930) Residents who are knowledgeable in Native Hawaiian practices (M = 0.858) Residents with special skills (M = 0.511) Residents with strong leadership, organizational, and communication qualities (M = 0.353) Residents with extensive knowledge of the community and the members within (M = 0.374)	None	Residents with manual labor jobs (M = 0.825) Residents who are knowledgeable in farming and gardening (M = 0.766) Residents who are knowledgeable in Native Hawaiian practices (M = 1.001) Residents with special skills (M = 0.668) Residents with extensive knowledge of the community and the members within (M = 0.373)	Residents with skills in manual labor (M = 0.770) Residents who are knowledgeable in farming and gardening (M = 0.996)) Residents who are knowledgeable in Native Hawaiian practices (M = 1.021) Residents with special skills, residents with strong leadership, organizational, and communication qualities (M = 0.329) Residents with extensive knowledge of the community and the members within (M = 0.379)
Significant differences among assets?	Yes, p < 0.001	Yes, p = 0.004	Yes, p < 0.001	Yes, p < 0.001

Table A.4. Summary of the comparison between PUC and Koʻolauloa of human assets to each community resilience element continued

	Community Networks &Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Total average ranks of assets?	Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.11) Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.05) Residents with special skills ($\bar{x}$ = 3.96) Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.78) Residents with skills in manual labor ($\bar{x}$ = 3.75) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.64)	Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.11) Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.05) Residents with special skills ($\bar{x}$ = 3.96) Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.78) Residents with skills in manual labor jobs ($\bar{x}$ = 3.75) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.64)	Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.30) Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.27) Residents with special skills ($\bar{x}$ = 3.56) Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.22) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.17) Residents with skills in manual labor ($\bar{x}$ = 2.99)	Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.39) Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.35) Residents with special skills ($\bar{x}$ = 4.01) Residents with skills in manual labor ($\bar{x}$ = 3.87) Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.80) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.51)

Table A.5. Summary of the comparison between PUC and Koʻolauloa of social assets to each community resilience element

	Community Networks &Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Significant interaction?	No, p = 0.263	No, p = 0.592	No, p = 0.381	No, p = 0.410
What assets ranked significantly higher in the Primary Urban Center?	None	None	None	None
What assets ranked significantly higher in Koʻolauloa?	None	None	None	None
Significant differences among assets?	Yes, p = 0.003	Yes, p = 0.005	Yes, p = 0.048	No, p = 0.223

Table A.6. Summary of the comparison between PUC and Koʻolauloa of social assets to each community resilience element continued

	Community Networks &Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Total average rankings of assets?	Residents who are friendly and bond with other households on their street ($\bar{x}$ = 4.27) Residents who frequently gather and share information to other households ($\bar{x}$ = 4.06) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 4.01) Residents who frequently organize neighborhood events ($\bar{x}$ = 4.00) Residents with close connections or work within a community-based organization ($\bar{x}$ = 3.97) Residents with close connections or work within the government system ($\bar{x}$ = 3.67)	Residents with close connections or work within a community-based organization ($\bar{x}$ = 4.03) Residents who frequently organize neighborhood events ($\bar{x}$ = 3.86) Residents who are friendly and bond with other households on their street ($\bar{x}$ = 3.81) Residents who frequently gather and share information to other households ($\bar{x}$ = 3.81) Residents with close connections or work within the government system ($\bar{x}$ = 3.71) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.49)	Residents who frequently gather and share information to other households ($\bar{x}$ = 4.10) Residents who are friendly and bond with other households on their street ($\bar{x}$ = 4.09) Residents with close connections or work within a community-based organization ($\bar{x}$ = 4.09) Residents who frequently organize neighborhood events ($\bar{x}$ = 3.95) Residents with close connections or work within the government system ($\bar{x}$ = 3.90) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.70)	None were significantly higher

Table A.7. Summary of the comparison between PUC and Koʻolauloa of all assets to each community resilience element

	Community Networks &Relationships	Training and Education	Information and Communications	Teamwork and Leadership
Significant interaction?	Yes, $p < 0.001$	Yes, $p = 0.015$	Yes, $p < 0.001$	Yes, $p < 0.001$
What assets ranked significantly higher in the Primary Urban Center?	None	None	None	Mass Transit Hubs (M = 0.414)
What assets ranked significantly higher in Koʻolauloa?	Medical facilities (M = 1.078) Government buildings (M = 0.652) Non-government buildings (M = 0.574) Cultural features (M = 0.427) Residents with skills in manual labor jobs (M = 0.784) Residents who are knowledgeable in farming and gardening (M = 0.930) Residents who are knowledgeable in Native Hawaiian practices (M = 0.858) Residents with special skills (M = 0.511) Residents with strong leadership,	Medical facilities (M = 0.802) Government buildings (M = 0.472) Non-government buildings (M =0.925) Community spaces (M = 0.763) Cultural features (M = 0.633) Residents with skills in manual labor jobs (M = 0.406) Residents who are knowledgeable in farming and gardening (M = 0.626) Residents who are knowledgeable in Native Hawaiian practices (M = 0.652) Residents with strong leadership, organizational, and communication	Medical facilities (M = 0.820) Non-government buildings (M = 0.916) Community spaces (M = 0.686) Cultural features (M = 0.862) Residents with skills in manual labor jobs (M = 0.825) Residents who are knowledgeable in farming and gardening (M = 0.766) Residents who are knowledgeable in Native Hawaiian practices (M = 1.001) Residents with special skills (M = 0.668) Residents with extensive	Medical facilities (M = 0.663) Government buildings (M = 0.588) Non-government buildings (M = 0.774) Community spaces (M = 0.290) Cultural features (M = 0.481) Residents with skills in manual labor jobs (M = 0.770) Residents who are knowledgeable in farming and gardening (M = 0.996) Residents who are knowledgeable in Native Hawaiian practices (M = 1.021) Residents with special skills (M = 0.574)

	organizational, and communication qualities (M = 0.353) Residents with extensive knowledge of the community and the members within (M = 0.374) Residents who frequently organize neighborhood events (M = 0.371) Residents who provide physical and emotional support to other households in times of need (M = 0.497) Residents with close connections or work within the government system (M = 0.565) Residents with close connections or work within a community-based organization (M = 0.593)	qualities (M = 0.373) Residents with extensive knowledge of the community and the members within (M = 0.520) Residents who are friendly and bond with other households on their street (M = 0.419) Residents who frequently organize neighborhood events (M = 0.501) Residents who provide physical and emotional support to other households in times of need (M = 0.742) Residents with close connections or work within the government system (M = 0.393) Residents with close connections or work within a community-based organization (M = 0.634)	knowledge of the community and the members within (M = 0.373) Residents who frequently organize neighborhood events (M = 0.473) Residents who provide physical and emotional support to other households in times of need (M = 0.700) Residents with close connections or work within a community-based organization (M = 0.473)	Residents with strong leadership, organizational, and communication qualities (M = 0.329) Residents with extensive knowledge of the community and the members within (M = 0.379) Residents who frequently organize neighborhood events (M = 0.452) Residents who provide physical and emotional support to other households in times of need (M = 0.685) Residents with close connections or work within a community-based organization (M = 0.428)
Significant differences among assets?	Yes, $p < 0.001$	Yes, $p < 0.001$	Yes, $p < 0.001$	Yes, $p < 0.001$
Total average rankings of assets?	Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.29) Residents who are friendly and bond with other households on their street ($\bar{x}$ = 4.27)	Education Facilities ($\bar{x}$ = 4.37) Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.11) Residents with extensive knowledge of the community and the members	Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.30) Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ =	Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.39) Residents with extensive knowledge of the community and the members within ($\bar{x}$ = 4.35) Community Spaces

	Residents with strong leadership, organizational, and communication qualities ($\bar{x}$ = 4.24) Community Spaces ($\bar{x}$ = 4.18) Education Facilities ($\bar{x}$ = 4.10) Residents who frequently gather and share information to other households ($\bar{x}$ = 4.06) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 4.01) Residents who frequently organize neighborhood events ($\bar{x}$ = 4.00) Residents with close connections or work within a community-based organization ($\bar{x}$ = 3.97) Cultural Features ($\bar{x}$ = 3.84) Residents with special skills ($\bar{x}$ = 3.74) Residents with close connections or work within the government system ($\bar{x}$ = 3.67) Residents who are knowledgeable in farming and gardening ($\bar{x}$ =	within ($\bar{x}$ = 4.05) Residents with close connections or work within a community-based organization ($\bar{x}$ = 3.97) Residents with special skills ($\bar{x}$ = 3.96) Residents who frequently organize neighborhood events ($\bar{x}$ = 3.86) Residents who are friendly and bond with other households on their street ($\bar{x}$ = 3.81) Residents who frequently gather and share information to other households ($\bar{x}$ = 3.81) Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.78) Residents with skills in manual labor jobs ($\bar{x}$ = 3.75) Residents with close connections or work within the government system ($\bar{x}$ = 3.71) Community Spaces ($\bar{x}$ = 3.66) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.64) Cultural Features ($\bar{x}$ = 3.64)	4.27) Residents who frequently gather and share information to other households ($\bar{x}$ = 4.10) Residents with close connections or work within a community-based organization ($\bar{x}$ = 4.09) Residents who are friendly and bond with other households on their street ($\bar{x}$ = 4.09) Education Facilities (4.08) Residents who frequently organize neighborhood events ($\bar{x}$ = 3.95) Residents with close connections or work within the government system ($\bar{x}$ = 3.90) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.70) Government Buildings ($\bar{x}$ = 3.67) Community Spaces ($\bar{x}$ = 3.61) Residents with special skills ($\bar{x}$ = 3.56)	($\bar{x}$ = 4.25) Education Facilities ($\bar{x}$ = 4.17) Residents who are friendly and bond with other households on their street ($\bar{x}$ = 4.13) Residents with close connections or work within a community-based organization ($\bar{x}$ = 4.07) Residents who frequently gather and share information to other households ($\bar{x}$ = 4.02) Residents with special skills ($\bar{x}$ = 4.01) Residents who frequently organize neighborhood events ($\bar{x}$ = 3.98) Residents with skills in building construction, crafts, home improvement, and other manual labor jobs ($\bar{x}$ = 3.87) Medical Facilities ($\bar{x}$ = 3.87) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.86) Residents with close connections or work within the government system ($\bar{x}$ = 3.85)

	3.57) Residents with skills in manual labor jobs ($\bar{x}$ = 3.50) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.47) Non-Government Buildings ($\bar{x}$ = 3.47) Public Attractions ($\bar{x}$ = 3.46) Medical Facilities ($\bar{x}$ = 3.31) Government Buildings ($\bar{x}$ = 3.25) Mass Transit Hubs ($\bar{x}$ = 2.89)	Government Buildings ($\bar{x}$ = 3.60) Residents who provide physical and emotional support to other households in times of need ($\bar{x}$ = 3.49) Medical Facilities ($\bar{x}$ = 3.47) Non-Government Buildings ($\bar{x}$ = 3.34) Public Attractions ($\bar{x}$ = 3.08) Mass Transit Hubs ($\bar{x}$ = 2.51)	Medical Facilities ($\bar{x}$ = 3.54) Non-Government Buildings ($\bar{x}$ = 3.42) Cultural Features ($\bar{x}$ = 3.22) Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.22) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.17) Public Attractions ($\bar{x}$ = 3.13) Residents with skills in manual labor jobs ($\bar{x}$ = 2.99) Mass Transit Hubs ($\bar{x}$ = 2.98)	Residents who are knowledgeable in farming and gardening ($\bar{x}$ = 3.80) Cultural Features ($\bar{x}$ = 3.79) Government Buildings ($\bar{x}$ = 3.62) Residents who are knowledgeable in Native Hawaiian practices ($\bar{x}$ = 3.51) Non-Government Buildings ($\bar{x}$ = 3.50) Public Attractions ($\bar{x}$ = 3.29) Mass Transit Hubs ($\bar{x}$ = 3.22)

Table A.8. Summary of the comparison between PUC and Koʻolauloa of each resilience hub site selection factor

	Site Factors
Significant interaction?	No, $p = 0.284$
What factors ranked significantly higher in the Primary Urban Center?	None
What factors ranked significantly higher in Koʻolauloa?	None
Significant differences Among factors?	Yes, $p < 0.001$
Average ratings of factors?	The site's location is easily accessible ($\bar{x} = 4.50$) The site can provide multiple functions ($\bar{x} = 4.36$) The site is trusted and accepted by residents ($\bar{x} = 4.22$) The site has the potential to change functions easily in the future ($\bar{x} = 4.12$)

APPENDIX B: INFORMED CONSENT

Mahalo for continuing this survey! Before we begin, please review the following information for an overview of the survey and your role in participating in it.

What am I being asked to do?

If you participate in this study, you will be asked to complete a 10 - 12 minute survey. You do not have to complete the survey in one sitting, you may take a break and come back.

Taking part in this study is your choice.

Your participation in this study is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you.

Why is this study being done?

We are asking residents to fill out this survey to help our research team gain insight on the types of physical, human, and social resources that they believe exist in their neighborhood. We also want to gain information on how residents will use their neighborhood's resources to develop a resilience hub. Throughout this survey, residents will be asked to rank the importance of their neighborhood's physical, human, and social resources for different elements of community resilience. Residents will also be asked to rank and compare factors that are involved in selecting a resilience hub.

What will happen if I decide to take part in this survey?

You will be asked to fill out a survey consisting multiple-choice questions, matrix ranking questions, and open-ended questions. On average, the survey takes roughly 10 - 12 minutes to complete. Some questions that will be asked include:

a) What types of physical features are in and around your neighborhood?
b) What types of relationships are in your neighborhood, including the members in your household?
c) What kind of skills and abilities do residents in your neighborhood and in your household have? Please select all that apply?
d) What factors are important in selecting a site for a resilience hub?

Risks and Benefits

There is little risk to you for participating in this research project. You may become stressed or uncomfortable answering any of the survey questions. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop taking the survey or you can withdraw from the project altogether. There will be no direct benefit to you for participating in this survey.

Confidentiality and Privacy

All survey responses will be anonymous. You have the right to withhold your contact information from the survey. Your contact information will only be used to contact you if there are any questions regarding your survey answers and no other purposes.

I will keep all study data secure in a locked filing cabinet in a locked office/encrypted on a

password-protected computer. Only my University of Hawai‘i advisor and I will have access to the information. Other agencies that have legal permission have the right to review research records. The University of Hawai‘i Human Studies Program has the right to review research records for this study.

Future Research Studies
Identifiers will be removed from your identifiable private information and after the removal of identifiers, the data may be used for future research studies and we will not seek further approval from you for these future studies.

Questions
If you have any questions about this study, please feel free to email me at cuongt@hawaii.edu or the Principal Investigator Suwan Shen at suwans@hawaii.edu. You may contact the UH Human Studies Program at 808-956-5007 or uhirb@hawaii.edu to discuss problems, concerns and questions, obtain information or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit http://go.hawaii.edu/jRd for more information on your rights as a research participant.

Agreement to Participate
Your participation is completely voluntary, and you can withdraw at any time. To take this survey, you must be:

a) At least 18 years old
b) Resident of O‘ahu

If you meet these criteria and would like to take the survey, **click the arrow below to the right** to start, to move forward, and to move backward in the survey. Starting the survey implies your consent to participate in this study. **Please answer each question truthfully to improve the data of the research project.**

Please print or save a copy of this page for your reference.

APPENDIX C: SURVEY QUESTIONS

Q1. What is your age?
- □ 18-24 years old
- □ 25-34 years old
- □ 45-54 years old
- □ 55-64 years old
- □ 65 years old and over

Q2. What is your gender?
- □ Male
- □ Female
- □ Non-binary
- □ Prefer to self describe (Please specify)
- □ Prefer not to say

Q3. Which of the following categories best describe you?
- □ White
- □ Hispanic, Latino, or Spanish origin
- □ Black or African American
- □ Asian
- □ American Indian
- □ Alaska Native
- □ Middle Eastern
- □ Native Hawaiian
- □ Samoan
- □ Tongan
- □ Chamorro
- □ Guamanian
- □ Marshallese
- □ Micronesian (FSM)
- □ Some other race, ethnicity, or origin (Please specify)

Q4. What is your zip code in O‘ahu?

Q5. Do you live in an urban or rural neighborhood?
- □ Urban
- □ Rural
- □ I am not sure

Q6. On average, what is your total household income in O‘ahu?
- □ Under $20,000
- □ $20,001 - $40,000
- □ $40,001 - $60,000
- □ $60,001 - $80,000
- □ $80,001 - $100,000

□ $100,001 or over

Q7. Which of the following physical resources do you think are in your neighborhood? Please select all that apply.

□ Education facilities (e.g., school, university, community college, early learning centers)
□ Medical facilities and clinics
□ Government buildings (e.g., libraries, fire stations, police stations, State and City Departments)
□ Non-government buildings (e.g., food banks, nonprofit organizations)
□ Community spaces (e.g. parks, community facilities, recreational centers, churches)
□ Cultural features (e.g., community gardens, monuments and temples, streams, lo'i kalo, loko i'a)
□ Public attractions (e.g., theaters, museums, entertainment venues, shops, restaurants)
□ Mass Transit Hubs (e.g., Transit Center for TheBus, future Rail Stations)

Q8. In your neighborhood, how important are the following physical resources at Bringing Residents Together & Collaborating on a Project? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Education facilities						
Medical facilities and clinics						
Government buildings						
Non-government buildings						
Community spaces						
Cultural features						
Public attractions						
Mass Transit Hubs						

Q9. In your neighborhood, how important are the following physical resources at Building Relationships with other Residents? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Education facilities						
Medical facilities and clinics						
Government buildings						
Non-government buildings						
Community spaces						
Cultural features						
Public attractions						
Mass Transit Hubs						

Q10. In your neighborhood, how important are the following physical resources at Distributing Information and Communicating with other Residents? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Education facilities						
Medical facilities and clinics						
Government buildings						
Non-government buildings						
Community spaces						
Cultural features						
Public attractions						
Mass Transit Hubs						

Q11. In your neighborhood, how important are the following physical resources at Helping your Neighborhood Gain New Knowledge and Skills? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Education facilities						
Medical facilities and clinics						
Government buildings						
Non-government buildings						
Community spaces						
Cultural features						
Public attractions						
Mass Transit Hubs						

Q12. Please briefly explain how you would use the physical resources so that your neighborhood can adapt to disasters. For example, is your neighborhood currently working together and using physical resources to adapt to disasters (e.g., food pantries, food gardens, etc.) or is your neighborhood missing certain resources/experiencing certain challenges?

Q13. Which of the following describes the characteristics of the residents in your neighborhood and in your household? Please select all that apply.

- Residents with skills in building construction, crafts, home improvement, and other manual labor jobs.
- Residents who are knowledgeable in farming or gardening.
- Residents who are knowledgeable in Native Hawaiian practices (e.g., medicinal plants, hula and chanting, kalo and fishpond farming and management).
- Residents with special skills (e.g., medical training, e.g. survival skills, martial arts) or talents (e.g., music and dance).
- Residents with strong leadership, organizational, and communication qualities.
- Residents with extensive knowledge of the community and the members within.
- Another skill or ability (Please specify)

Q14. In your neighborhood, how important are the following human resources at Bringing Residents Together & Collaborating on a Project? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents with skills in building construction, crafts, home improvement, and other manual labor jobs						
Residents who are knowledgeable in farming or gardening						
Residents who are knowledgeable in Native Hawaiian practices						
Residents with special skills or talents						
Residents with strong leadership, organizational, and communication qualities						
Residents with extensive knowledge of the community and the members within						

Q15. In your neighborhood, how important are the following human resources at Building Relationships with other Residents? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents with skills in building construction, crafts, home improvement, and other manual labor jobs						
Residents who are knowledgeable in farming or gardening						
Residents who are knowledgeable in Native Hawaiian practices						
Residents with special skills or talents						
Residents with strong leadership, organizational, and communication qualities						
Residents with extensive knowledge of the community and the members within						

Q16. In your neighborhood, how important are the following human resources at Distributing Information and Communicating with other Residents? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents with skills in building construction, crafts, home improvement, and other manual labor jobs						
Residents who are knowledgeable in farming or gardening						
Residents who are knowledgeable in Native Hawaiian practices						
Residents with special skills or talents						
Residents with strong leadership, organizational, and communication qualities						
Residents with extensive knowledge of the community and the members within						

Q17. In your neighborhood, how important are the following human resources at Helping your Neighborhood Gain New Knowledge and Skills? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents with skills in building construction, crafts, home improvement, and other manual labor jobs						
Residents who are knowledgeable in farming or gardening						
Residents who are knowledgeable in Native Hawaiian practices						
Residents with special skills or talents						
Residents with strong leadership, organizational, and communication qualities						
Residents with extensive knowledge of the community and the members within						

Q18. Please briefly explain how you would utilize residents' knowledge, skills, and abilities so that your neighborhood can adapt to disasters. Provide current examples if any.

Q19. Which of the following describes the existing relationships in your neighborhood, including the members in your household? Please select all that apply.

- □ Residents who are friendly and bond with other households on their street.
- □ Residents who provide physical and emotional support to other households in times of need.
- □ Residents who frequently gather and share information to other households.
- □ Residents who frequently organize neighborhood events (e.g., cleanups, watch parties, planning meetings).
- □ Residents with close connections or work within the government system (e.g., City Council, Department worker, House or State representative).

□ Residents with close connections or work within a community-based organization (e.g., neighborhood associations, church groups, nonprofits).
□ Another relationship (Please specify)

Q20. In your neighborhood, how important are the following types of relationships at Bringing Residents Together & Collaborating on a Project? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents who are friendly and bond with other households on their street						
Residents who provide physical and emotional support to other households in times of need						
Residents who frequently gather and share information to other households						
Residents who frequently organize neighborhood events						
Residents with close connections or work within the government system						
Residents with close connections or work within a community-based organization						

Q21. In your neighborhood, how important are the following types of relationships at Building Relationships with other Residents? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents who are friendly and bond with other households on their street						
Residents who provide physical and emotional support to other households in times of need						
Residents who frequently gather and share information to other households						
Residents who frequently organize neighborhood events						
Residents with close connections or work within the government system						
Residents with close connections or work within a community-based organization						

Q22. In your neighborhood, how important are the following types of relationships at Distributing Information and Communicating with other Residents? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents who are friendly and bond with other households on their street						
Residents who provide physical and emotional support to other households in times of need						
Residents who frequently gather and share information to other households						
Residents who frequently organize neighborhood events						
Residents with close connections or work within the government system						
Residents with close connections or work within a community-based organization						

Q23. In your neighborhood, how important are the following types of relationships at Helping your Neighborhood Gain New Knowledge and Skills? Please rate the physical resources from 1 (not important) to 5 (extremely important).

	1	2	3	4	5	N/A
Residents who are friendly and bond with other households on their street						
Residents who provide physical and emotional support to other households in times of need						
Residents who frequently gather and share information to other households						
Residents who frequently organize neighborhood events						
Residents with close connections or work within the government system						
Residents with close connections or work within a community-based organization						

Q24. Please briefly explain how you would use the following types of relationships so that your neighborhood can adapt to disasters. Provide current examples if any. For example, does your neighborhood encourage equitable community engagement or focus on climate vulnerable or underserved populations?

Q25. In each row, please rate whether or not a resource is more important than another resource at helping your neighborhood adapt to disasters. For example, are physical resources that exist near your neighborhood more important than your neighbors' skills and abilities at adapting to disasters?

	Importance	
Physical resources that exist near your neighborhood		Your neighbors' skills and abilities
Your neighbors' skills and abilities		Strength of relationships among you and your neighbors
Strength of relationships among you and your neighbors		Physical resources that exist near your neighborhood

Q26. Which of the following factors are important in selecting a site for a resilience hub? Please use the table below to rank the factors from 1 Not Important) to 5 (Extremely Important).

	1	2	3	4	5
The site is trusted and accepted by local residents					
The site's location is easily accessible					
The site can provide multiple functions					
The site has the potential to change functions easily in the future					

Q27. In each row, please rate whether or not a factor is more important than another factor at determining a resilience hub site. For example, is a site that is trusted and accepted by local residents more important than a site that is established by non-residents or an outside entity?

	Importance	
The site is trusted and accepted by local residents		The site is well known by people new to the area, visitors, or non-residents
The site is mainly accessible to pedestrians and cyclists		The site has available space for vehicle parking and drive-through access
The site's planned functions can be maintained		The site has the ability to easily change functions in the future
The site primarily serves populations in special need		The sight primarily serves the general public including all surrounding residents.

Q28. What is your preference on where a resilience hub should be located? In each row, please rate the following locations from 1 (least preferred location) to 6 (most preferred location).

- The site is located in or near a residential area.
- The site is located in or near an education facility
- The site is located in or near a government building.
- The site is located in or near a non-government building.
- The site is located in or near a community gathering space.
- The site has green space for recreational or cultural use.

This is the end of the survey. Mahalo for participating!

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