

# FOOD SECURITY AND CLIMATE VULNERABILITY IN HONOLULU:

A CASE STUDY OF THE MAKIKI COMMUNITY



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## EXECUTIVE SUMMARY

Anthropogenic climate change is now a widely accepted phenomenon among the scientific community. Research shows unprecedented levels of greenhouse gas emissions are warming the planet at exponential levels.<sup>1</sup> While all regions globally are experiencing some degree of impact from a changing climate, vulnerabilities, risk, and exposure determine the degree to which communities are affected by climate change. One aspect of local vulnerabilities and exposure has received limited attention in the scholarly literature: food systems. The island of O’ahu is inextricably connected to global supply chains, importing 90% of food and possessing only a 5–7-day supply of food at a time, making the island’s food system vulnerable to global shocks like COVID-19 and impending climate change.<sup>2</sup>

Food systems have received little attention on O’ahu even without the predicament of climate change, despite planners significantly affecting the food system through actions taken in designing transportation infrastructure, permitting and zoning, through land-use planning, and a myriad of other ways when designing public infrastructure.<sup>3</sup> The USDA defines low food access as neighborhoods that lack healthy food sources; and, there are many factors that ultimately impact access to food including the source of the food, distance to food retailers, income, vehicle availability, public transportation, and affordability.<sup>4</sup> In efforts to close the gaps between planning and the food system, in this report a census-tract level analysis of the Makiki community food system in Honolulu is undertaken and findings from discussions with

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<sup>1</sup> Masson-Delmotte et al., “Summary for Policymakers.”

<sup>2</sup> Miles, “If We Get Food Right, We Get Everything Right: Rethinking the Food System in Post-COVID-19 Hawai‘i”; Raj, Brinkley, and Ulimwengu, “Connected and Extracted.”

<sup>3</sup> Raja, *A Planners Guide to Community and Regional Food Planning : Transforming Food Environments, Facilitating Healthy Eating*.

<sup>4</sup> “USDA ERS - Food Access Research Atlas.”

community gardeners, market organizers, and homeowners are presented. The analysis indicates dysfunction in the food system. Vulnerabilities to food insecurity like low access and affordability stack spatially on low-income and low-access groups. The community faces climate impacts of increased temperatures from the urban heat island effect, intensified rainfall, and major weather events, which all impact food security.

The food system is an underrecognized area of climate vulnerability. To create a more equitable food system that is resilient to climate change, recommendations for Makiki are given to increase local food production, create greater food policy discourse, and connect local markets. At a local level, policy intervention can improve food security in the face of climate risks. As a whole, Honolulu should move towards a standalone food system planning document, that brings food stakeholders across the island together into one coalition. In a climate resilient future, Honolulu will produce more of its own food, bolster local food with sound policy, and live more integrated with local ecosystems.

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## POLICY ISSUES

Planning for climate change has two distinct facets: mitigation and adaptation. Mitigation means winding down emissions to decarbonize the global economy; however, the scientific consensus is that climate change is already underway and adaptation to climate impacts is necessary in addition to mitigating emissions.<sup>5</sup> Food systems planning is a relatively new area of focus for community planning. A call-to-action article by Pothukuchi and Kaufman in 2000 showed how food was, “a stranger to the planning field,” and was followed by a comprehensive guide to community food system planning in 2008 and increased attention from planning practitioners thereafter.<sup>6</sup> Governments have started to include food as part of their planning focus, but there is still an issue of understanding the linkages to climate change and adapting the food system accordingly.

The O’ahu General Plan from the City and County of Honolulu was adopted in 1977 and lays out broad policies for the development of O’ahu. Last amended in 2017, food is mentioned within the plan in the context of energy systems, a balanced economy, and public health.<sup>7</sup> While there is recognition that food is connected to different aspects of society, there is no concerted planning effort surrounding food. Gaps exist in the comprehensive planning effort of Hawaii in that there is limited integration of food within the general planning framework, and that no standalone food plan or charters exist at the state or county level.

A planning document does exist for addressing climate change. The One Climate, One O’ahu Plan is the City and County of Honolulu’s Climate Action Plan

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<sup>5</sup> Hunt and Watkiss, “Climate Change Impacts and Adaptation in Cities.”

<sup>6</sup> Raja, *A Planners Guide to Community and Regional Food Planning : Transforming Food Environments, Facilitating Healthy Eating.*

<sup>7</sup> “O’ahu General Plan.”



(CAP) for decarbonizing the economy and moving towards a carbon neutral O’ahu.<sup>8</sup> The CAP estimates emissions over multiple reduction pathways. The plan deals largely with decarbonizing the energy system, a crucial mitigation effort; however, the CAP does not address adaptation measures. A gap exists in that there is little planning for adapting to climate impacts or planning for the food system with a lens of equity and climate change.

## THE MAKIKI FOOD SYSTEM AND CLIMATE CHANGE

Makiki is an urban area of Honolulu City and County on the island of O’ahu, northeast of downtown Honolulu. The neighborhood is referred to as “upper Makiki” because the H-1 Highway borders the south side of the community, dividing it from what is considered “lower Makiki” to the south.

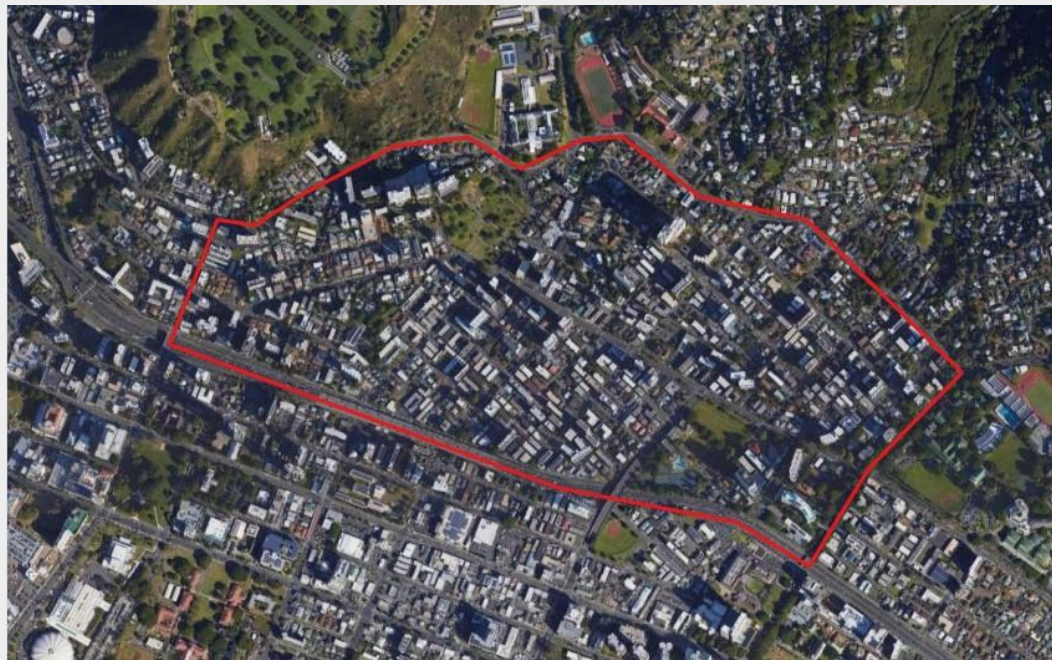


Figure 1 – Makiki Area of Study

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<sup>8</sup> “One Climate One O’ahu.”

The area considered in USDA Food Research Atlas is outline in red in Figure 1. This area is largely residential, with high-story apartment and condo buildings with a few single-family homes surviving from past times of less population density.

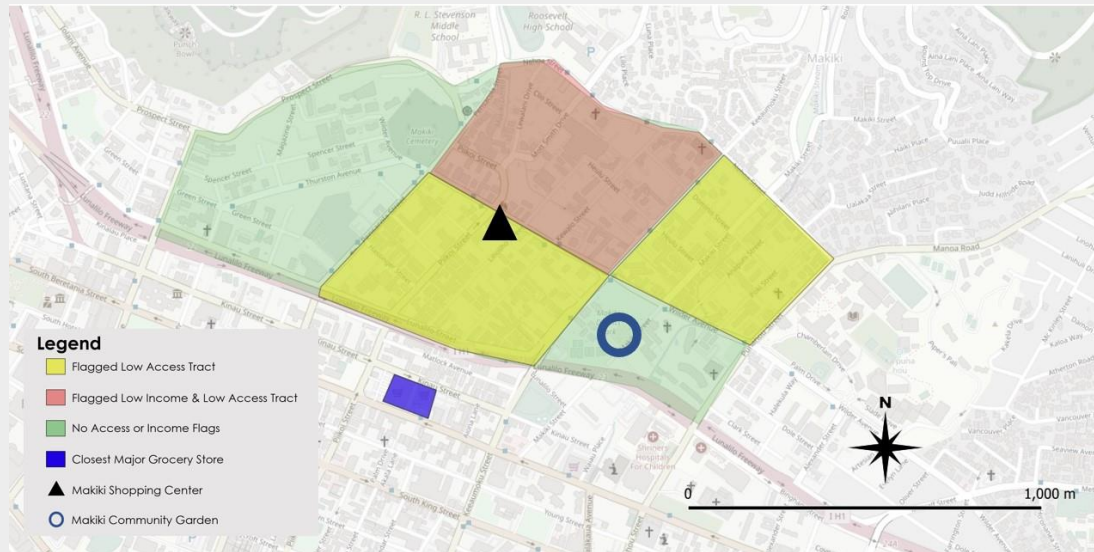


Figure 2 – Makiki Food Access by Census Tract

Figure 2 shows the USDA Low-Access and Low-Income designations for the census tracts in the Makiki neighborhood. A census tract is considered low-access if a majority of the residents are more than a half mile from a major grocery store. The closest major grocery store to Makiki is indicated in purple and lies in lower Makiki across the major highway H-1. The Makiki Shopping center is designated by a black triangle, containing a Pizza Hut, Subway, Village Market, wine cellar, sushi restaurant, Korean barbeque, laundromat, nail salon and fast-food restaurant Makiki Inn. There is no locally produced food at the village market, and produce is much more expensive than the grocery store. Fast food options abound in Makiki, but there is little affordable healthy food for people in the neighborhood, and especially those without car access. The Makiki Community Garden lies with Makiki District Park and is denoted by a circle in Figure 1.

<b>Tract 34.04</b>	
<b>Access</b>	
Population	4716
Low-Access Population at Half Mile	2639
Housing Units Without a Vehicle	243
<b>Affordability</b>	
SNAP	116
Poverty Rate	15% (707)
Low-Income	1127
Low-Income, Low-Access at Half Mile	523

Figure 3 – Access and Affordability data for Tract 34.04

Census block 34.04, shaded red in Figure 2, is designated as low-income, low-access, and low vehicle-access. Figure 3 shows the extent of the population that is low-access and low-income. While people should not need cars to be able to access food, when healthy food is not physically present in the community cars become an indicator of the level of access. Another important food security metric is SNAP participation. SNAP is an indicator of families that are having difficulty meeting their food needs. With 116 households enrolled in SNAP within the census tract, there is significant evidence of households struggling to be food secure.

The median income in tract 34.04 is \$70,000 but 15% live below the federal poverty threshold, suggesting there is great income disparity within the tract. With over 10% of the households unable to drive to grocery stores, there is a significant proportion of the tract that attains food through other means.<sup>9</sup> A gap in the data is that we do not know the income status of those without vehicles. Still a meaningful group of people is likely low-income, low-access, and without a vehicle. This is the group that is abandoned by the current urban food system and now must also face impacts of climate change to their food system.

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<sup>9</sup> “Food Access Research Atlas.”



## CLIMATE CHALLENGES IN MAKIKI

For islanded states and nations, climate change is usually synonymous with sea level rise. While sea level rise may indirectly affect the Makiki food system, it is not a direct threat that the community will face. Understanding the impacts to which the community is most vulnerable is important for establishing goals and crafting effective policy to adapt to a changing climate.

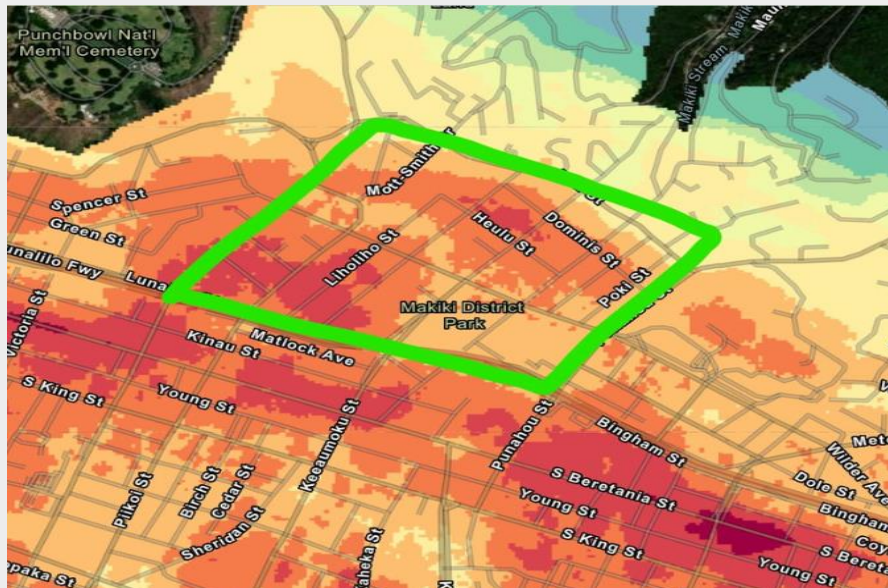


Figure 4 – O'ahu Community Heat Map

### *Urban Heat Island*

Cities tend to be hotter than rural areas, and there is evidence that urban heat disproportionately affects low-income areas.<sup>10</sup> Characterizations of the built environment, such as a lack of trees in an area, contribute to the intensity of the urban heat island effect. Those without vehicles are forced to contend with heat as they access food, making heat a climate impact that threatens food security. Figure 4 shows

<sup>10</sup> Hsu et al., "Disproportionate Exposure to Urban Heat Island Intensity across Major US Cities."

the afternoon heat index from the O’ahu Community Heat Map GIS Viewer.<sup>11</sup> The Makiki neighborhood is outlined in green. The already low-access tracts face increased temperature in the afternoon due to the Urban Heat Island effect.

### *Intensified Rainfall*

Climate change is predicted to alter global water cycles, changing rainfall patterns, and increasing the intensity of both wet and dry events.<sup>12</sup> Increased intensity of rainfall will further impede food access for those located far from food retailers. In Makiki, there is significant elevation change. In large rainfall events, water flows uninterrupted on impervious surfaces which can lead to flooding and road access being impaired.<sup>13</sup> A lack of vegetation along major roads allows water to flow freely and leads to impassable areas during heavy rain.

### *Major Weather Events*

Extreme storms and flash floods are likely to become more damaging due to climate change; effective drainage and stormwater management are critical to ensuring food access.<sup>14</sup> In large hurricanes, public infrastructure can be significantly damaged, impairing access to goods and services. Hurricanes are accompanied with storm surge, rainfall, and high winds. Communities require strong logistical response to hurricanes to ensure that there is enough food locally available to last until further aid can arrive. In Makiki, there could be significant damage to roads and highways. The major food retailers are located on the opposite side of the H-1 highway, which could become impassable during a major storm.

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<sup>11</sup> Capa Strategies, “Heat Watch Report Honolulu, Hawaii.”

<sup>12</sup> Masson-Delmotte et al., “Summary for Policymakers.”

<sup>13</sup> Martel et al., “Climate Change and Rainfall Intensity–Duration–Frequency Curves.”

<sup>14</sup> Lu and Qin, “Integrated Framework for Assessing Climate Change Impact on Extreme Rainfall and the Urban Drainage System.”

## THE FOOD SYSTEM & COMPREHENSIVE PLANNING

Three examples of model cities with comprehensive food policies are Philadelphia, Baltimore, and Seattle. The incorporation of food into the three cities' planning efforts differ in style, method, and design.

### *Baltimore*

The Baltimore Sustainability Plan, released in 2009, has an overarching theme of local ecosystem health, and considers food to be part of the local ecosystem. The plan is cognizant of the distance food travels from farm to plate, citing that the average American meal travels great distances. The plan has chapters spanning transportation, education, and the green economy. Within the Greening chapter of the plan, there are strategies described to improve the food system: modifying zoning to bring more land under cultivation, developing an urban agriculture plan, and creation of a food policy task force. The plan defines a sustainable food system as a system that protects ecosystems, encourages local production and distribution, and makes healthy food affordable and accessible to all.<sup>15</sup> Honolulu could learn from Baltimore's example by incorporating food into general planning documents such as the O'ahu General Plan and Climate Action Plan.

### *Philadelphia*

Philadelphia has adopted an example of another way that food is included with a city's comprehensive planning, a food charter. The Philadelphia Food Charter includes background, vision, and guiding objectives for the office of sustainability. By following the guidelines of the document, the city aims to establish a food policy council, overcome zoning barriers, pursue food related economic development, and create a

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<sup>15</sup> "The Baltimore Sustainability Plan."

more equitable food system. The charter recognizes food traveling long distances, dependency on imports, and the increased vulnerability to food shortages. Overall, a food charter serves to enrich the local food system of a city by strengthening local connections and becoming less dependent on global markets for food. The document serves as a reference for Philadelphia's planners to incorporate food into transportation, economic development, and public health.<sup>16</sup> Honolulu could benefit from a food charter which would serve as a reference document for a greater food policy discourse and serve as the backbone of moving towards greater food system equity.

### *Seattle*

Seattle integrated food into their 2004-2024 Comprehensive Plan, which encompasses land use, transportation, housing, economic development, neighborhood planning, and environment.<sup>17</sup> The plan considers food access and the decentralized distribution of grocery stores in its "Urban Villages" element. Food sovereignty is even addressed with the "Human Development" element which involves healthy food as a human right, food banks, and nutrition programs. Finally, what sets Seattle apart is food within the "Neighborhood Planning" element, which creates opportunity for establishing urban gardens, known as "P-Patch" garden plots.

In one community garden at Beacon Hill, a communally owned food forest project was added as a garden expansion. The community worked with professional landscape architects to design a food forest and hundreds of volunteers helped to develop a diverse and resilient edible landscape.<sup>18</sup> Much of the publicly grown food is donated to local food banks. In 2014 over 400 pounds of food was donated. In 2020 participation was down due to the pandemic, but still 200 pounds of food was donated

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<sup>16</sup> City of Philadelphia, "Philadelphia Food Charter."

<sup>17</sup> "City of Seattle Comprehensive Plan."

<sup>18</sup> Remiarz, *Forest Gardening in Practice*.

to local food banks during a critical time.<sup>19</sup> Honolulu can learn from this involvement in the food system by looking for ways to increase local production and involve more community members in the food system.

## GOALS AND OBJECTIVES

The purpose of this policy paper is to shed light on the lack of attention paid to food systems in Honolulu in the face of climate vulnerabilities to the food system. More specifically, the paper examines the Makiki community food system in Honolulu through census tract data and discussions with community members. The community discussion is presented in the analysis followed by recommendations that aim to create a Makiki community that is food secure and resilient to climate change.

## ANALYSIS & KEY FINDINGS

### *Peoples Open Market*

The People's Open Market (POM) is facilitated by the Department of Parks and Recreation within the City and County of Honolulu government. Vendors apply to the program and travel from park to park, spending an hour or two at each park one day per week. The vendors are provided the space to sell their produce, and the program works with vendors to keep prices low. The POM in Makiki is for one hour from 8:30-9:30 a.m. on Mondays. Along with Makiki, the vendors go to Manoa District Park, Magic Island, Ala Moana Regional Park, and the Frank Fasi Municipal Building.

There were only two vendors at the market, one selling locally grown food from Hawaii Kai, and another selling imported foods. Locally grown foods included potatoes, tomatoes, citrus, squash, papaya, and bananas. The representative from the

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<sup>19</sup> "Beacon Food Forest."



Department of Parks and Recreation said that the Makiki stop had seen 25-50 customers for the day which is about average for after the pandemic. One of the vendors mentioned before COVID-19 there were about five vendors that made the weekly trip, and more customers. The market was in a shaded area in the parking lot at Makiki District Park, there was no signage for the market, and it is impossible to access if you are not available from 8:30-9:30 am on Mondays.

### *Makiki Community Garden*

The Makiki Community Garden was established in 1975 as the first garden in the city's recreational gardening program. An organizer for the Makiki Garden said that COVID-19 impacted the community garden severely as a lot of the gardeners are elderly. All meetings for most of 2020 and 2021 were cancelled, but the group is optimistic about having more events and volunteer participation during 2023. The entire Makiki District Park was part of the Experiment Station of the Hawaiian Sugar Planters' Association before being sold to the city.<sup>20</sup> The organizer described a tense relationship with city officials, who enforce rules such as no trees planted in the ground and no selling of any produce from the garden.

While all members of the community benefit from an increase in fresh produce, the most social benefits go to those actively participating in the garden.<sup>21</sup> Some garden plots had small fruit trees, pruned to be kept within the confines of the dividing walls. Many plots only had a few container gardens up on tables, with nothing planted in the actual ground. Some were completely unattended with chairs and gardening equipment cluttering the space.

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<sup>20</sup> "A History of the Experiment Station of the Hawaiian Sugar Planters' Association 1895-1945."

<sup>21</sup> Furness and Gallaher, "Food Access, Food Security and Community Gardens in Rockford, IL."

From speaking with several gardeners, the community garden is not viewed as just a place to grow food, but a habitat for pollinators and soil life. The gardeners feel, especially since COVID-19, that the community garden is a critical piece of local infrastructure, superseding the sole intended use of recreation. The garden members deal with the challenge of trying to take food growing seriously with a gardening program that was created for recreation. There are no regular meetings between the gardeners and the city, and many fear that the city will frown upon any plans for expansion or changing the rules.

### *Connecting the Food System*

Makiki has the potential to massively increase the efficiency of the local food system, but strong connections between local stakeholders need to be formed to reduce the dependence on global supply chains and fossil fuels. There is no connection between the POM and community garden even as they share the same district park. Both said that their operation was severely limited by COVID-19. Climate impacts have potential to deliver similar shocks to these programs. The intention of the POM and community garden are examples of food system policy that was well ahead of its time. Both policies were introduced in the 1970s and increased residents' access to nutritious, locally grown foods. Similarly, Seattle's P-Patch program was adopted in the 1970's, but while Seattle's community gardens evolved and expanded, Honolulu's have remained largely static, likely due to the surrounding policy environment.

The difference is a lack of inclusion of local food systems within the comprehensive planning of Honolulu. The disconnection of the food system is felt by the homeowners with valuable yard space. The way that land is regulated is a significant barrier to growing trees and food. Homeowners expressed frustration with the restrictions by the city of what could be planted by sidewalks, saying that we could be doing more to mitigate heavy rainfall events. A homeowner also was not allowed by

the city to put up a roadside vegetable stand, pointing out that even with more food produced locally there are barriers in bringing local food to market. For those living in apartments, another challenge to planting trees and growing food is dealing with strict HOA regulations.

## RECOMMENDATIONS

There is a policy gap between the food system and the broader socioeconomic system that leaves communities vulnerable to impacts from climate change. Local government intervention allows the community to have a greater stake in the food system, producing more food locally and developing convenient food access for all residents. Climate change impacts are localized, and adaptation responses are most effective when undertaken at the community level.<sup>22</sup> Food security is a dynamic issue with multiple aspects. Climate change affects three facets of food security: availability, accessibility, and affordability. In turn, strategies for adapting the food system to climate change need to be diverse in time horizon and scope.

Adaptation strategies are also hierarchical; a neighborhood will take a different approach to adaptation than a city, and a state a different approach than a city and so on. While mitigation is addressed at the state, national, and international levels, adaptation is largely left up to the community.

## URBAN AGRICULTURE

### *Expanded Community Garden*

Taking a lesson from Seattle, expanding the community garden in Makiki with the addition of a communally held forest garden would be an appropriate way to

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<sup>22</sup> Hunt and Watkiss, “Climate Change Impacts and Adaptation in Cities.”

increase access to gardening for the community and improve food security. There is evidence of unmet demand for urban agriculture in Makiki with a waitlist of over 300 for a garden plot. The community garden policy has remained static since its inception in 1975 while the island has rapidly urbanized and increased in population. A blend of public and private ownership of the garden space can stack functions and make efficient use of the limited land under cultivation. Private plots can continue to be used to grow herbs, fruits, and vegetables, while common areas can have diverse fruit, nut, and shade trees.<sup>23</sup>

### *Urban Forestry*

Linkages between the food system and the urban forest system should be considered for policy intervention at the local level. Trees have been shown to interact with the local hydrological cycle, and green infrastructure is increasingly being used in cities to bolster ecosystem services.<sup>24,25</sup> Urban trees create shade, improve air quality, and fight against the urban heat island effect while managing stormwater.<sup>26</sup> Outside of Makiki District Park and community garden, the community should not shy away from edible landscaping, creating new gardens, and pursuing food sovereignty.

## FOOD POLICY

### *Food Policy Council*

In other cities, food policy councils create a forum for food system discussion. Food policy councils organize stakeholders around key issues and can provide a forum for the public to communicate with businesses and public officials. Zoning is a key

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<sup>23</sup> Remiarz, *Forest Gardening in Practice*.

<sup>24</sup> Berland et al., “The Role of Trees in Urban Stormwater Management.”

<sup>25</sup> Lu and Qin, “Integrated Framework for Assessing Climate Change Impact on Extreme Rainfall and the Urban Drainage System.”

<sup>26</sup> Hsu et al., “Disproportionate Exposure to Urban Heat Island Intensity across Major US Cities.”

barrier to urban agriculture that food policy councils can discuss and bring to the attention of the community and legislators.<sup>27</sup> The formation of a food policy council would improve the policy environment for the local food system.

### *Food Action Plan*

There is a growing discourse around the connections between food sovereignty, intersectionality, local knowledge, and community planning.<sup>28</sup> A standalone document for food equitable food systems planning in Honolulu would serve as a framework for moving towards greater food sovereignty. Food charters coalesce the goals, objectives, challenges, and opportunities of a food system, and are crucial working documents for increasing equity and adapting food systems to climate change.

## CONNECTED MARKETS

### *Healthy Shopping Village*

The food retail options in Makiki point to inequities in the food system and the spatial allocation of healthy food. The way land is regulated should be examined and criticized to foster greater food sovereignty and a better spatial distribution of food in the community.<sup>29</sup> With affordable, healthy food available at the Makiki Shopping center, those that are low access and without vehicles would be better off.

### *Revitalize Local Markets*

There is a disconnect between community gardening and local markets in Makiki. The rules of the community garden should be amended to allow members to sell their produce at a local level. Additionally, there should be local market

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<sup>27</sup> McClintock, Wooten, and Brown, "Toward a Food Policy 'First Step' in Oakland, California."

<sup>28</sup> Pendergrast et al., "Introduction to the Symposium."

<sup>29</sup> Raja et al., "Planning and Food Sovereignty in Conflict Cities."



opportunities for community members that grow food at home, such as community farm stands.

## CONCLUSION

Successfully planning for and adapting to climate change requires policy intervention in many systems with food as one important aspect. A future resilient Hawaii could have a decarbonized economy and food systems that are more regionally connected. The study of Makiki shows inequality within the food system that if not addressed will be exacerbated by shocks like COVID-19 and future climate change effects. It is up to the State and Federal government to create a policy environment that recognizes the connection between food and community resilience, but at the local government level there are interventions that can be made to improve the community.

At a city level there should be an integration of food systems planning within the general plan and as a standalone document. Climate impacts to the food system deserve further study, as the practice of food systems planning is still new to the planning field and adaptation will require a robust community response. The island may not be able to grow enough food to feed everyone, but agriculture at a local level is a viable way to build resilience to climate change.

## APPENDIX

### Appendix A



Makiki Neighborhood Census Tracts (2010 Census)

Census Tract	Pop. 2010	Poverty Rate	Low Access Half Mile	Low Vehicle Access
34.03	5530	10.4	1	0
34.04	4716	15.0	1	1
34.05	3250	7.8	0	0
34.06	5777	11.7	0	0
34.07	913	4.5	0	0

Census Tract Population, Poverty Rate, and Access Flags

Tract 34.04 Demographics			
	Total	Low Access, Number	Low Access, Share
White	930	550	59%
Black	41	21	51%
Asian	2643	1569	59%
Native Hawaiian/Pacific Islander	287	113	39%
Alaskan/native American	13	7	54%
Multiracial	802	378	47%
Hispanic	260	116	45%

Tract 34.04 Demographics

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