

Co-Housing: A Housing Approach to Fostering a Multigenerational Community

A DARCH PROJECT SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY
OF HAWAII AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF
DOCTOR OF ARCHITECTURE

DECEMBER 2022

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Keywords: Co-housing, Community, Housing, Common House

ACKNOWLEDGMENTS

First and foremost, I would like to thank my committee, Chairperson David Rockwood, Sean Baumes, and Geoffrey Lewis for guiding me. Without them, this dissertation would have been possible. Thank you for encouragements and guidance. Working with you all has been great.

Thank you to my family for the support for these past 7.5 years. Thanks for pushing me forward even when I thought I could not.

Thank you to my friends and classmates for all the memories we had throughout these years.

ABSTRACT

Multigenerational living has deep roots in the culture and history here in Hawaii, especially among most of the population, including Native Hawaiians, Asians, and Pacific Islander communities. Economic factors such as housing and child/elderly care costs and social factors such as cultural preferences contribute to the decision for multigenerational families to live together. Due to land costs and material import costs, Hawaii severely lacks affordable housing, and the demand for such housing continues to grow. Where affordable housing is found, it is often located far from the city center and available jobs, creating a cycle of increased urban sprawl. This, in turn, impacts families regarding commuting time and expense, isolation in suburban neighborhoods, and numerous environmental impacts. Despite Hawaii's attempts to promote multigenerational living, the existing housing stock is built following models imported from the U.S. mainland. Therefore, the housing stock accommodates nuclear families but not multigenerational families.

Multigenerational housing is a model where multiple generations live under the same roof, typically the grandparents, parents, and (grand)children. Co-housing is a form of multigenerational living that emphasizes the intentionality of community. It aligns with the concept of multigenerational living in which multiple generations of families live under one roof to ease financial and social stress. Co-housing also aligns with many cultural values of different ethnicities here in Hawaii. Although owning a single-family house is an ideal aspiration of many, it is simply impossible for everyone to achieve in Hawaii. With the limited available land in Hawaii, it is essential to design for a denser Hawaii rather than sprawl out and continue building single-family homes. In Honolulu, people are isolated from their urban environment through the lack of connections to the street and human scale, creating an urban disconnect.

This dissertation is a working solution for the state's housing issue through a conceptual affordable housing design reflective of co-housing and multigenerational principles. A design

framework will test this dissertation by applying components to an end product of a building design in Hawaii. Co-housing projects are often pedestrian-friendly, managed, maintained, and governed by the residents and include participation in shared activities and meals.

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01 | INTRODUCTION

Regarding housing, Hawaii's current built environment does not reflect the complex social dynamics of households where multiple generations live together under one roof. It also does not address Hawaii's urgent need for density without sacrificing Hawaii's agricultural and natural lands. As these two problems continue to grow, we must prepare to address them as accurately as possible and propose solutions to them efficiently. Questions such as "Are these housing solutions reflective of the demographics and their cultural backgrounds?" The state has addressed the housing problems by putting multiple efforts into building more single-family housing, contributing to the urban sprawl on the Leeward side of O'ahu. The social dynamics in Hawaii are changing, and the current built environment must change to accurately address these social dynamics within Hawaii's demographics, specifically multigenerational families.

The life expectancy in the United States is longer than in the 1970s, and it is now estimated to be 78.7 years of age on average.¹ The built environments within our cities have become healthier and cleaner, increasing people's life expectancy. The life expectancy in Hawaii, 80.5 years of age, is slightly more significant than the US's life expectancy, 78.7 years of age.² The difference in life expectancy from the 1970s (70.8 years) to the present (78.7 years) is a significant change that has allowed the healthcare system and the social demographics to evolve into what it is today.

The traditional/nuclear family is the typical family type expected in every household: a mother, a father, and children. In an extended/multigenerational household, it includes the grandparents. As the elderly age, their independence begins to wane as their cognitive and motor functions decline, and as a result, the elderly have two options, move into a care home/retirement home, or live with their children's family. Families of Asian descent, the dominant ethnic demographic in Hawaii, typically decide on option two. This spark of social norms change

¹ Xu, Jiaquan, Sherry L. Murphy, Kenneth D. Kochanek, and Elizabeth Arias. "Mortality in the United States, 2018," January 2020. <https://www.cdc.gov/nchs/data/databriefs/db355-h.pdf>.

² Sandra A LeVasseur and Kristine Qureshi, "Hawaii's Nursing Workforce: Keeping Pace with Healthcare," *Hawai'i Journal of Medicine & Public Health*, February 2015, p. 45, http://www.hawaiijournalhealth.org/past_issues/HJMPH_Feb15.pdf.

requires designers and architects to stop and reflect on how the current architectural practices can address this change. The elderly are living longer, causing a change in the family structure. Multigenerational housing has become the norm for the typical family structure here in Hawaii.³ It demands a better understanding of social and cultural changes to address Hawaii's housing crisis better.

By 2025, Hawaii is projected to have 53,500 new households.⁴ Understanding Hawaii's needs for new housing, is the state's approach effective in resolving its density problem and related to the needs of its cities? Hawaii continues to build more housing within Oahu's Leeward side, contributing more to the urban sprawl. This introduces new problems, specifically for people who rely primarily on public transportation. In Kapolei, new single-family townhouses and walk-ups are being erected, but these do not reflect Hawaii's demographic needs, specifically with the lack of support for multigenerational living.

Within this dissertation, I will address the need for multigenerational living here in Hawaii by looking at the evolution of the American family structure and higher life expectancies. The lack of affordability is due to financial factors such as the cost of living in Hawaii compared to the continental United States and senior care and childcare costs. However, due to the time constraints of this thesis, affordability will not be part of this thesis's primary focus. I will also look at Hawaii's demographics, analyzing how the cultures of different ethnicities, such as Asian and Pacific Islander, play a role in families' decision to live in a multigenerational household. Different typologies, such as low-rise-high-density developments, and high-rise apartments, will be analyzed to determine which typology is best suited for co-housing and to create a multigenerational environment.

³ Peterkin, O. (2017, November 28). Why Hawaii trends toward large and extended families. Honolulu Civil Beat. Retrieved January 10, 2022, from <https://www.civilbeat.org/2017/11/why-hawaii-trends-toward-large-and-extended-families/>

⁴ Measuring Housing Demand in Hawaii, 2015-2025." Honolulu: Department of Business, Economic Development & Tourism, March 2015. <https://files.hawaii.gov/dbedt/economic/reports/2015-05-housing-demand.pdf>

02 | ADDRESSING THE NEED FOR MULTIGENERATIONAL LIVING

According to Christopher Alexander's book, "A Pattern Language: Towns, Buildings, Construction," it is essential to have balance in a community of all life stages.⁵ Each age group contributes to the larger community through unique experiences to compose the holistic image of life cycles. A supportive environment must be established to provide an age balance in a community. This chapter will address the need for multigenerational living by analyzing the history and development of the family structure, higher life expectancy, Hawaii's demographics, and 'Ohana zoning.

2.1 - The Changing Family Structure

Analyzing the family structure and its evolution into different family structures is important because economics, social needs, and cultural values helped create these other family structures. Exploring these factors will help us understand why the changes and creation of new family structures came to be.

External factors such as high divorce rates, higher years of life expectancy, and economic and social stresses have created new family structures while old ones re-emerge. The multigenerational family, also known as the extended family, is one of the old family structures to re-emerge. These changes to the family structure can be seen during three historical phases: the agricultural era, the industrial era, and the present.

The agricultural era was before mass production, and demand was the dominant economic factor resulting from the World Wars. The family dynamics and structure changed after World War II during the industrial era. The present age then shifts away from the industrial era with the invention of the internet, where information is easily distributed and accessed.

Understanding the family's roles is essential because it affects the dynamics of each family structure. Two roles that play a massive part in family structures are the financial and the

⁵ Christopher Alexander, Sara Ishikawa, and Murray Silverstein, "26 Life Cycle," in *A Pattern Language: Towns, Buildings, Construction* (New York, NY: Oxford Univ. Pr., 2010), pp. 140-145.

domestic providers. From here, we begin to see how the multigenerational family was introduced. As the name states, the financial provider(s) are the main income generator within the family. With a sustainable income, the family can have necessities such as shelter and food. Domestic providers are family members who help nurture and take care of the children and the elderly. As the family survives the typical life, household and financial providers must be present in each family structure. As a result of significant events and shifts in eras, the roles in the family structures also shift. We can identify the introduction of the multigenerational family and why designing for this family structure is vital today.

Agricultural Era

The agricultural era takes place between the 1500-1800s.⁶ Situated in a rural context, the extended household, the most common household during this time, functioned as a supportive unit that worked together to produce an autonomous environment based on agriculture production. In this setting, men provided food through hunting, gathering, and harvesting, while women took care of the household duties, the children, and the elderly. Every member contributed to the survival and day-to-day functions of the family.

Due to high birth rates and the common practice of taking in non-related people, these households were large. During this era, the birth rates were high for three reasons: needed additional labor for farms, high infant mortality rates, and birth control was non-existent.⁷ Regarding the second reason, taking in non-related people, such as hired hands, enslaved people, apprentices, and so forth, was common practice, contributing to the large households at this time, especially since the average life expectancy was about 45 years. The large family structure of this time was due to necessity as it contributed to the family's survival.

Industrial Era

The family structure changed in the industrial era to a smaller family adapting to this time's social and economic conditions. The change from an extended family shift into a single-family

⁶ Roberta L. Coles, *Race and Family: A Structural Approach* (Lanham, MD: Rowman & Littlefield, 2016), 42.

⁷ *Ibid*, 44

dwelling consisting of the husband, wife, and children removes the need for the grandparents and non-family members from the household. Due to changes in the economy, the leading male figure became the primary financial provider for the family. Unlike the agricultural era, where every member contributes to the family's survival, the top male figures in this era are the "breadwinners" of the family, being solely responsible for the family's survival. The domestic provider then falls under the responsibility of the female members of the family, staying at home and raising the children.⁸

Along with economic shifts, a shift in the built environment also came to be. Houses became more private. With the households shifting to single-family, there was no need to keep the house's open plan. Rooms became connected through hallways as parents and children slept in separate rooms. This change in the family created a household based on privacy and separation. Separating work and home became the norm creating the famous image we know today of the single-family house surrounded by a white picket fence.

Present Era / Modern Times

The family structure has shifted and changed in the present era due to the increasing gender role of women. With the decrease in men's real wages, the number of women entering the paid workforce increased, changing the positions in the family structure from a single financial provider to co-providers.⁹ Today, the typical family structure is composed of typological family structures as families deal with social and economic fluxes. Evident are new family structures such as non-family households, single-parent households, and multigenerational households. Although the nuclear/traditional family still exists today, many different types of households exist today as seen as Table 2.1. The US has a diverse range of traditional and non-traditional family structures. This dissertation will look into the multigenerational family as it has gained a more substantial presence in today's demographics.

Throughout these three eras, the family structures have evolved from the typical child

⁸ Ibid, 48

⁹ Ibid, 110

and parent family. With factors such as higher life expectancies, higher cost of living, increasing divorce rates, etc. occurring in today's society, the family structure has grown in complexity. The focus of this dissertation, the multigenerational family, is no exception. This family type is the blend of different generations, typically the grandparents, parents, and the (grand)children. This

HOUSEHOLD TYPE	1960	1980	2000	2010	2017
Family Households	85	74	68	66	65
Married Couples w/ Children	44	31	24	20	19
Married Couples w/out Children	31	30	28	28	30
Single Parents w/ Children	4	7	9	10	9
Other Family	6	6	7	8	9
Non-family Households	15	26	32	34	25
One Person	13	24	26	27	28
Other Non-family	2	4	6	7	7

Table 2.1 - Household types in the US
Source: Population Reference Bureau

household type has emerged as a working ,adaptable living arrangement for the modern family. This applies to Hawaii as it is a “melting pot” of different ethnicities and strong cultural and familial values. With this in mind, the multigenerational household is a clear response to these societal factors. Unlike in the agricultural era where the extended/multigenerational household was based on family succession for economic stability, this household typology is a choice that provides solutions to many issues today.

Due to events related to the economy, societal values, and the built environment, the family structure has adapted and evolved throughout history. However, the built environment needs to address these changes in our family structures. The following chapter will focus on Hawaii and why designing the built environment to mirror the values of a multigenerational family is necessary.

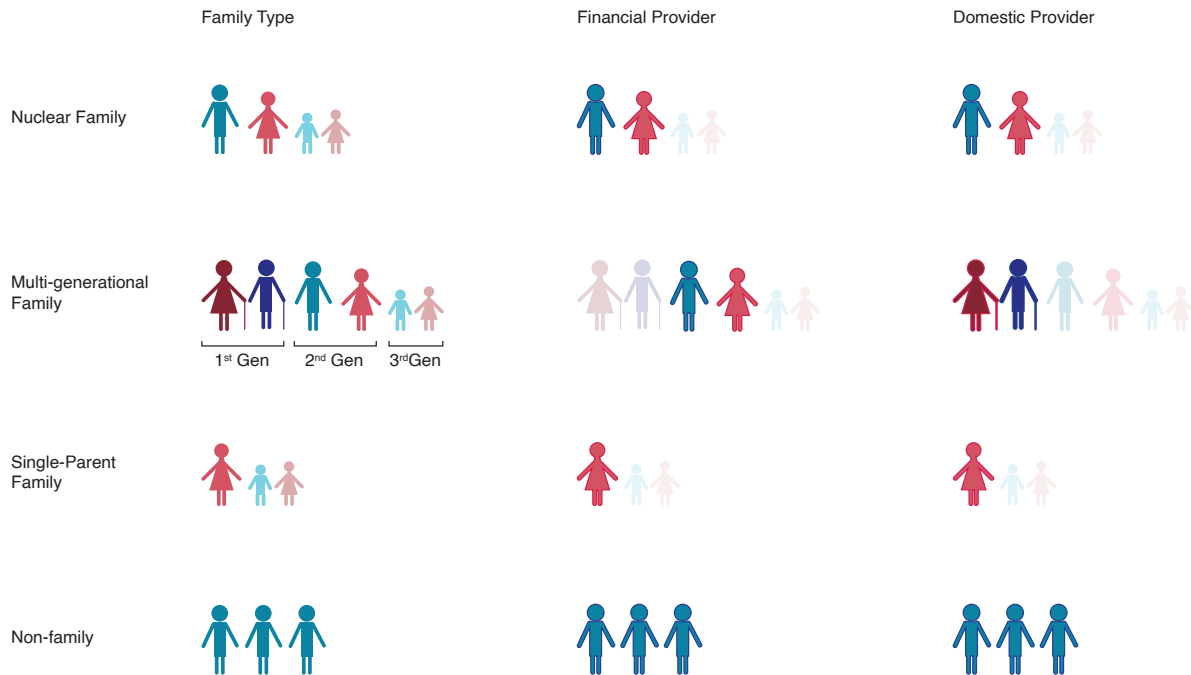


Figure 2.1 - Different family structures
Source: Author

2.2 - Higher Life Expectancy

The United States population is living longer these days compared to the 1960s. It is expected that by 2060, the life expectancy is projected to be 85.6, about a six-year increase from 2017's projected life expectancy of 79.7.¹⁰ With medical and technological advances, the population is living with a higher age expectancy. Other factors that increased the average life expectancy are increased time of physical activities and the accessibility to healthcare which contributed to a better quality of life.

As the number of elderly steadily increases, government aid programs such as social security and medical coverage increase the quality of life for the elderly. As of 2020, the number of people ages 65 and older is expected on average to be about 56.0 million in the United States.

¹⁰ Lauren Medina, Shannon Sabo, and Jonathan Vespa, "Living Longer: Historical and Projected Life Expectancy in the United States, 1960 to 2060," Population Estimates and Projections, February 2020, <https://www.census.gov/content/dam/Census/library/publications/2020/demo/p25-1145.pdf>.

Year	State Total	Hawaii County	Honolulu County	Kauai County	Maui County
1980 ¹	968,500	92,900	764,600	39,400	71,600
1990 ¹	1,113,491	121,572	838,534	51,676	101,709
2000 ¹	1,213,519	149,244	876,629	58,568	129,078
2010 ¹	1,363,621	185,406	955,775	67,226	155,214
2016 ¹	1,428,557	198,449	992,605	72,029	165,474
2025 ²	1,514,700	222,400	1,032,700	78,000	181,600
2035 ²	1,592,700	248,500	1,062,100	84,300	197,800
2045 ²	1,648,600	273,200	1,073,800	90,000	211,500
Average annual growth rate (%)					
1980-1990	1.4	2.7	0.9	2.7	3.6
1990-2000	0.9	2.1	0.4	1.3	2.4
2000-2010	1.2	2.2	0.9	1.4	1.9
2010-2016	0.8	1.1	0.6	1.2	1.1
2016-2025	0.7	1.3	0.4	0.9	1.0
2025-2035	0.5	1.1	0.3	0.8	0.9
2035-2045	0.3	1.0	0.1	0.7	0.7

¹ July estimates by the U.S. Census Bureau

² DBEDT projections, figures presented here can be different from those in the appendix tables because of rounding.

Table 2.2 - Projected population growth up to 2045
Source: US Census Bureau

By 2060, people ages 65 and older are estimated to increase to about 94.7 million, a 69 percent increase.¹¹

As stated before, one of the main contributing factors to higher life expectancy is the advancements in the medical and technology fields. These advances helped contribute to the decline of diseases and provided preventive measures for many ailments improving the quality of life for the elderly. Americans live better and longer life due to better healthcare services. According to the Department of Health and Human Services, 7 in 10 seniors reaching the age of 65 are expected to need some form of long-term care.¹² Long-term care involves various services designed to meet a person's health or personal care needs during a short or long period.¹³ The cost of long-term care in 2018 has been estimated at \$849 billion, according to the Kaiser Family Foundation and the American Association of Retired Persons.¹⁴ This will be further expanded upon later in *Chapter 03 – Lack of Affordability*.

2.3 - Hawaii's Demographics

Hawaii has continued to preserve the extended/multigenerational family culture despite the changes in the family structures due to economic and social factors. Growing up in Hawaii, 'ohana has always held a significant value in the local culture. With Hawaii's larger households and diverse demographics, it is no surprise that Hawaii has a more substantial percentage of multigenerational families compared to the rest of the United States. In 2018, the number of multigenerational households in Hawaii was 23,483, or 20.7 percent.¹⁵ With the large percentage of families in Hawaii of various ethnicities, it creates a unique spirit and support system base.

¹¹ Mark Mather and Lillian Kilduff, "The U.S. Population Is Growing Older, and the Gender Gap in Life Expectancy Is Narrowing," PRB, February 19, 2020, <https://www.prb.org/resources/u-s-population-is-growing-older/>.

¹² Tara O'Neill Hayes et al., "The Ballooning Costs of Long-Term Care," AAF, February 21, 2020, <https://www.americanactionforum.org/research/the-ballooning-costs-of-long-term-care/>.

¹³ "What Is Long-Term Care?," National Institute on Aging (U.S. Department of Health and Human

¹⁴ Ibid.

¹⁵ Mark A. Carrozza, "Distribution of Multigenerational Households by Race ...," Health Landscape Geospatial Research Brief, August 2020, <https://www.healthlandscape.org/documents/Geospatial-Brief-Multigenerational-Households.pdf>.

Hawaii's General Population

According to the US Census Bureau, over the past decade (2010-2020), Hawaii's population has increased by 7 percent.¹⁶ This growth is associated with the consistent migration of foreign immigrants and active-duty military personnel. It is projected that the general population will increase to 1.65 million in 2045, an average growth rate of 0.5 percent per year.¹⁷ For Hawaii, with its ethnically mixed culture, the concept of living in a multigenerational/extended household is not new. It is estimated that about 8 percent of Hawaii's households are multigenerational. The leading ethnicities that compose this percentage of extended family households are Filipinos, Native Hawaiians, and Chinese. This lifestyle, surrounded by aunties, uncles, cousins, brothers and sisters, and grandparents, is deeply tied into the cultural roots of these families.

*"Multigenerational housing is a very local way of living because the word
"ohana" is really about the extended family, not the nuclear family."*¹⁸

– Ikaika Hussey, member of the Kalihi Neighborhood Board

A traditional value that resonates with many families regardless of cultural background are that elderly are cared for and respected. In Hawaii's society and in the typical Asian culture, it is the child's devotion and obligation to care for their parents as they age, thus reversing the roles of caretaker. Parents take care of their children when they are young, and then the children take care of their parents as they get older. It is this concept of filial piety that emphasizes the treatment of our elders. According to the Center on the Family at the University of Hawaii, Hawaii's population is aging rapidly. By the year 2040, it is estimated that about 28.5 percent of Hawaii's population

¹⁶ U.S. Census Bureau, "Historical Population Change Data (1910-2020)" (April 26, 2021) accessed Nov. 12, 2021

¹⁷ State of Hawaii, "Population and Economic Projections for the State of Hawaii to 2045," DBEDT State of Hawaii, accessed November 14, 2021

¹⁸ Olivia Peterkin, "Why Hawaii Trends toward Large and Extended Families," Honolulu Civil Beat, November 28, 2017, <https://www.civilbeat.org/2017/11/why-hawaii-trends-toward-large-and-extended-families/>

will be composed of elderly residents aged 60 years and older. This is a 28.5 percent increase from Hawaii's 2010 elderly population. For residents that are aged 85 years and older, they would compose about 5.5 percent of the population.¹⁹ This is a significant piece of data as it shows that the elderly cannot be removed from the equation of the family unit as they play a significant impact in the social and economic factors of the family unit.

Ethnicity

Hawaii is “an ethnically mixed plate” of the Pacific, as it is composed of a diverse set of cultures, languages, and ethnicities. In fact, Hawaii is the United States' third most diverse state, both racially and ethnically. Over the course of many generations, families have formed in Hawaii from many different racial and ethnic backgrounds. Diversity enables people to be more accepting of communities composed of individuals from a multi-ethnic background as opposed to homogeneous communities. Living in multi-ethnic communities, individuals may be able to form a community that welcomes various lifestyles.

The population of Hawaii is racially integrated while being composed of ethnic minorities. According to the 2020 United States Census, the population of Hawaii is composed of 36.5 percent of Asian descent compared to the Caucasian group, which is the United States' largest ethnic group (57.8 percent), and comprises about 21.6 percent of Hawaii's population.

As stated before, the Asian population in Hawaii contributes to the largest ethnic group on the islands. This group is composed of individuals of the Chinese, Japanese, Korean, Filipino, Vietnamese, and so forth that form a unique multi-ethnic culture. From the 1850s up to the annexation of Hawaii, one of the main economic forces in Hawaii was the sugar industry. During this time, there was a major influx of workers from other countries migrating to Hawaii. The majority of these workers came from Asian countries such as China, Korea, Japan, Philippines, etc., bringing in their strong cultural values along with them. These Asian immigrants came to Hawaii as families and not as individuals. This act of immigrating as a family and not as individuals not

¹⁹ Jenjira Yahirun and Hua Zan, “HAWAII'S OLDER ADULTS A DEMOGRAPHIC PROFILE,” accessed November 12, 2021, https://uhfamily.hawaii.edu/sites/uhfamily.hawaii.edu/files/publications/HIOlderAdults_DemogProfile_2016.pdf.

only help readjust to a new environment but further reinforces the firm obligation to the family unit. Strong cultural and familial relations among the Asian group are significant elements for the high composition of intergenerational households. Generalizing the Asian culture, a couple of strong cultural values are filial piety and great respect for family elders. Generally, elders are typically viewed with authority over their juniors as well as guiding them along as they grow. Research has shown that about 27 percent of the Asian population lives in multigenerational households.

2.4 - 'Ohana Zoning

To assist families in purchasing affordable living quarters while encouraging the concept of the extended/multigenerational family, a zoning ordinance was introduced in the 1980s by Eileen Anderson. This ordinance permits homeowners to build a second dwelling on their property under specific provisions. This secondary dwelling can be an attached or detached single-family home existing on a residential lot, provided that all building codes are followed.

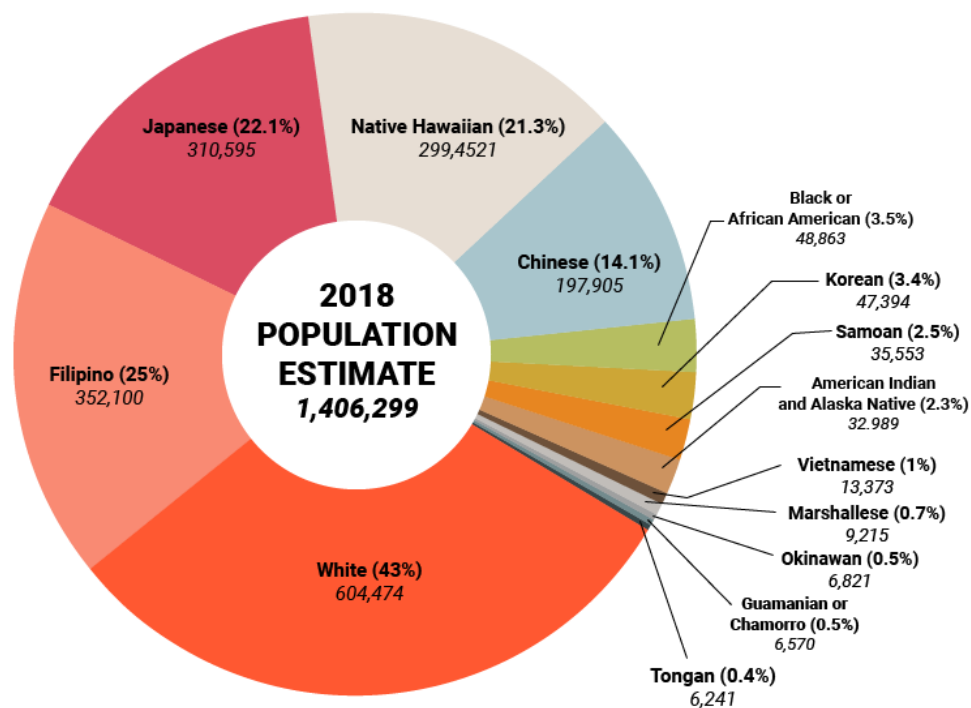


Figure 2.2 - Population estimates by ethnicity
Source: US Census Bureau + Honolulu Civil Beat

The 'Ohana Zoning ordinance has its restrictions, however. One of them is the second dwelling is only for related members to the owners of the main house to maintain the extended family structure. This restriction encouraged the concept of generational living. To promote this concept further, provisions were suggested that the family members live in the attached dwelling for a fixed number of years.²⁰ If this requirement was satisfied, the homeowner is then allowed to have any resident dwell in the second dwelling regardless of relations. This further encouraged the intention of multigenerational living but restricted owners and financial institutions from expending money to build units.

Today, 'Ohana Zones are used as a place for individuals experiencing homelessness and those who serve them to treat each other as an extended family. Although each zone is designed differently, each area is a safe place where people are treated with familial care and compassion.²¹

2.5 - Conclusion

Family structures have evolved into many different compositions, including extended households, single-parent families, and non-family households. With the increasing need for housing, the outlook of the multigenerational home is expected to become more common in the future. The multigenerational lifestyle provides families with an alternative housing solution that accommodates their needs. Given Hawaii's ethnically rich and diverse background of melding cultures, multigenerational living is a rational solution to the housing issue in Hawaii.

²⁰ Ryan Shidaki, Multigenerational Living in the Urban High-Rise: Designing for Hawaii's Extended Family. p 40

²¹ Collaborative Quality Consulting, "Housing First and Ohana Zone Implementation - Homelessness. hawaii.gov," <https://homelessness.hawaii.gov/>, December 2020, <https://homelessness.hawaii.gov/wp-content/uploads/2021/04/2020-HF-and-OZ-Year-2-Progress-Report.pdf>.

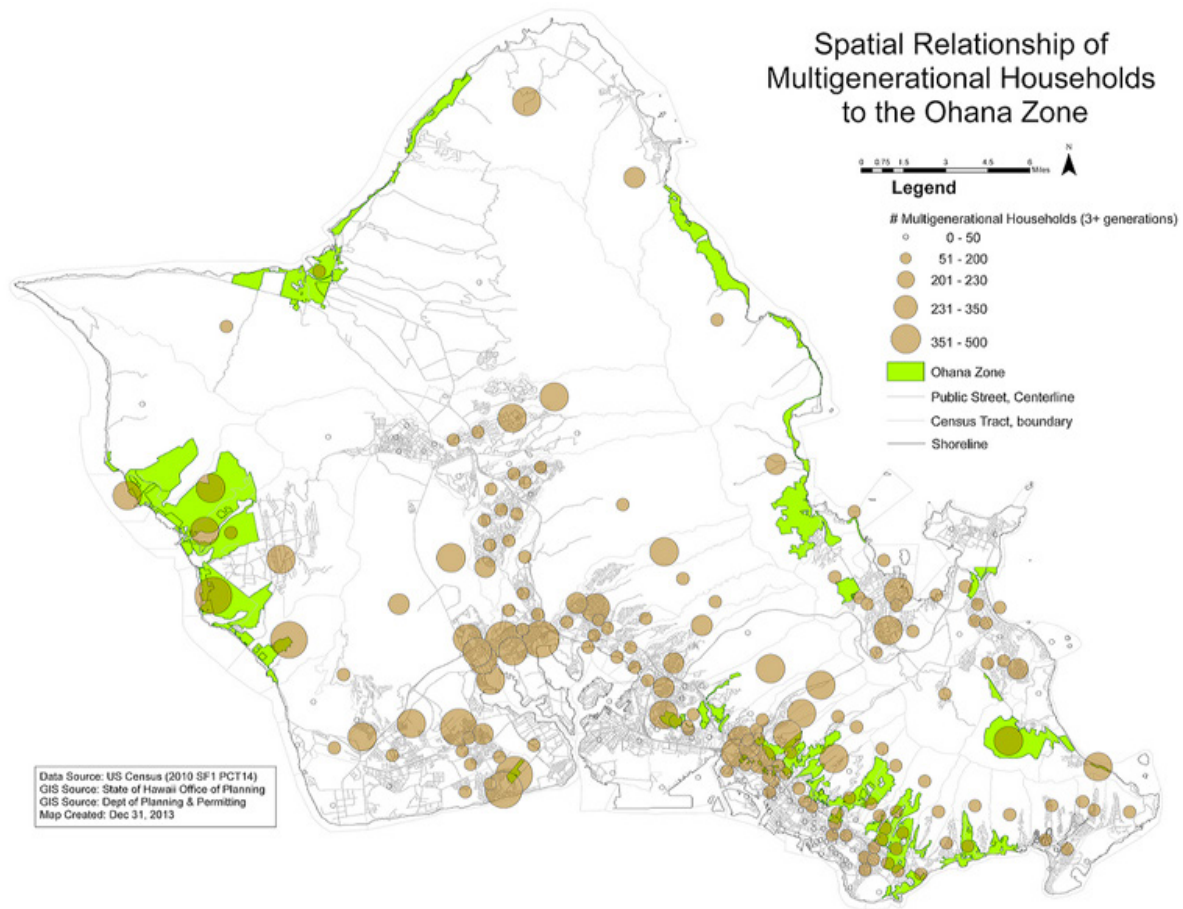


Figure 2.3 - Spatial relationship of multigenerational households to the 'ohana zone
 Source: HHF Planners

03 | AFFORDABILITY

3.1 - The Lack of Affordability

According to the US Department of Housing and Urban Planning, housing is only considered affordable if it does not consume more than 30% of its monthly income. In Hawaii, families with a median salary spend about 45 percent of their income on housing expenses.²² In 2005, the average sale price of a single-family house was \$744,174, while the average sale price in 2020 was \$1,014,167 – a 136 percent increase in 15 years.²³ If 30 percent of a family's income is used as the standard for affordability, then several families and individuals may not be able to find adequate, affordable housing for themselves. The lack of affordable housing affects the family on many different levels: financially, socially, physically, etc. To resolve the high cost of housing, young adults would stay with their parents to reduce the cost of living even into starting their own families. This points out the inadequacies in our current housing situation. As designers, creating a living environment that responds to the changing needs of families and fosters a healthy mental and physical environment for them.

With Hawaii's geographical location, one can understand why Hawaii's prices are higher than the mainland. To live comfortably in Hawaii, the household's annual income needs to be \$122,000, but a household's annual income in Hawaii is \$83,102.²⁴ The median income of a household is relatively lower than the median family income (\$96,462) due to 12.1 percent of Hawaii's households consisting of single individuals.²⁵ Neither the median income of households nor the median family income values are greater than the needed \$122,000 to live comfortably here in Hawaii.

²² "Hawaii," National Low Income Housing Coalition, accessed November 8, 2021, <https://nlihc.org/housing-needs-by-state/hawaii>.

²³ Gord Collins, "Hawaii Housing Market Forecast," ManageCasa, August 17, 2021, <https://managecasa.com/articles/hawaii-housing-market-forecast/>.

²⁴ Research Economic Analysis Division, "Census Data Highlights," CENSUS DATA HIGHLIGHTS Hawaii State Data Center, September 17, 2020, http://census.hawaii.gov/wp-content/uploads/2020/10/acs2019_1-yr_DBEDT-highlights.pdf.

²⁵ Ibid

3.2 - Senior Care

Assisted living involves professionally managed personal and health care services in a residential environment in character and appearance. This type of long-term care provides better quality health and personal services; however, these healthcare systems have isolated our elderly from actively interacting within the community. Another reason our elderly are socially isolated is our current style of living in single-dwelling housing that prevents our elderly from aging in place and living a better-quality life.

Affordable assisted living is essentially non-existent as it is becoming difficult to acquire due to the cost of assisted living has become too expensive. From 2004 to 2020, sixteen years, the cost of assisted living increased by 79.17 percent. The average cost of assisted living facilities in the United States in 2020 was \$51,600.²⁶ Another drawback of assisted living is the separation of the elderly from the rest of the community. Assisted care living facilities are designed separately from the community. Seniors are also rooted in their current housing resulting in the loss of social contact with friends and neighbors. Both separations, physical in terms of the built environment and social, do not allow a healthy environment for our elderly. Essentially, the elderly have become prisoners in assisted care facilities that offer almost no interaction with the surrounding community. A multigenerational household can help remove the burden of the extra cost of outside help while keeping the elderly in constant interaction with people of different generations.

3.3 - Childcare

Throughout the three eras mentioned previously, women have always been the primary caregiver. However, in the present era, women have joined the labor workforce away from home, leaving children unattended without adult supervision.

Childcare is important today due to the increased value of education. Childcare centers are provide both high-quality early education and daycare services to working parents. Similar

²⁶ "Median Cost of Nursing Home, Assisted Living, & Home Care," Genworth, February 12, 2021, <https://www.genworth.com/aging-and-you/finances/cost-of-care/cost-of-care-trends-and-insights.html>.

to assisted living, the cost of childcare is a challenge. The average cost of childcare per month for an infant is about \$1,300, which puts the average cost per year at about \$16,000.²⁷ According to the US Department of Health and Human Services, childcare is only considered affordable if it only consumes 7 percent of a family's income. In Hawaii, this would mean that childcare is only affordable to about 10.9 percent of families.²⁸ Just like with senior care, a multigenerational household can reduce the burden of extra costs.

3.4 - Affordability of Co-housing

A large aspect of affordability in co-housing projects is the participation of the residents during the planning and design process. In this process, residents actively give feedback and input to the consultants (architects, engineers, etc.) about their wants and needs for their homes and living styles. This participatory process gives the residents a clear understanding of the total costs that they would need for the project. Charles Durrett, Architect Emeritus, mentions several ways in which the participatory process helps a co-housing project become more affordable in his book, *“Community-Enhanced Design: Cohousing and Other High-Functioning Neighborhoods.”*²⁹

- Education and awareness
- Rezoning
- Proactive municipal involvement
- Affordability by necessity / lifestyle
- Grants
- Proactive municipal involvement
- Passive design
- Question unnecessary expenses during design and construction phases

²⁷ Simon Walker, “The True Cost of High-Quality Child Care across the United States,” Center for American Progress, June 28, 2021, <https://www.americanprogress.org/article/true-cost-high-quality-child-care-across-united-states/>.

²⁸ “Child Care Costs in the United States,” Economic Policy Institute, accessed November 8, 2021, <https://www.epi.org/child-care-costs-in-the-united-states/#/HI>.

²⁹ Charles Durrett et al., *Community-Enhanced Design: Cohousing and Other High-Functioning Neighborhoods* (Nevada City, CA: The Cohousing Company, 2021), 311-340.

3.5 - Conclusion

The cost of living in Hawaii is already expensive due to the high costs of housing for families of low-to-medium size income. Once the cost of elderly and child care is included, the cost-of-living skyrockets. In a multigenerational setting, the costs of living can be offset. In a typical multigenerational household, everyone helps takes care of everyone. Grandparents babysit children while the parents are at work during the day. Grandparents are taken care of by the parents and children when needed. In co-housing, affordability comes from the participatory process during the planning and design process. Without the participatory process, issues and concerns will arise when the project's total cost is higher than expected.

04 | BUILT ENVIRONMENT

The built environment refers to artificial elements and aspects of our surroundings, distinguished from the natural environment. The built environment encompasses the buildings we live in, the distribution systems that provide us with water and electricity, and the roads, bridges, and transportation systems we use to get from place to place. Generally, the built environment is artificial or modified structures that provide people with living, working and recreational spaces.³⁰ The physical resources of the built environment used by individuals for daily activities include the grocery store, pharmacy, theatre, etc. A person's "life space" determines the social component of the built environment. Life space is defined as a socio-physical milieu that individuals inhabit.³¹ This includes families, friends, neighbors, co-workers, colleagues, and the community. This chapter will look into the built environment and its conditions in context to the elderly, the effects of the urban sprawl, and Hawaii's housing predicament.

4.1 - The Urban Sprawl

Urban sprawl is a pattern of urban and metropolitan growth that reflects low-density, automobile-dependent, exclusionary new development on the fringe of settled areas, often surrounding a deteriorating town.³² This shift from the urban core areas of the city created low-density communities that are extensions of development outward from the city. Other low-density communities developed are "edge cities" and "edgeless cities" – fragmentation of land use planning among multiple municipalities.³³ In these low-density communities, houses were mass-developed, contributing to the urban sprawl. The advent of the automobile and lower transportation costs became the primary catalyst of sprawling cities throughout much of the twentieth century. This

³⁰ "Basic Information about the Built Environment," EPA (Environmental Protection Agency), accessed March 15, 2022, <https://www.epa.gov/smm/basic-information-about-built-environment#builtenviron>.

³¹ Epimakhova, *Designing for Multigenerational Community: Creating a Supportive Environment for Young and Old in the U.S.A.*, p 11

³² Gregory Squires, *Urban Sprawl: Causes, Consequences and Policy Responses* (Washington, DC: Urban Institute Press, 2002). p 49

³³ Ibid. p 2

sprawling is evident in comparing populations in the city and suburbs during the latter half of the twentieth century. During the 1950s, the central cities housed about 65 percent of the urbanized population, while the remaining 35 percent lived in the suburbs. By the 1990s, these percentages flipped, where the central city population housed 35 percent of the urbanized population, and the suburbs housed the remaining 65 percent.³⁴

The urban sprawl had adverse effects resulting in land loss and a reduction of diversity due to the high-density, low-rise approach. The single-family dwellings that were massed produced allowed for high density in a low-rise building environment consuming a large area. The rapid mass development of single-family homes deprived the area of diversity. The repetitive housing construction in the suburbs resulted in poor living qualities and a lack of community sense and healthy living.

As the sprawl continued, significant infrastructure investments had to be made to develop these low-density communities quickly. Investments in infrastructure included roads, schools, sewer systems, and other public systems.³⁵ These services designed in sprawled areas raise each household's price as infrastructure is spread thin. And with the dependency on cars rising as the cost of commuting was low, and vehicles became more affordable, this makes for easier access to these services, which are spread out in sprawled areas resulting in more infrastructure. Residents of these sprawled areas spent a more significant portion of their income on transportation and maintenance of their cars.³⁶

4.2 - Walkability and the Elderly

The current living conditions for our elderly inhibit them from actively integrating into our communities. Assisted living and other healthcare solutions have isolated our elderly from their surroundings preventing active integration within the community. Long-term healthcare facilities,

³⁴ Thomas J Nechyba and Randall P Walsh, "Urban Sprawl," *Journal of Economic Perspectives* 18, no. 4 (2004): pp. 177-200, <https://doi.org/10.1257/0895330042632681>, p 180. Squires, p 12

³⁵ Squires, p 12

³⁶ Ibid. p 128-129

such as nursing homes and assisted living facilities, can be seen as one of the main reasons for this social isolation. Another reason is our current living lifestyle – the single-family household. This living lifestyle prevents a built environment that allows one to age in place.

“The design and development of buildings and the built environment have the capacity to facilitate or to hinder people’s movement and mobility, and in particular designs ... are infused with powers of demarcation and exclusion.”³⁷

Long-term healthcare facilities have isolated our elderly, making them prisoners in their homes. The National Institute on Aging has listed these services as long-term care facilities: Residential Care Facilities, Assisted Living, Nursing Homes, and Continuing Care Retirement Communities.³⁸ These types of long-term care services are becoming increasingly unaffordable as the cost of these services has been proven unaffordable.³⁹ What is a possible solution that can be affordable and integrate the elderly into their surrounding community? The answer is to design using multigenerational principles to create an inclusive, thoughtful environment.

Another contributing factor to this problem is single-family housing, the most common type of dwelling. This type of housing fails to address the family’s need to extend or to accommodate a family to age in place. Aging in place is defined as “the ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level” by the Centers for Disease Control and Prevention.⁴⁰ Single-family dwellings offer minimal adaptability or flexibility to allow the nuclear family to include the extension to the grandparents in a cohesive

³⁷ Elizabeth Burton and Lynne Mitchell, *Inclusive Urban Design: Streets for Life* (Architectural Press, 2006). p 11

³⁸ “Residential Facilities, Assisted Living, and Nursing Homes,” National Institute on Aging (U.S. Department of Health and Human Services), accessed November 11, 2021, <https://www.nia.nih.gov/health/residential-facilities-assisted-living-and-nursing-homes>.

³⁹ Tara O’Neill Hayes et al., “The Ballooning Costs of Long-Term Care,” AAF, February 21, 2020, <https://www.americanactionforum.org/research/the-ballooning-costs-of-long-term-care/>.

⁴⁰ National Center for Environmental Health, “CDC - Healthy Places - Healthy Places Terminology,” November 12, 2021, <https://www.cdc.gov/healthyplaces/terminology.htm>

manner. The American dream consists of the image of a single-family house that emphasizes independence and individualism, the opposite of multigenerational living which emphasizes co-dependence and a sense of community.

4.3 - Hawaii's Current Housing Predicament

In Hawaii, houses are retrofitted from single-story dwellings and transformed into two-story homes to add more units to offer rental units to offset financial burdens. This trade-off of living space to open natural space shows the housing desperation in Hawaii. The lack of affordable housing is in dire need of solutions and assistance.

The development on the West side of the island of Oahu, such as Ewa and Kapolei, are areas where single-family housing is the dominant type. To establish Kapolei as Oahu's second city, trouble is found in traffic commutes from the leeward side to Honolulu, the urban core of Oahu, and vice versa. A typical commuter spends about 64 hours in traffic to Honolulu on annually.⁴¹ Traffic in Hawaii had improved compared to 2012, when Hawaii was named the number one state with the worst traffic. However, time is still wasted as longer commutes consume an individual's time to get things done. Although long commutes are slowly being solved, better solutions can be implemented.

Planning new developments costs Hawaii residents money as their taxes are used to fund these new developments. These project developments convert land that could be used for prime agricultural resources into subdivisions and residential dwellings, creating a need for new infrastructure. Utilities such as sewer, water, and electricity lines are implemented at the cost of Hawaii's residents' taxes. As the cost of living rises in Hawaii and precious lands are depleted, sprawling forces a horizontal urban expansion, increasing the loss of family interaction and neighborhood feel. The scale of growth and proximity of residential homes to city life only allows for social interaction by using a vehicle preventing a sense of community and place to foster.

⁴¹ "What Is Traffic like in Hawaii?," Hawaii Vehicle Shipping Blog, accessed December 10, 2021, <https://www.hawaiicartransport.com/news/traffic-like-hawaii/>.

The height of high-rise structures, whether for commercial or residential purposes, is limited here in Hawaii. In the urban core of Honolulu, the building height limit is 400 feet. This limit exists because city planners wanted to ensure that natural features such as Diamond Head were not hidden or overwhelmed by buildings.⁴² This inherent desire to protect distinguishing landmarks such as Diamond Head is a consideration when designing and planning for Hawaii's unique regionalism. This preservation of views is because Hawaii offers a wonderful backdrop of the mountains and the sea, unlike other developed cities in the continental US. Achieving a sustainable urban density is not just about increasing it through high-rises, nor is it the continuous expansion of single-family households. It's about balancing the input and outputs of a system within the capacity of that given system in the core to neutrality as possible.⁴³ If the answer isn't in single-family or high-rise housing typologies, it is time to explore a low-to-mid-rise housing development. Low-to-mid-rise buildings are best suited to creating a generationally integrated and socially interactive environment.

Multigenerational Housing in Hawaii

As mentioned before, there is a need to address multigenerational living. Hawaii's political parties had attempted to address this through bills such as 'Ohana Zoning in the early 1980s and Bill 20 in 2015, which introduced extensions to single-family housing, both attached and detached dwelling units, that encouraged extended/multigenerational living in the suburban environment. Some residents and developers have interpreted these bills to create more housing units on a single lot with the recent rise of Monster Houses throughout 'Oahu.

Bill 20 - 'Ohana Units + Accessory Dwelling Units

In 2015, the City and County of Honolulu by Kirk Caldwell adopted Bill 20, introducing two new types of units: the 'Ohana Units and Accessory Dwelling Units. The 'Ohana unit is an addition to a family home to maintain practical yet affordable living accommodations for their loved ones.

⁴² A. Kam Napier, "How Tall Can a Honolulu Building Be? It Depends...", Honolulu Magazine, October 13, 2020, <https://www.honolulumagazine.com/how-tall-can-a-honolulu-building-be-it-depends/>.

⁴³ Lombawa, p 83

These additions, however, must be attached to the existing housing through the roof. According to the covenant agreement, homeowners must sign, and these units can only be rented to the related family members. According to the Building Department, the relationship with the owner must be through blood, marriage, or adoption. Since the 'Ohana unit is an attachment, it can only maintain a "wet bar," not a fully functional kitchen.

Accessory Dwelling Units (ADUs) are another alternative to multigenerational living. An ADU can be built as a separate unit on site. Unlike the 'Ohana units, the ADU is equipped with a living space, a full kitchen, and a bath. To allow an area to qualify as an ADU, it must have a sink, stovetop range, a refrigerator installed, and water and sewer lines. It must have road access and one parking spot. Anyone can use the space as long as the lease is six months. This means that the 'Ohana unit can be converted into an ADU to help increase the value of the single-family house. Since both unit options give many families an economical and viable option for affordable living, these housing units are strongly preferred.

Monster Housing

An issue that concerned neighbors and residents of Hawaii are structures that are popping up in residential areas called "Monster Houses." These homes are nearly three stories tall and can contain 16 bedrooms, 11 bathrooms, and numerous wet bars. Concerned residents in neighborhoods such as Kaimuki are against the idea of these Monster Houses being constructed. They affect property values due to the height it is being built, blocking the pristine views of the mountains and oceans from its surrounding buildings. Concerned neighbors like Kim Smith said, "We feel like an apartment will be built here with no parking." These Monster Homes are considered legal only if the house's tenants are all related to the owner.

4.4 - Hawaii Precedents

Multigenerational living carefully considers its user's needs indicating that the current housing stock in Hawaii does not fully support the multigenerational housing model. Low-to-mid-rise walk-ups, single-family developments, and mixed-use apartments are a few standard housing typologies in Hawaii. Analyzing the current housing stock in Hawaii, strengths and weaknesses can be gathered. During this section, these terms will be often used and are defined:

- **Private space:** This is a space within the residential unit. This will typically refer to the bedrooms.
- **Common space:** This space is within a residential unit that is used by all its users. This refers to the living/dining room, kitchen, laundry, and outdoor space.



Figure 4.1 - Exterior photo of a 28-bedroom monster home in Kalihi.
Source: Honolulu Star Advertiser

- **Shared space:** This space is set aside for the residential amenities and commercial spaces.

As stated before, owning a single-family home is a common life goal that many families desire. This housing model is easy and challenging to study because there are many iterations and sizes. It offers basic living needs: a kitchen, bathroom, multiple private bedrooms, private laundry, and parking. It also provides a front/backyard for children to play in or space for gardening. The single-family homes at Kapolei Knolls are a great example of why these are both easy and challenging to study. The homes in Kapolei Knoll vary since the houses differ from one-story to two-story homes. This means that the number and size of the bedrooms and the shared spaces, such as the kitchen, dining area, and living room, can vary from house to house. The images below show the floor plans of a one-story home versus a two-story home at Kapolei Knolls.

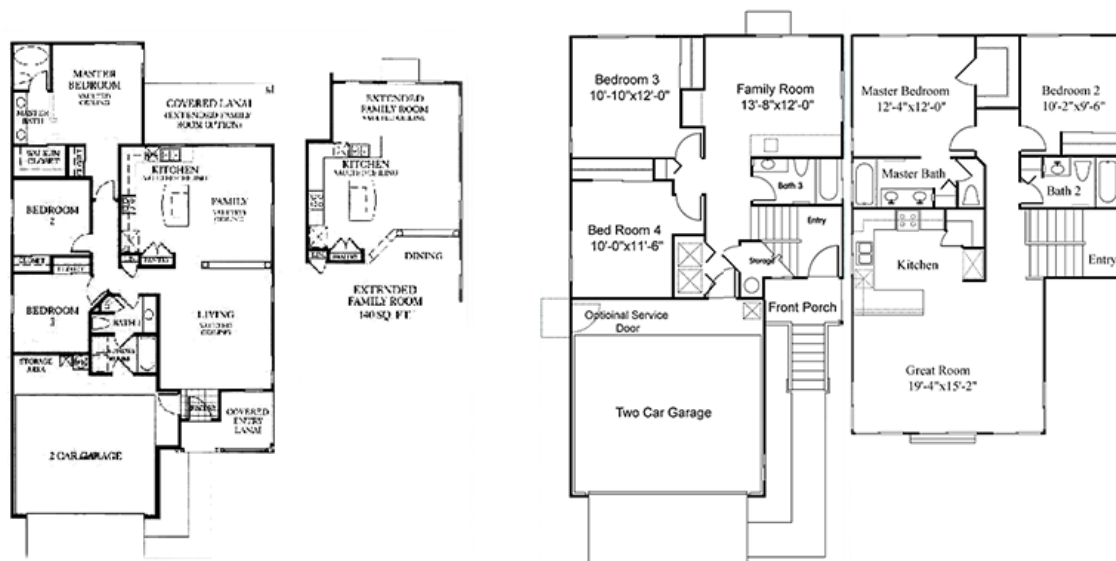


Figure 4.2 - Floor plan of two single-family homes in Kapolei Knolls. The floor plan on the left shows a horizontal expansion and on the right, a vertical expansion.

Source: Dhorton.com

The benefit of single-family homes is the possibility of expanding the house for a growing family. Unlike the multi-family housing models from before, single-family housing is one of the most flexible housing typologies found in Hawaii. It can expand vertically, transforming from a one-story house into a two-story house, and horizontally, sacrificing yard space to increase living space.

Walk-up apartments are low-rise developments of two-to-four-story apartment buildings, typically single-loaded corridors. This model provides housing for various demographics – nuclear families, single-person households, and the elderly. For this typology, the first floor is typically used for on-site parking, leaving a minimal number of units accessible to people with disabilities and the elderly. The residential units comprise 1-3 bedroom units, and these units provide the core programs for a unit to function: a kitchen, living/dining room, bathroom, private bedrooms, and private laundry. Due to its single-loaded corridor, this typology allows for natural ventilation and daylighting.

In urban cities, mixed-use apartment buildings were favored for their ability to increase housing density per acre while implementing commercial spaces on the street level creating prime real estate projects. This typology can be found in many areas throughout Hawaii, but Kaka’ako is a developing area where mixed-use apartment buildings are typically found. In the following precedents, we will look at the spatial relationship between the private space and the common space of the residential units.

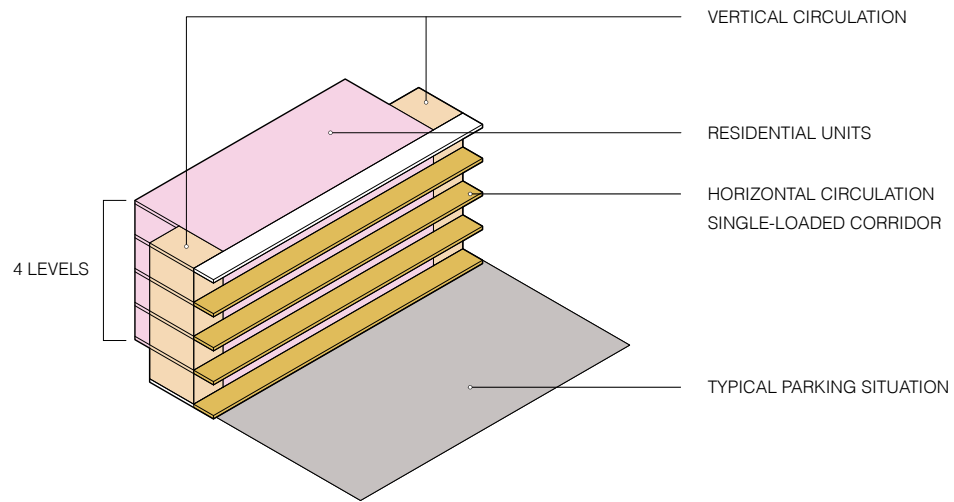


Figure 4.3 - Typical walk-up situation seen throughout Hawaii.
Source: Author



Figure 4.4 - Exterior photo of 400 Keawe Street.
Source: Kaka'ako.com

Hawaii Precedent 01 - 400 Keawe Street

All information and floor plans used to analyze information are from hicondo.com.⁴⁴

400 Keawe is a 6-story mixed-use building located in Kaka'ako. This project comprises 95 residential units, including 1–3-bedroom units. The first floor includes commercial spaces (i.e., restaurants and office spaces), while the second to the sixth floor comprises residential units and amenities. Tables 4.1 through 4.3 show the residential unit analysis by looking at the ratios of private space, common space, and circulation.

⁴⁴ "400 Keawe," Hawaii Real Estate Condominium Guide by Hicondos.com - Honolulu, Oahu, Hawaii condos for sale, accessed June 15, 2022, <http://www.hicondos.com/hawaii-Condos/400-Keawe.asp>.

1 BR							
	Name	SF	Name	SF	Name	SF	
Type A	Bedroom 1	196	Living/Dining	280	Entry	30	
			Kitchen	112	Circulation	70	
			Bathroom	80			
			Laundry	32			
			Outdoor Spaces	0			
Type B	Bedroom 1	182	Living/Dining	192	Entry	30	
			Kitchen	110	Circulation	52	
			Bathroom	75			
			Laundry	32			
			Outdoor Spaces	0			
	Average SF	378	Average SF	913	Average SF	182	Total Avg SF
	% of area	26%	% of area	62%	% of area	12%	1473

Table 4.1 - Spatial analysis of 1-bedroom units in 400 Keawe Street.
Source: Author

2 BR							
	Name	SF	Name	SF	Name	SF	
Type A	Bedroom 1	427	Living/Dining	271	Entry	30	
	Bedroom 2	161	Kitchen	162	Circulation	73	
			Bathroom	67			
			Laundry	30			
			Outdoor Spaces	87			
Type B	Bedroom 1	376	Living/Dining	290	Entry	33	
	Bedroom 2	165	Kitchen	135	Circulation	61	
			Bathroom	76			
			Laundry	35			
			Outdoor Spaces	140			
Type C	Bedroom 1	423	Living/Dining	307	Entry	30	
	Bedroom 2	184	Kitchen	170	Circulation	70	
			Bathroom	76			
			Laundry	33			
			Outdoor Spaces	0			
Type D	Bedroom 1	277	Living/Dining	243	Entry	30	
	Bedroom 2	141	Kitchen	95	Circulation	60	
			Bathroom	79			
			Laundry	31			
			Outdoor Spaces	0			
	Average SF % of area	2154 44%	Average SF % of area	2327 48%	Average SF % of area	387 8%	Total Avg SF 4868

Table 4.2 - Spatial analysis of 2-bedroom units in 400 Keawe Street.
Source: Author

3 BR							
	Name	SF	Name	SF	Name	SF	
Type A	Bedroom 1	390	Living/Dining	342	Entry	60	
	Bedroom 2	160	Kitchen	124	Circulation	135	
	Bedroom 3	142	Bathroom	66			
			Laundry	25			
			Outdoor Spaces	75			
Type B	Bedroom 1	331	Living/Dining	282	Entry	30	
	Bedroom 2	123	Kitchen	111	Circulation	103	
	Bedroom 3	111	Bathroom	56			
			Laundry	25			
			Outdoor Spaces	63			
Type C	Bedroom 1	280	Living/Dining	231	Entry	50	
	Bedroom 2	133	Kitchen	137	Circulation	100	
	Bedroom 3	137	Bathroom	66			
			Laundry	25			
			Outdoor Spaces	0			
	Average SF	1807	Average SF	1628	Average SF	478	Total Avg SF 3913
	% of area	46%	% of area	42%	% of area	12%	

Table 4.3 - Spatial analysis of 3-bedroom units in 400 Keawe Street.
Source: Author



Figure 4.5 - Exterior photo of Keauhou Lane
Source: Keauhoulane.com

Hawaii Precedent 02 - Keauhou Lane

All information and floor plans used to analyze information are from their website.⁴⁵

Keauhou Lane is another mixed-use building located in Kaka‘ako. The first floor comprises commercial spaces, restaurants, and the lobby of the residential area. The 2nd-6th floors are composed of residential units with the amenities such as a recreation room and amenity deck on the second floor. The residential units provided in this mixed-use building are studio apartments and 1-2-bedroom units. Table 4.4 shows the residential unit analysis through the ratios of private space, common space, and circulation.

⁴⁵ “Keauhou Lane,” keauhou lane, accessed June 19, 2022, <https://www.keauhoulane.com/#apartments>.

	Private Spaces		Common Spaces		Circulation		Shared Spaces	
1st Floor	Name	SF	Name	SF	Name	SF	Name	SF
					Circulation	1176	Restaurant Spaces	14,400
					Lobby	1721	Commercial Spaces	17,600
					Pedestrian Only Passage	13,249	Bike Storage	700
							Trash	2400
					Total	16,146	Total	35,100
2nd Floor Shared Spaces	Name	SF	Name	SF	Name	SF	Name	SF
							Courtyards	12000
							Recreational Room	900
							Total	12900
Studio	Name	SF	Name	SF	Name	SF	Name	SF
x12/floor	Bedroom / Living Room	150	Kitchen Bathroom	91 62	Circulation			
	subtotal	150	subtotal	153	subtotal	0	Unit Total SF	303
	% of area	50%	% of area	50%	% of area	0%	Unit Quantity	12
							Total SF	3636
1 Bedroom	Name	SF	Name	SF	Name	SF	Name	SF
x17/floor	Bedroom	141	Kitchen Living/Dining Bathroom	100 110 62	Circulation	55		
	subtotal	141	subtotal	272	subtotal	55	Unit Total SF	468
	% of area	30%	% of area	58%	% of area	12%	Unit Quantity	17
							Total SF	7956
2 Bedroom	Name	SF	Name	SF	Name	SF	Name	SF
x12 /floor	Bedroom 1	120	Kitchen Living + Dining Bathroom	100 266 62	Circulation	75		
	subtotal	270	subtotal	428	subtotal	75	Unit Total SF	773
	% of area	35%	% of area	55%	% of area	10%	Unit Quantity	12
							Total SF	9276
3rd-6th Floor Shared Spaces	Name	SF	Name	SF	Name	SF	Name	SF
							Laundry	500
							Storage	300
							Total SF	800
Studio	Name	SF	Name	SF	Name	SF	Name	SF
x12/floor	Bedroom / Living Room	150	Kitchen Bathroom	91 62	Circulation			
	subtotal	150	subtotal	153	subtotal	0	Unit Total SF	303
	% of area	50%	% of area	50%	% of area	0%	Unit Quantity	12
							Total SF	3636
1 Bedroom	Name	SF	Name	SF	Name	SF	Name	SF
x17/floor	Bedroom	141	Kitchen Living + Dining Bathroom	100 110 62	Circulation	36		
	subtotal	141	subtotal	272	subtotal	36	Unit Total SF	449
	% of area	31%	% of area	61%	% of area	8%	Unit Quantity	17
							Total SF	7633
2 Bedroom	Name	SF	Name	SF	Name	SF	Name	SF
x12 /floor	Bedroom 1	120	Kitchen Living + Dining Bathroom	100 266 62	Circulation	60		
	subtotal	150	subtotal	428	subtotal	60	Unit Total SF	638
	% of area	24%	% of area	67%	% of area	9%	Unit Quantity	12
							Total SF	7656

Table 4.4 - Overall spatial analysis of Keauhou Lane by unit type.
Source: Author



Figure 4.2 - Exterior photo of Ala Wai Plaza.
Source: [Apartments.com/ala-wai-plaza-honolulu-hi/p9c46et/](https://www.apartments.com/ala-wai-plaza-honolulu-hi/p9c46et/)

Hawaii Precedent 03 - Ala Wai Plaza

All information and floor plans used to analyze information are from [hawaiiliving.com](https://www.hawaiiliving.com/).⁴⁶

Ala Wai Plaza is an apartment complex located in Waikiki and was built in the 1970s. This precedent is divided into two buildings, the 25-story Park Tower and the 17-story Diamond Head Tower. Both towers comprise of 1-3 bedroom units. The shared programs, such as the lobby, outdoor pool, and recreation area, are located on the first floor. The rest of the floors are used for residential units. For this precedent, the 1-bedroom units are single-level units, while the 2-3-bedroom units are split into two-level and penthouse-type units.

⁴⁶ "Ala Wai Plaza - General Info & Sold Data," Ala Wai Plaza Condos for Sale in Honolulu, accessed September 16, 2022, <https://www.hawaiiliving.com/oahu/honolulu/metro/ala-wai-plaza-kapiolani-condos-for-sale/>.

Name	Private Spaces		Common Spaces		Circulation		Shared Spaces		Number of Units	
1 Bedroom										
	Name	SF	Name	SF	Name	SF	Name	SF	Amount	
1 Level	Bedroom 01	102	Living / Dining Room Kitchen Bath Laundry Outdoor Space	116 45 40 10 54	Circulation	84			44	
	Subtotal	102	Subtotal	265	Subtotal	84	Subtotal		Total Unit Area:	451
	% of area	22.6%	% of area	58.8%	% of area	18.6%	% of area		Subtotal	19844
2 Bedroom										
	Name	SF	Name	SF	Name	SF	Name	SF		
2 Level	Master Bedroom + Bath Bedroom 02	286 171	Living / Dining Room Kitchen Bath Half Bath Laundry Outdoor Space	243 100 56 27 10 100	Circulation	192			207	
	Subtotal	457	Subtotal	536	Subtotal	0	Subtotal		Total Unit Area:	993
	% of area	46.0%	% of area	54.0%	% of area	0.0%	% of area		Subtotal	205551
Penthouse	Master Bedroom + Bath Bedroom 02	553 271	Living / Dining Room Kitchen Bath Laundry Outdoor Space	438 107 100 16 731	Circulation	187			5	
	Subtotal	824	Subtotal	1392	Subtotal	187	Subtotal		Total Unit Area:	2403
	% of area	34.3%	% of area	57.9%	% of area	7.8%	% of area		Subtotal	12015
3 Bedroom										
	Name	SF	Name	SF	Name	SF	Name	SF		
2 Level	Master Bedroom + Bath Bedroom 02 Bedroom 03	314 184 163	Living / Dining Room Kitchen Bath Half Bath Laundry Outdoor Space	210 94 55 20 10 133	Circulation	215			88	
	Subtotal	314	Subtotal	522	Subtotal	215	Subtotal		Total Unit Area:	1051
	% of area	29.9%	% of area	49.7%	% of area	20.5%	% of area		Subtotal	1051
Penthouse	Master Bedroom + Bath Bedroom 02 Bedroom 03	460 296 189	Living / Dining Room Kitchen Bath 01 Half Bath Laundry Outdoor Space	442 120 84 25 12 296	Circulation	177			5	
	Subtotal	756	Subtotal	979	Subtotal	177	Subtotal		Total Unit Area:	1912
	% of area	39.5%	% of area	51.2%	% of area	9.3%	% of area		Subtotal	1912
Shared Spaces										
	Name	SF	Name	SF	Name	SF	Name	SF		
							Lobby	1800		
							Outdoor Pool	2100		
							Security	150		
							Outdoor Kitchen / BBQ	1225		
							Recreation Area	1500		

Table 4.5 - Overall spatial analysis of Ala Wai Plaza by unit type.
Source: Author

Overall Building Analysis	Private Spaces	% of area	Common Spaces	% of area	Shared Spaces	% of area	Circulation Space	% of area
400 Keawe Street	185900	35%	316650	59%	15156	3%	18470	3%
Keauhou Lane	96568	38%	57980	23%	51200	20%	45546	18%
Ala Wai Plaza	134619	29%	180403	39%	6775	1%	140348	30%

Table 4.6 - Overall spatial analysis all precedents.
Source: Author

Common Space	1 BR	% of area	2 BR	% of area	3 BR	% of area	Overall Average	% of area
Average Area 400 Keawe								
Living/Dining	236	66%	278	48%	285	53%	266	54%
Kitchen	11	3%	141	24%	124	23%	92	19%
Bathroom	78	22%	75	13%	63	12%	72	15%
Laundry	32	9%	32	6%	25	5%	30	6%
Outdoor Space	0	0%	57	10%	46	8%	34	7%
Keauhou Lane	Studio	% of area	1 BR	% of area	2 BR	% of area	Overall Average	% of area
Kitchen	91	28%	100	37%	100	23%	97	28%
Living/Dining	175	53%	110	40%	266	62%	184	54%
Bathroom	62	19%	62	23%	62	14%	62	18%
Laundry	0	0%	0	0%	0	0%	0	0%
Outdoor Space	0	0%	0	0%	0	0%	0	0%
Ala Wai Plaza	1 BR	% of area	2 BR	% of area	3 BR	% of area	Overall Average	Avg % of area
Living/Dining	116	44%	269	31%	326	43%	237	38%
Kitchen	45	17%	82	9%	107	14%	78	12%
Bathroom	40	15%	92	11%	92	12%	75	12%
Laundry	10	4%	13	1%	11	1%	11	2%
Outdoor Space	54	20%	416	48%	215	29%	228	36%

Table 4.7- Overall spatial analysis of the common spaces of all precedents.
Source: Author

Conclusion

Hawaii is filled with families that value 'ohana. Political attempts such as 'Ohana Zoning and Bill 20 are evidence of that as it encourages extended and multigenerational living. However, extreme attempts by local homeowners and developers to construct monster houses are popping up around 'Oahu, agitating neighbors due to their non-contextual construction, disrupting and lowering the value of surrounding properties. Using these attempts of multigenerational living as a starting point to develop a diversity of housing options and services that can better meet an evolving family's varied and changing needs.

Looking at the overall data from the tables, we can determine that:

- As the amount of bedrooms increases, the common space within the unit decreases while the circulation increases.
- The average ratio of private space to common space in a residential unit is about 30% - 60%, with the remaining 10% allocated to circulation.

In Table 4.1, we can observe that most of the residential units' space is allocated for the common spaces. This is good due to the opportunities for social interaction, but it also brings up privacy issues within the unit. We can also observe in the newer precedents that a private outdoor space is less of a priority for the residential units as most units do not have a private outdoor space compared to the older precedent, as seen in Table 4.7. This does not allow the users to connect to the outdoors, which does not take advantage of Hawaii's natural elements. Moving forward, we need to determine what building typology is best suited to host a multigenerational community in Hawaii.

05 | BUILDING TYPOLOGIES

To foster a multigenerational community, it is essential to understand what kind of environment it needs to grow. After analyzing Hawaii's current housing predicament and the existing housing available in Hawaii, it is essential to look at different housing typologies worldwide to enhance the housing here in Hawaii. Typologies such as low-rise-high-density developments and mixed-use apartment complexes will be analyzed at the building and neighborhood scale. At the building scale, the objectives explored in the upcoming precedents will be the spatial organization and the ratios between the private and common spaces. Looking at the neighborhood scale, the objectives that will be examined will be the connection between the building at the street level and the walkability/drivability to neighborhood necessities such as schools and grocery stores, as well as access to neighborhood amenities such as parks, public transportation, shopping malls, etc. Analyzing the context of the building to its neighborhood surroundings is important because one of the main goals of this dissertation is to build a framework to foster a multigenerational community. Connecting the users to their surroundings and the building to make a community is essential because it helps create an identity for the community and a sense of place.

5.1 - Low-Rise High-Density Developments

Low-rise, high-density housing developments evolved from criticism of the overdeveloped landscape due to the construction of detached single-family homes.⁴⁷ This typology achieves a higher density reducing the unbuilt surface area to a minimum rather than building higher. It combines the best elements of urban and suburban development schemes: many public transportation options, access to urban services, moderate scale, public open space, and individualized dwellings. To achieve this, these developments are composed of low-rise buildings or mid-rise buildings.

⁴⁷ Heckmann, Schneider, and Zapel, *Floor Plan Manual Housing* (Basel: Birkhäuser, 2018), 297.

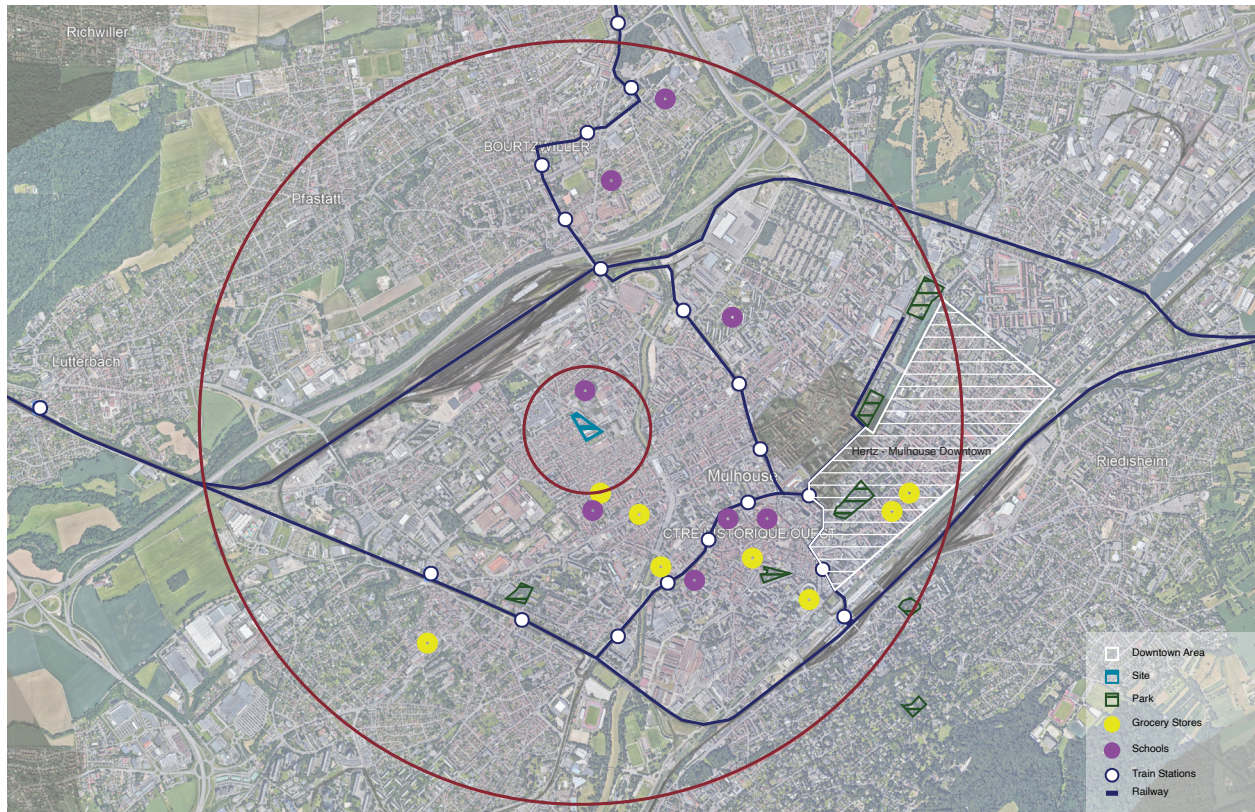


Figure 5.1 - Neighborhood analysis of Cité Manifeste
Source: Author



Figure 5.2 - Exterior photo of Cité Manifeste designed by Block Architects + Duncan Lewis
Source: b-l-o-c-k.com

Precedent 01: Cité Manifeste - Block Architects + Duncan Lewis

The Cité Manifeste, located in Mulhouse, France, was completed in 2005. Four architectural teams have developed this project. Block Architects + Duncan Lewis, Lacaton Vassal, Shigeru Ban + Jean De Gastines, and Ateliers Jean Nouvel.⁴⁸ I will focus on the Block Architects + Duncan Lewis team and the Lacaton & Vassal team. When it was developed, this project had two main goals: to give prominence to the old residential scheme and make social housing attractive again.⁴⁹

The Block Architects + Duncan Lewis team designed twelve two-story units, a mix of 2-3 bedrooms. A large open living room on the first floor directly connects with the bedrooms, and on the second floor are where the amenities are located. Each bedroom is located towards the edge of the street, allowing the private space to be connected to the street-scape rather than the living

⁴⁸ Fani Kostourou and Kayvan Karimi, "The Integration of New Social Housing in Existing Urban Schemes: The Case of Cité Manifeste in Mulhouse, France," Research Gate, April 2017, https://www.researchgate.net/publication/315341761_The_integration_of_new_social_housing_in_existing_urban_schemes_The_case_of_Cite_Manifeste_in_Mulhouse_France.

⁴⁹ Ibid. 47

room. It also cuts down the circulation space, essentially dead space underutilized, by eliminating hallways within the unit and directly connecting the private bedrooms to the common area.

One area of concern for this portion of the project is the safety of its residents. After the project was completed and the residents moved in, issues started to occur. There were incidents of unwanted people occupying the intermediate open spaces on the lots due to obstructed street visibility.⁵⁰ This raised a matter of safety for the residents.

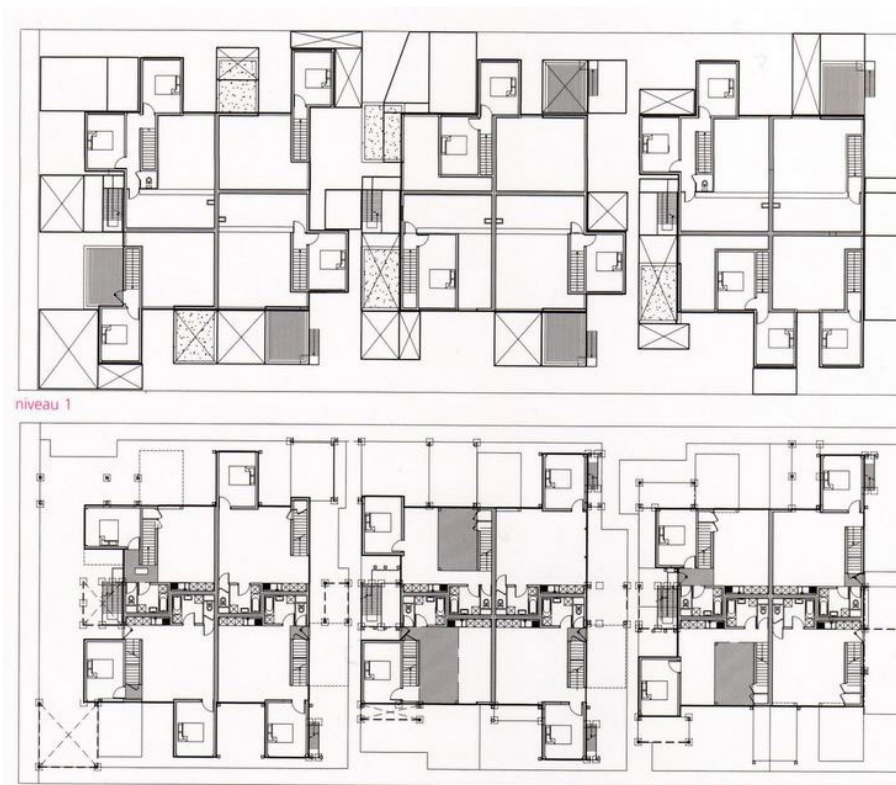


Figure 5.3 - First and second level floor plans of Cité Manifeste designed by Block Architects + Duncan Lewis
Source: b-l-o-c-k.com

⁵⁰ Ibid. 52



Figure 5.4 - Exterior photo of Cité Manifeste designed by Lacaton & Vassal
Source: Architecturaviva.com

Precedent 01: Cité Manifeste - Lacaton & Vassal

The Lacaton & Vassal team designed a total of fourteen housing units. These houses aimed to create maximal rather than minimal apartments meaning that these housing units were larger than the typical units built under the existing laws.⁵¹ Out of the four different teams, the design meets the demands of the entire project by including the residents as players in the configuration of their living space.⁵²

The housing units are a mix of 1 to 4-bedroom units that expand over two levels. The common spaces can be located either on the first or second floor, depending on the unit. Suppose the common spaces are located on the first floor. In that case, the second level area is significantly smaller, and vice versa if the common spaces are located on the second level, as shown below

⁵¹ Architectura Viva, "Manifesto City, Mulhouse - Lacaton & Vassal," Architectura Viva (Architectura Viva, March 16, 2021), <https://arquitecturaviva.com/works/ciudad-manifiesto-5>.

⁵² Social Housing in Mulhouse," Housing models. experimentation and everyday life :: Social housing in Mulhouse, accessed September 14, 2022, <http://www.wohnmodelle.at/index.php?id=80%2C71%2C0%2C0%2C1%2C0>.

in Figure 5.2. Since the level where the common spaces are not located is smaller, the space is used for the private bedrooms. The larger units, highlighted in orange and pink, have bedrooms alongside the common spaces.

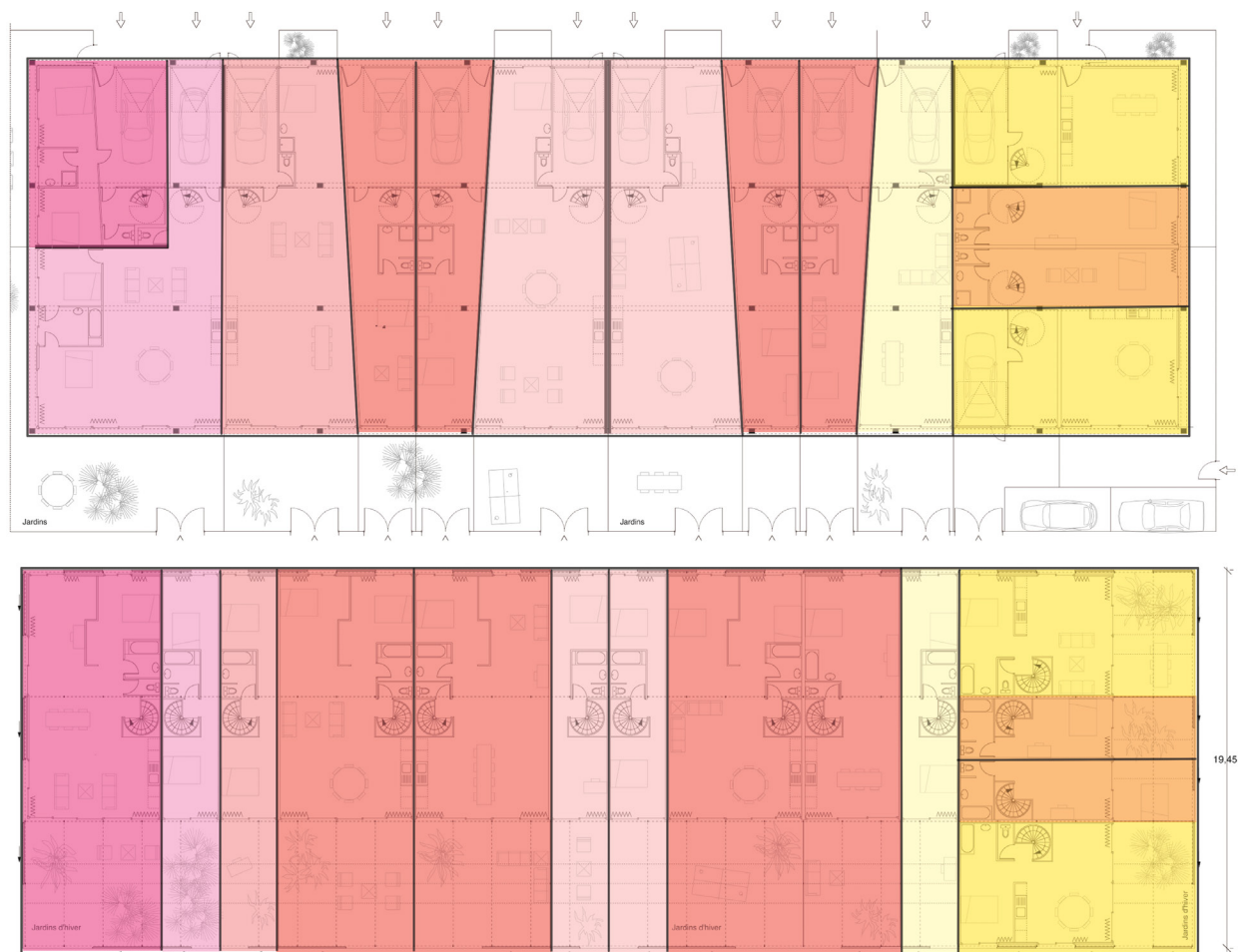


Figure 5.5 -Overall floor plan of Cité Manifeste designed by Lacaton & Vassal, color coded by the author. This shows the relation between the first and second floor of each unit.
Source: lacatonvassal.com

One takeaway from this portion of the precedent is the need for nature. Each unit has access to a greenhouse that can be manually adjusted depending on the season. The greenhouse can open up in the spring and summer, while in the fall and winter, the greenhouse can be closed off from the harsh cold. This allows the residents to have access to and grow their garden all year round.

Overall, Cité Manifeste is inviting and accessible to the surrounding neighborhood. Although fragmented due to ownership, the outside spaces form a continuous and united interface with the dwellings.⁵³ The housing units are traditional urban models that are outward-facing and street-oriented, keeping the residents well connected to the street level where activities, such as informal dinners and gatherings, can occur. However, the architecture of the urban space of this project separated itself from the old neighborhood instead because it is a city within a city, creating this sense of elitism in the residents of Cité Manifeste.⁵⁴ This sense of elitism created a sense of community within Cité Manifeste but isolated it from the rest of the neighborhood.

5.2 - High-Rise Apartment Complexes

High-rise apartment complexes became a popular housing solution in the 1950s after World War II when housing became a significant issue due to destroyed homes and damaged city infrastructure. The population growth resulting from the “baby boom” called for a rapid housing expansion.⁵⁵ The seven main motives that influenced the demand for high-rise housing are:⁵⁶

1. The need to solve long-standing housing shortages.
2. The development of innovative technologies.
3. Confidence in “Modern Architecture” to reach a more just and fair society.

⁵³ Kostourou and Karimi, 52

⁵⁴ Kostourou and Karimi, 52

⁵⁵ R. Turkington, R. Van Kempen, and F. Wassenberg, *High-Rise Housing in Europe: Current Trends and Future Prospects* (Delft: DUP Science, 2004), p. 130

⁵⁶ Ibid 7

4. A desire to protect the countryside from mass development.
5. The demand for improved standards of living.
6. Competition between authorities in the provision of modern housing.
7. The support of governments for radical solutions to meeting housing problems.

I am focusing on the fifth motive, the demand for improved living standards. This desire to improve the overall quality of life by making collective amenities, such as childcare, laundry, grocery stores, and recreation facilities, accessible to make high-rise living comfortable and convenient in the modern city.⁵⁷

⁵⁷ Ibid 8



Figure 5.6 Exterior photo of Shinonome Canal - Block 1
 Source: architecturalmoleskine.blogspot.com/2011/10/toyo-ito-kengo-kuma-etc-shinonome-canal.html

Precedent 02 - Shinonome Canal Court - Block 1

All information is taken from architecturalmoleskine.blogspot.com.⁵⁸ Floor plans are taken from Actar Publisher.⁵⁹

The Shinonome Canal Court is a large-scale apartment complex in Tokyo, Japan that was built in 2003. This apartment complex was built as SOHO, a small office/home office, but its primary goals were to revitalize the role of housing and Tokyo's waterfront. This project is

⁵⁸ Carlos Zeballos, "Toyo Ito, Kengo Kuma, Etc: Shinonome Canal Court," MY ARCHITECTURAL MOLESKINE®, January 1, 1970, <http://architecturalmoleskine.blogspot.com/2011/10/toyo-ito-kengo-kuma-etc-shinonome-canal.html>.

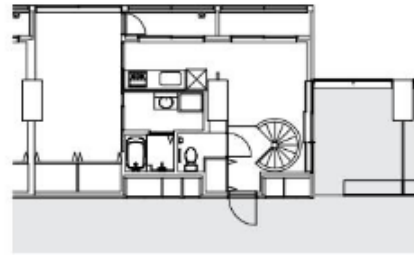
⁵⁹ "Shinonome Canal Court Block 1," in *Total Housing: Alternatives to Urban Sprawl* (Barcelona: Actar, 2010).



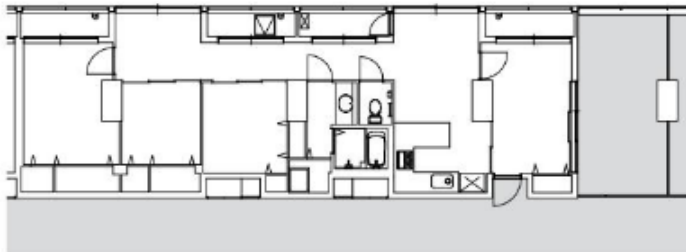
Basic unit



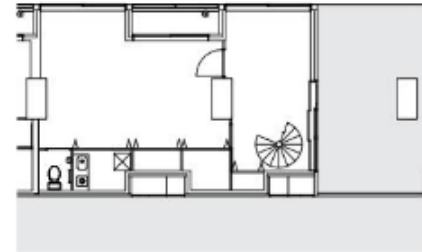
f-room/B type



Upper floor



Sharing / B type

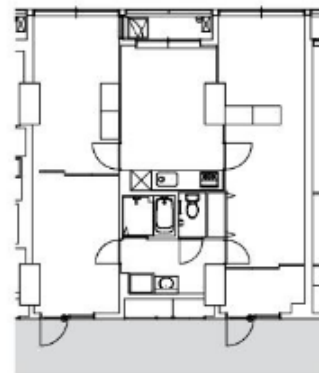


SO (small office) type

Lower floor



f-room / A type



Sharing / A type

Figure 5.7 Typical floor plans of the units of Shinonome Canal - Block 1
Source: Total Housing by Actar Publishers

composed of 6 different blocks by six separate architectural teams. The portion that I will be focusing on is Block 1, designed by Riken Yamamoto & Associates, Architects.

Block 1 has eight different units. Seven of the eight units are apartment units, while the last is a small office unit that takes up two floors. The units are split into four categories: basic units, A-type, B-Type, and SO (small office). The basic units consist of studio-style apartments and a one-bedroom apartment. The common spaces, such as the kitchen and bathroom, are located toward the unit's exterior rather than the unit's entrance, unlike traditional apartment units. A-type and B-type units are the larger housing units. These units are split into two sub-categories: foyer-room and sharing. The foyer room, also known as the foyer, can be used as an office in the home or a place to join in leisure activities with their neighbors. The foyer rooms of units A and B are one-bedroom apartments. The sharing units are multi-bedroom units, with unit A being two-bedroom and unit B is a three-bedroom apartment. All units within Block 1 have adjustable partitions, each adaptable to the residents' needs. The adjustable partitions are used for the sharing units to subdivide the space into temporary bedrooms/offices. For the foyer-room units, the partitions allow the resident to separate the personal living space from the public activities of the foyer room. This allows the unit to change however the user needs.

The shared terraces play a considerable role in creating a community within this apartment complex. The shared terraces are open spaces with double heights and are accessible to all residents. Apartments with shared terraces have the f-rooms with glass curtain walls that partially open the house up. Opening up part of the house to the public helps create a community through active interaction with neighbors rather than opaque apartments, closed off to the rest of the community. To make privacy when needed, these shared terraces and f-rooms have wooden shutters that can be manually adjusted.

This project connects all six blocks through a winding main street connecting a supermarket at one end and a riverside park at the other. Neighborhood amenities such as shops, services, kindergarten, and playgrounds are placed along this main street, providing convenience and

comfort for the neighborhood. The public spaces in the building establish a network of social relations among the inhabitants, promoting a sense of community and socialization of housing at levels rarely seen in Japan. This is done through the transparency of the shared terraces and the foyers that form the hollowed-out volumes of the building.

5.3 - Co-housing vs. Co-living

Multigenerational living, commonly found in detached housing typologies, usually houses these types of households: the three-generation household, two adult generation household, and the four-generation household.⁶⁰ Other forms of multigenerational living include co-housing and co-living, commonly found in larger-scale housing typologies such as apartment complexes.

Co-housing is an intentional community or neighborhood where people know and look after each other. What separates co-housing from other housing models is the intentionality of the model to foster connections and community. The members of co-housing actively create and share in a community. These activities are organized around common characteristics such as building relationships, community participation, shared values, and neighborhood design. Through these activities, a collaboration between families, generations, and members in co-housing becomes second nature due to the intentionality of this housing model to create a tight-knit community. An example of these activities is community dinners where inhabitants would take turns cooking as a group for the whole co-housing community. Activities such as this help build close relationships while fostering community participation.⁶¹ It is also affordable for those wanting to live in a city. Still, the price will be based on 'normal' factors that influence private rentals, such as the quality and desirability of the area of the property and local amenities.⁶²

The standard definition of co-living, widely accepted among providers, is “a modern form

⁶⁰ “Multigenerational Households,” Generations United, accessed November 14, 2022, [https://www.gu.org/explore-our-topics/multigenerational-households/#:~:text=Types%20of%20Multigenerational%20Households&text=A%20few%20common%20types%20include,parent\(s\)%20or%20grandchildren](https://www.gu.org/explore-our-topics/multigenerational-households/#:~:text=Types%20of%20Multigenerational%20Households&text=A%20few%20common%20types%20include,parent(s)%20or%20grandchildren).

⁶¹ “Cohousing,” Schemata Workshop, accessed November 2, 2021, <https://www.schemataworkshop.com/passions-cohousing>.

⁶² Ibid

of housing where residents share living space and a set of interests, values, and intentions.”⁶³ In this housing model, occupants are provided with private bedrooms while the amenities such as kitchens, bathrooms, and entertainment spaces are shared with the rest of the community. Several people rent a co-living space, all living under the same roof and community, but all have their contracts.⁶⁴

5.4 -Conclusion

With the finite amount of land, it is essential to reduce the amount of land used for housing while at the same time increasing the number of available housing units, making it necessary to look at different typologies that offer a higher housing density while having a relatively low urban footprint such as high-rise apartment complexes. However, residents of high-rise apartment complexes are taken away from the ground level and the casual, everyday society on the sidewalks, streets, gardens, and porches.⁶⁵ This argues for low to mid-rise building design rather than high-rise apartment complexes to keep residents connected to their surroundings and establish a neighborhood-like feeling. This leaves a low-rise, high-density development. However, this does not meet the vision of Hawai‘i’s transit-oriented development (TOD) plan. The TOD plan is oriented around the Honolulu Authority of Rapid Transportation (HART) rail stations. The surrounding area will be revitalized through residential, commercial, and institutional programming as low-rise-high-density developments are typically oriented around neighborhood amenities rather than incorporating them. This argues for a middle-ground typology, the mixed-use mid-rise building typology.

One key takeaway from these precedents is a central space for users to interact outside the unit. Creating spaces or nodes for users to interact, regardless of ability and age, is essential for the success of multigenerational living. Without

⁶³ Rachel Osborne, “Best Practices for Urban Coliving Communities” p.1

⁶⁴ Living vs Co-Housing Explained: Co-Living Group,” Accessed April 12, 2022

⁶⁵ Christopher Alexander, A Pattern Language (München: Fachhochsch., Fachbereich Architektur, 1990). p 116

these, the interaction between users will be limited to the residential unit.

Another takeaway from these precedents is the adjustable interiors with partitions, connectivity between the private unit and public space, a central space to connect the users, and the ability. With the use of partitions, the interior space's divisions can create more rooms and separate the private and common spaces. This flexibility of space within the unit allows for a greater variety of uses for the users.

06 | CO-HOUSING

Co-housing is not a new concept. Co-housing originated from the collective movement in the late 1960s in Denmark, and it was developed as a dense, low-rise clustering of individual housing at that time.⁶⁶ Co-housing schemes are urban or suburban settlements often developed on brownfield sites, reusing existing land rather than spreading further across an idyllic landscape.⁶⁷ According to the United States Environmental Protection Agency, a brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.⁶⁸ Co-housing offers what must be actively sought – family, community, and a sense of place.⁶⁹ Co-housing addresses families' social and economic needs today by reestablishing the advantages of a traditional village within the modern context.

6.1 - What is Co-housing?

Co-housing was a way to address the changes in lifestyles in the 1960s. The single-family detached home symbolized the American dream: the working father, a stay-at-home mother, and between 1-4 children. The American dream does not work as a lifestyle today when both parents must work to provide for their families. Issues such as child and elderly care began to arise as the times started to change. After 50 years, co-housing has developed and matured, embracing a multigenerational mix of family types making this an attractive option for young families, single-parent families, retired elderly couples, and single-person households.⁷⁰

⁶⁶ Anna Falkenstjerne Beck, "What Is Co-Housing? Developing a Conceptual Framework from the Studies of Danish Intergenerational Co-Housing," *Housing, Theory and Society* 37, no. 1 (2019): pp. 40-64, <https://doi.org/10.1080/14036096.2019.1633398>.

⁶⁷ Caroline Dove, *Radical Housing: Designing Multigenerational + Co-Living Housing for All* (London: RIBA Publishing, 2020), 85.

⁶⁸ "Brown Fields," EPA (Environmental Protection Agency), accessed September 17, 2022, <https://www.epa.gov/brownfields/overview-epas-brownfields-program>.

⁶⁹ Kathryn McCamant, Charles Durrett, and Ellen Hertzman, *Cohousing: A Contemporary Approach to Housing Ourselves* (Berkeley, CA: Ten Speed Press, 2003), 35.

⁷⁰ Chris ScottHanson and Kelly ScottHanson, *The Cohousing Handbook: Building a Place for Community* (Gabriola Island, BC: New Society Publishers, 2005), 2.

The individual developments for co-housing vary in size, location, design, and priorities but share common characteristics:⁷¹

- Intentional neighborhood design
- Participatory process and Resident Management
- Private homes and shared facilities

Intentional neighborhood design is about the physical structure of the project. The design encourages and builds a strong sense of community, prioritizing the human scale with central pedestrian walkways and keeping cars relegated to the edge of the project. The participatory process refers to future residents participating in the planning and designing of their community. In contrast, resident management refers to how the residents manage their community by voicing common concerns at regular community meetings.⁷² The private homes and shared facilities refer to how co-housing allows each family to have individual residences but share extensive common facilities with the rest of their community. These shared facilities include a large kitchen and dining hall, children's playrooms, workshops, guest rooms, and laundry.⁷³ These are separate from the individual dwellings as it is located in what is commonly referred to as the "Common House."

Co-housing has many benefits, such as creating a safe and supportive environment, opportunities for social interaction, sharing resources and childcare, and a diverse generational community.⁷⁴ A safe and supportive environment is built from the opportunities for social interaction where families get to know their neighbors personally while eliminating the feeling of isolation. Co-housing communities construct relationships quickly due to opportunities to share their skills and talents, such as music, cooking, gardening, etc. Sharing resources allows residents to access more facilities than they would own, such as gardens, play areas, workshops, crafts rooms, and lounges, which are common co-housing facilities. Finally, living with people of all ages provides diverse experiences. While other communities may separate people by age, co-housing brings

⁷¹ McCamant, et all. Cohousing: A Contemporary Approach to Housing Ourselves 36

⁷² Ibid

⁷³ McCamant, et all.

⁷⁴

everyone together.⁷⁵

6.2 - How does it fit into Hawaii?

Kono, meaning to invite, and hiki, meaning ability, create the word konohiki, meaning to invite willingness.⁷⁶ In pre-contact Hawaii, chiefs and chiefesses -individuals with the role of konohiki- were part of a more extensive network of community kuleana (responsibility) to share food, work, and talents.⁷⁷ Community members had roles they needed to fulfill for the whole community to prosper. Today, we see konohiki in the community through the community helping each other during hard times. Mehana B. Vaughan talks about konohiki in her book, “Kaiaulu - Gathering Tides.” An interviewee gave anecdotes about how the community would help each other out. Everyone made sure that each family was taken care of, especially during hard times, such as an economic recession or a death in the family, when they couldn’t provide enough for themselves.

“Community, well, all local people. Japanese, Filipino, Hawaiian few haole [Caucasian]. Everybody lives together, they help each other. Never need to be told. They see with their eyes; they can see that person need help. They come, that closeness, everybody helps each other. They have their ups and downs but they were always there.”⁷⁸

⁷⁵ Scotthanson and Scotthanson, The Cohousing Handbook: Building a Place for Community

⁷⁶ Mehana Blaich Vaughan, Kaiāulu Gathering Tides (Corvallis, OR: Oregon State University Press, 2018), 58.

⁷⁷ Ibid.

⁷⁸ Ibid. 67



Figure 6.1 - Marmalade Lane
Source: Mole Architects

6.3 - Co-housing Precedents

Precedent Study 01: Marmalade Lane Co-Housing

All information is taken from Archdaily.com.⁷⁹ Images and floor plans used for analysis taken from molearchitects.co.uk⁸⁰

Marmalade Lane Co-housing is located in Cambridge, United Kingdom, designed by Mole Architects. It is Cambridge's first co-housing development which was completed in 2018. The development is comprised of 42 homes – a mix of both large houses and apartments. The large houses are a mix of two-to-five-bedroom units, while the apartments are a mix of one-and-two-bedroom units. A prominent design feature of this precedent is the shared spaces and communal facilities – designed to foster community spirit and sustainable living. The shared gardens are the focal space for the community, with areas for growing food, play, and socializing. The flexible

⁷⁹ Daniel Tapia, "Marmalade Lane Cohousing Development / Mole Architects," ArchDaily (ArchDaily, June 26, 2019), <https://www.archdaily.com/918201/marmalade-lane-cohousing-development-mole-architects>.

⁸⁰ "Marmalade Lane," Mole MarmaladeLane, accessed March 17, 2022, <https://www.molearchitects.co.uk/project/marmalade-lane>.

common house contains a playroom, guest bedrooms, laundry facilities, meeting rooms, and a large hall and kitchen for shared meals and parties. A small gym and a workshop are located elsewhere on the site.

All single-family housing units are 3-levels and have been custom-built to tailor to the needs of the intended resident, all without the risks or complexity of self-built while balancing personalization with the visually cohesive architectural style. This layout has all of the shared spaces on the first floor, and the remaining two contain the bedrooms. This separation of shared and private spaces is effective because it physically separates them vertically and keeps the private spaces relatively connected by keeping the bedrooms adjacent. The advantage of having single-family housing is that it allows for more oversized private bedrooms due to these being multiple levels compared to the apartment units, which are single-level units.

Mole Architects design is a street based-development to create a scheme that knits it into the existing neighborhood while meeting the needs for private and shared spaces. “The Lane” is a child-friendly, car-free ‘street’ through the development that encourages neighborly interaction and invites the existing neighborhood in. The lane ensures that the development looks not only inward but outward as well.

A-Type House (3-Bedroom)	Private Spaces		Common Spaces		Circulation		Total amount of unit type:	19
							Total Overall SF	27170
Floor 1								
	Name	SF	Name	SF	Name	SF		
			Kitchen	75	Circulation	82		
			Living + Dining	271				
			Half Bath	24				
			Outdoor Space	237				
Floor 2								
	Name	SF	Name	SF	Name	SF		
	Bedroom 2	174	Bathroom 1	55	Circulation	103		
	Bedroom 3	108	Storage	10				
Floor 3								
	Name	SF	Name	SF	Name	SF		
	Bedroom 1	141	Shower Room	60	Circulation	57		
			Storage	33				
	Subtotal SF:	423	Subtotal SF:	765	Subtotal SF:	242	Total SF	1430
	% of area	30%	% of area	53%	% of area	17%		
B-Type House (4-Bedroom)	Private Spaces		Common Spaces		Circulation		Total amount of unit type:	6
							Total Overall SF	9420
Floor 1								
	Name	SF	Name	SF	Name	SF		
			Kitchen	86	Circulation	101		
			Living + Dining	300				
			Half Bath	28				
			Outdoor Space	262				
Floor 2								
	Name	SF	Name	SF	Name	SF		
	Bedroom 2	148	Bathroom 1	80	Circulation	103		
	Bedroom 3	117						
	Bedroom 4	75						
Floor 3								
	Name	SF	Name	SF	Name	SF		
	Bedroom 1	197	Storage	17	Circulation	56		

Table 6.1 - Marmalade Lane unit analysis

Source: Author

	Subtotal SF:	537	Subtotal SF:	773	Subtotal SF:	260	Total SF	1570
	% of area	34%	% of area	49%	% of area	17%		
D-Type Apartment (2-Bedroom)	Private Spaces		Common Spaces		Circulation		Total amount of unit type:	14
							Total Overall SF	12642
	Name	SF	Name	SF	Name	SF		
	Bedroom 1	125	Kitchen	100	Circulation	110		
	Bedroom 2	103	Living + Dining	320				
			Bathroom	45				
			Outdoor Space	100				
	Subtotal SF:	228	Subtotal SF:	565	Subtotal SF:	110	Total SF	903
	% of area	25%	% of area	63%	% of area	12%		
E-Type Apartment (1-Bedroom)	Private Spaces		Common Spaces		Circulation		Total amount of unit type:	3
							Total Overall SF	2463
	Name	SF	Name	SF	Name	SF		
	Bedroom 1	116	Kitchen	93	Internal Circulation	76		
			Living + Dining	251	External Vertical Circulation	135		
			Bathroom	50				
			Outdoor Space	100				
	Subtotal SF:	116	Subtotal SF:	494	Subtotal SF:	211	Total SF	821
	% of area	14%	% of area	60%	% of area	26%		
Overall Site	Private Spaces		Shared Spaces		Circulation			
	Name	SF	Name	SF	Name	SF		
	Residential	51695	Common House	3967	Pedestrian only Lane	15354		
			Shared Garden	7340	External Circulation	15207		
			Parking	15501				
			Open Green Space	29940				
	Subtotal SF:	51695	Subtotal SF:	56748	Subtotal SF:	30561	Total SF	139004
	% of area	37%	% of area	41%	% of area	22%		

Table 6.1 - Marmalade Lane unit analysis continued.
Source: Author

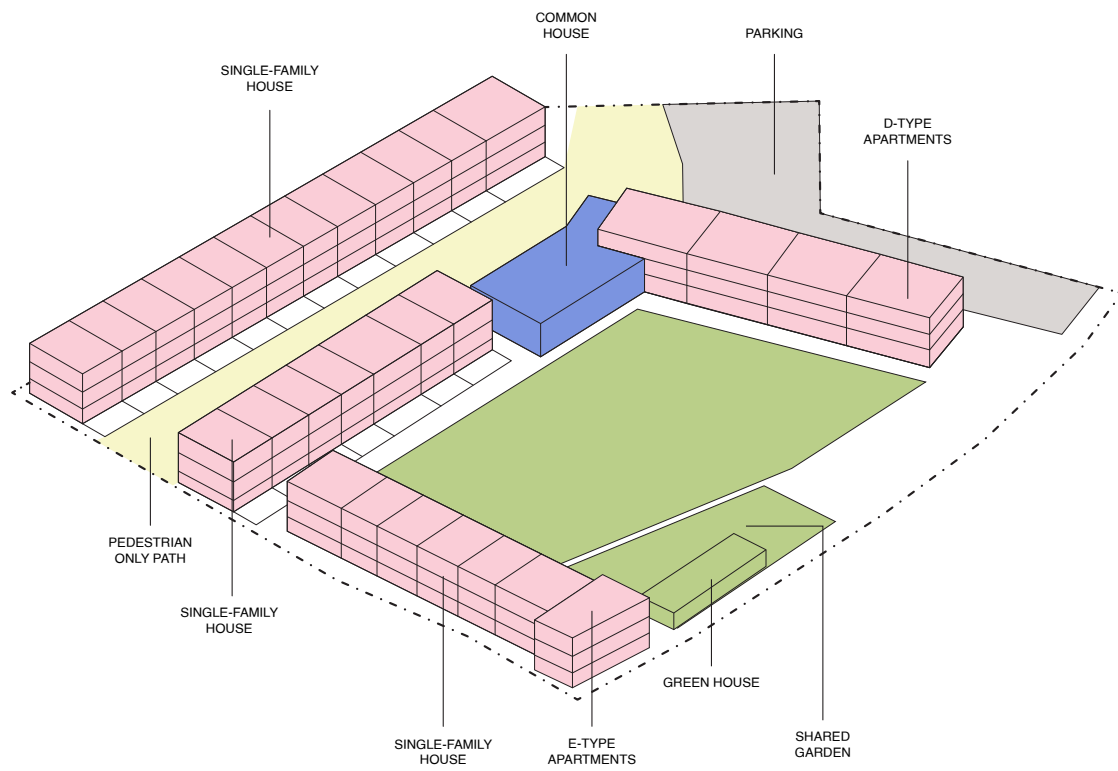


Figure 6.2 - Program massing diagram highlighting key components of the site
Source: Author



Figure 6.3 -Ritterstrasse 50
Source: Mole Architects

Precedent Study 02: Ritterstrasse 50

All information and floor plans used in this analysis are taken from Archdaily.com.⁸¹

Co-housing at Ritterstrasse 50 is in Berlin, Germany, was completed in 2014. It was designed by the architecture firm Heide & von Beckerath and ifau und Jesko Fezer. Set in a street of mid-rise blocks, “R50” comprises 19 flats in an eight-story block. The residents wanted affordable homes and as much flexibility for future adaptation. As a result, a concrete frame and a common standard for fixtures and fittings within each apartment were used. Each apartment was

⁸¹ Daniel Sánchez, “R50 – Cohousing / Ifau Und Jesko Fezer + Heide & Von Beckerath,” ArchDaily (ArchDaily, February 8, 2015), <https://www.archdaily.com/593154/r50-nil-cohousing-ifau-und-jesko-fezer-heide-and-von-beckerath>.

left to be fitted out and finished by the residents to their choice. The architectural concept is based on a compact and efficient structure with carefully detailed connections on different scales to meet the owner's aspiration for collective and affordable living. It maximizes its capacity for adaptation and flexibility throughout its lifetime. This maximization for adaptation and flexibility opened up a mutual agreement between residents of the location, design, and size of the shared spaces

R50 connects to the surrounding neighborhood through a semi-basement double-height, flexible community space. It combines the building's direct access with the street access making this space available to neighborhood groups and other public uses. The guest facilities on the upper level had previously been used as temporary shelters for refugees.

	Private Space		Common Space		Circulation		Shared Space	
	Name	SF	Name	SF	Name	SF	Name	SF
1st floor							Common House	2400
2nd floor	Residential Units	1556			Internal Circulation	550		
	Residential Units	2553			Internal Circulation	301		
3rd floor	Residential Units	2553			Internal Circulation	301		
	Residential Units	2553			Internal Circulation	301		
4th floor	Residential Units	2553			Internal Circulation	301		
	Residential Units	2553			Internal Circulation	301		
5th floor	Residential Units	2553			Internal Circulation	301		
	Residential Units	2553			Internal Circulation	301		
6th floor	Residential Units	2553			Internal Circulation	301		
	Residential Units	2553			Internal Circulation	301		
7th floor	Residential Units	2553			Internal Circulation	301		
	Residential Units	1706			Internal Circulation	280	Shared Space	837

Table 6.2 - Overall analysis of R50 by floor.
Source: Author

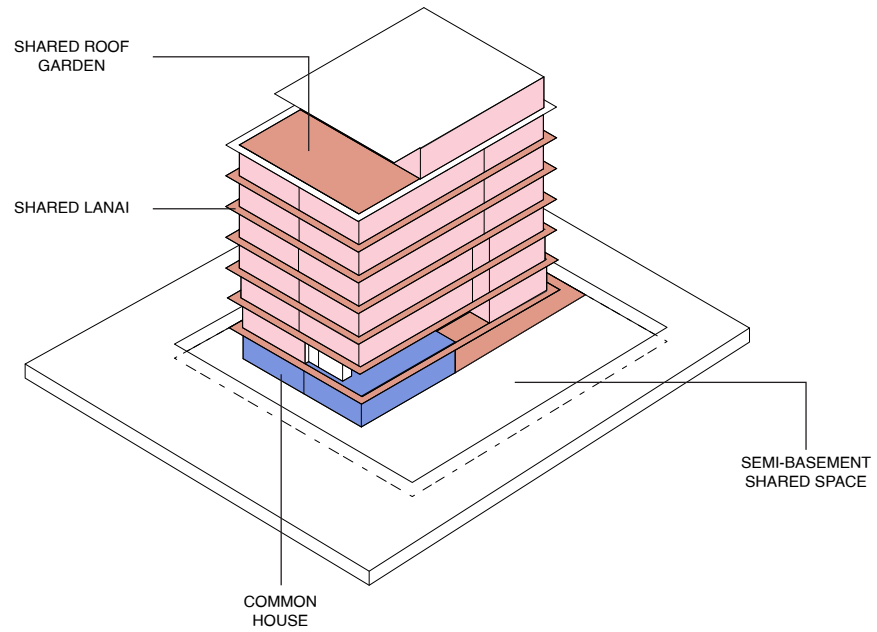


Figure 6.4 - Program massing analysis diagram of R50 highlighting the key components of the project
Source: Author



Figure 6.5 - Capitol Hill Urban Co-Housing (CHUC)
Source: Mole Architects

Precedent Study 03: Capitol Hill Urban Co-housing (CHUC)

All information, images, and floor plans used to create this analysis are from the CHUC website.⁸²

Capitol Hill Urban Co-housing is a 5-story, mixed-use building in Capitol Hill, Seattle, completed in 2016 and designed by Schematic Workshop. The first floor is dedicated to commercial space, while the upper four floors are dedicated to residential programs. The second floor contains both residential units and the common house. The residential units are a mix of 1-2-bedroom with additional programs such as dens and home offices. This allows for limited customization to address the personal preferences of the families.

The shared indoor and outdoor amenities are located on the second floor and on the roof. The Common House contains the communal kitchen and communal room, the guest room, storage, and trash/recycling. Just outside is the patio deck shared by all the residents. On the roof is a community garden used by the residents to grow food for their community and family dinners.

⁸² "Capitol Hill Urban Cohousing in Seattle - an Overview," Capitol Hill Urban Cohousing, accessed April 14, 2022, <https://capitolhillurbancohousing.org/overview/>.

The food grown in the community garden is also used by a local farm-to-table restaurant nearby.

The small area of the site allowed the project's design to have a condensed circulation, opposite the traditional suburban co-housing models. The circulation stacked around the courtyard creates a constant visual connection between the vertical circulation and the residential units. This creates a sense of connection to resident activity within the community.

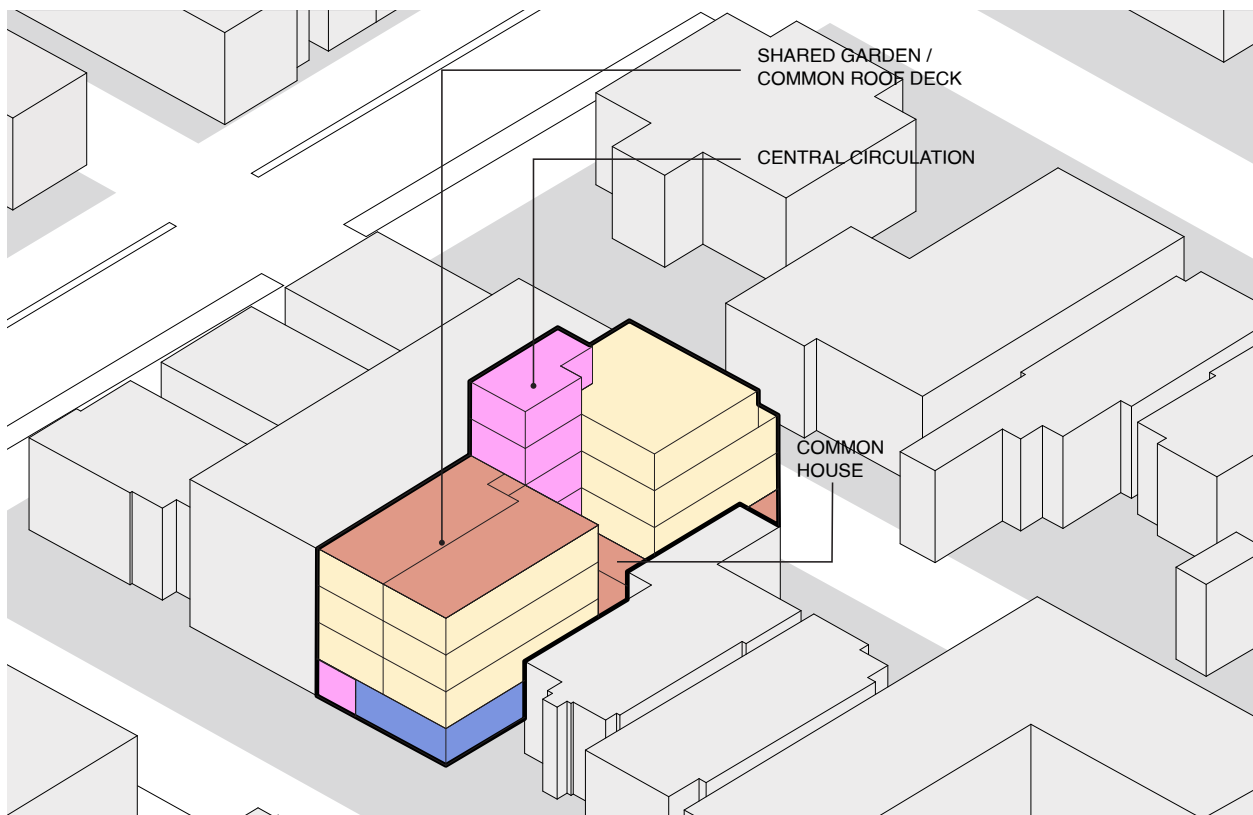


Figure 6.6 - Program massing diagram of CHUC
Source: Mole Architects

Name	Private Spaces		Common Spaces		Circulation		Shared Spaces	
1st Floor								
	Name	SF	Name	SF	Name	SF	Name	SF
					Corridor	560	Storage	648
					Entry	108	Bike Storage	96
					Vertical		Utilities	244
					Circulation	370	Mailbox	80
						Commercial/Office	2011	
					subtotal SF	1038	subtotal SF	3079
					% of Area		% of Area	
2nd Floor								
	Name	SF	Name	SF	Name	SF	Name	SF
Unit 1	Bedroom 1	125	Kitchen	115	Entry	50		
			Living/Dining	221	Circulation	70		
			Office	101				
			Den	112				
			Bathroom 1	60				
		Bathroom 2	60					
		Laundry	20					
	subtotal SF	125	subtotal SF	689	subtotal SF	120	subtotal SF	
	% of Area		% of Area		% of Area		% of Area	
Unit 2	Bedroom 1	121	Kitchen	185	Entry	30		
	Bedroom 2	161	Living/Dining	115	Circulation	185		
			Den	40				
			Bathroom 1	60				
			Half bath	40				
		Laundry	20					
	subtotal SF	282	subtotal SF	460	subtotal SF	215	subtotal SF	
	% of Area		% of Area		% of Area		% of Area	
Common House					Building		Common	
					Circulation	636	Patio	487
							Community	
							Room	668
							Laundry	60
						Guest		
						Bedroom 01	208	
						Guest Bath	80	
						Trash /		
						Recycling	136	
						Storage	62	
	subtotal SF	0	subtotal SF	0	subtotal SF	636	subtotal SF	1701
	% of Area		% of Area		% of Area		% of Area	
3rd-4th Floor								
	Name	SF	Name	SF	Name	SF	Name	SF
Unit 1	Bedroom 1	125	Kitchen	115	Entry	50		
			Living/Dining	221	Circulation	70		
			Office	101				
			Den	112				
			Bathroom 1	60				
		Bathroom 2	60					
		Laundry	20					

Table 6.3 - CHUC unit spatial analysis
Source: Mole Architects

	subtotal SF % of Area	125	subtotal SF % of Area	689	subtotal SF % of Area	120	subtotal SF % of Area	
Unit 2	Bedroom 1	121	Kitchen	185	Entry	30		
	Bedroom 2	161	Living/Dining Den	115 40	Circulation	185		
			Bathroom 1	60				
			Half bath	40				
			Laundry	20				
	subtotal SF % of Area	282	subtotal SF % of Area	460	subtotal SF % of Area	215	subtotal SF % of Area	
Unit 3	Bedroom 1	154	Kitchen	230	Entry	75		
	Bedroom 2	137	Living/Dining Office	1121 55	Circulation	65		
			Bathroom 1	77				
			Halfbath	37				
			Laundry	58				
			Outdoor Space	252				
	subtotal SF % of Area	291	subtotal SF % of Area	1830	subtotal SF % of Area	140	subtotal SF % of Area	
Building Circulation				Vertical Circulation Corridors		300 155		
	subtotal SF % of Area	291	subtotal SF % of Area	2082	subtotal SF % of Area	0	subtotal SF % of Area	
5th Floor								
	Name	SF	Name	SF	Name	SF	Name	SF
Unit 1	Bedroom 1	154	Kitchen	230	Entry	75		
	Bedroom 2	137	Living/Dining Office	1121 55	Circulation	65		
			Bathroom 1	77				
			Halfbath	37				
			Laundry	58				
	subtotal SF % of Area	291	subtotal SF % of Area	1578	subtotal SF % of Area	140	subtotal SF % of Area	
Roof				Vertical Circulation Building Circulation		300 100	Shared gardens	1940
	subtotal SF % of Area	291	subtotal SF % of Area	1578	subtotal SF % of Area	400	subtotal SF % of Area	1940

Table 6.3 - CHUC unit spatial analysis continued.
Source: Mole Architects



Figure 6.7 -Daybreak Co-Housing
Source: Mole Architects

Precedent 04 - Daybreak Co-Housing

All information, images, and floor plans used for this analysis are taken from the Daybreak Co-Housing website.⁸³

Daybreak Co-Housing is a complex of four multi-story buildings, three with residential units and one large Common House with residential units on top. It is located in the Overlook neighborhood of North Portland, Oregon. It was completed in 2009 and designed by Schemata Workshop. The residential units range from 1-3 bedrooms with a total amount of 30 units. The units are connected through the outdoor walkways and visually with the central courtyard.

The common house contains a communal kitchen, dining room, lounge, guest rooms, and workshops. Another shared space is the courtyard area containing shared gardens and the children's play area..

⁸³ "Daybreak Cohousing," Daybreak Cohousing, accessed April 14, 2022, <https://www.daybreakcohousing.org/>.

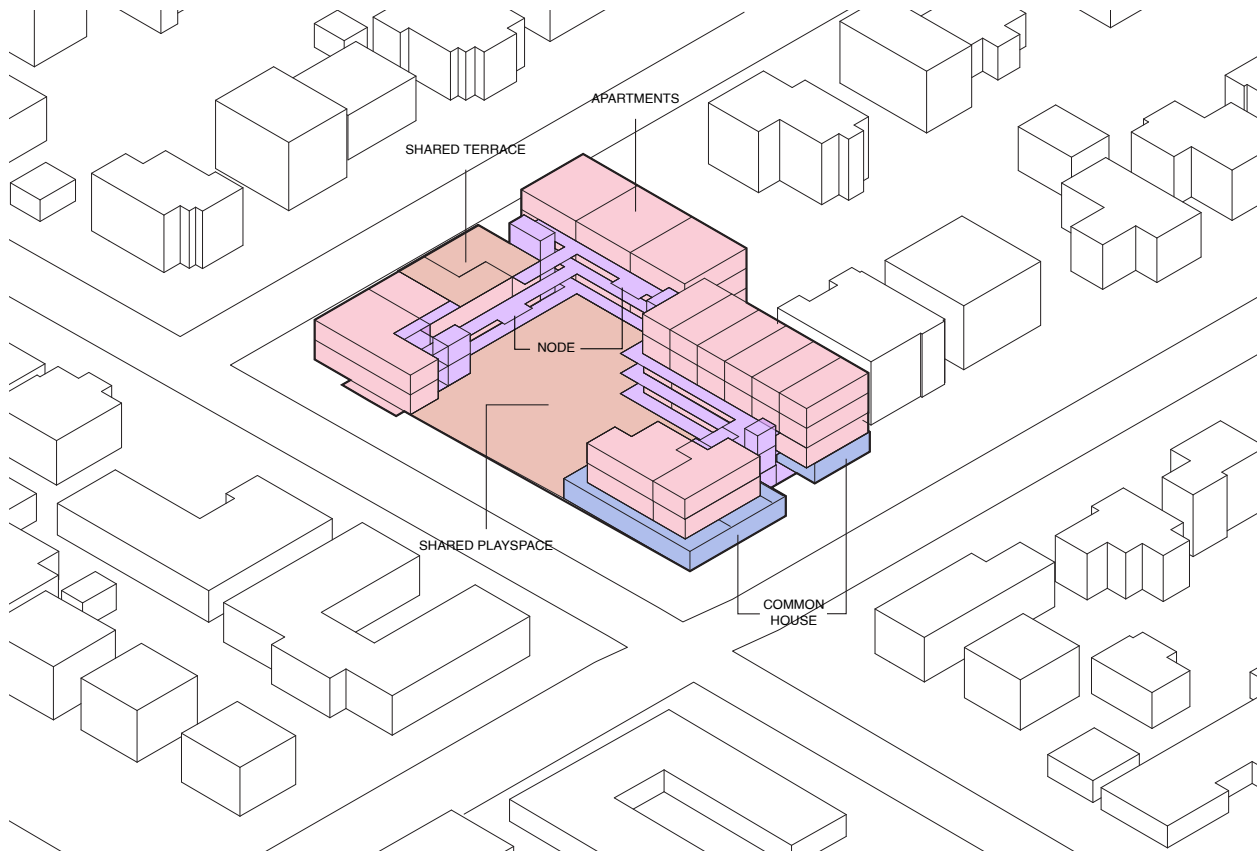


Figure 6.8 - Program massing diagram of Daybreak Co-Housing
Source: Author

6.4 - Key Takeaways

Marmalade Lane:

- Creating a neighborhood connection creates a more vibrant community
 - Pedestrian-only Lane creates a safe zone for pedestrians from cars inviting more people into the site
- The common house location acts as a central point for the site. The placement of it is next to the open green space, the pedestrian-only lane, and the rest of the residential units.

Ritterstrasse 50

- The open floor plan for the residential units allowed the unit to be finished by the residents allowing the unit to be custom fit for the users' needs.
- The placement of the common house in a double-height semi-basement creates a gateway between the residential units and the public. This is the entry point into their community since it is the first space in the community.

Capitol Hill Urban Co-Housing

- Create a visual connection between all units to the shared spaces.
- The placement of the common house makes it a focal point of the community through the visual connections from the residential units.

Daybreak Co-housing

- Small nodes in front of residential units create informal gathering spaces.
- The common house expands outwards toward the courtyard through the terrace space connecting all the significant shared spaces on the ground level.

Conclusion

Co-housing is a multi and intergenerational housing concept that creates a tight-knit community. From the beginning of the design process, residents are involved heavily in the planning and design because these housings are for them. Residents of co-housing communities are intentional in everything they do— selecting a site, the facilities shared for the common house, and the connection to the surrounding neighborhood. In the previous chapter, we have seen in the case study of The Cité Manifeste that it was a planned community designed with residents chosen. However, this led to a sense of elitism that created a rift with the surrounding neighborhood creating a sense of a city within a city rather than a cohesive neighborhood. With these co-housing precedents, the residents have been involved with the planning and design process from the beginning to create a holistic approach connecting them and their surrounding neighborhoods.

Another integral part of co-housing is the common house, where most communal activities

and facilities are located. It must be accessible to the whole development. Like A Pattern Language by Christopher Alexander, the common house has its signature patterns within the community. These patterns include:⁸⁴

- Roles in the community
 - Activity nodes
 - Central building
- Programs
 - Communal eating
 - Community Hall
 - Guest rooms
 - Community facilities
- Site planning
 - Focal Point
 - Gateway to community

⁸⁴ Schemata Workshop Follow this publisher - current follower count:16, "Cohousing Common House Design," Issuu, April 22, 2014, https://issuu.com/schemataworkshop/docs/cohousing_common_house_design.

07 | CO-HOUSING DESIGN FRAMEWORK

The co-housing design framework ensures that the proposed co-housing project goes through a process that ensures a thoughtful design that connects to and enhances the community at different scales. In this chapter, I will review the requirements for the different scales and the design guidelines.

7.1 - Different Scales

Before getting into the different guidelines for the design framework, we need to address the different scales needed:

1. Neighborhood scale
2. Building/Site scale
3. Residential scale
4. User scale

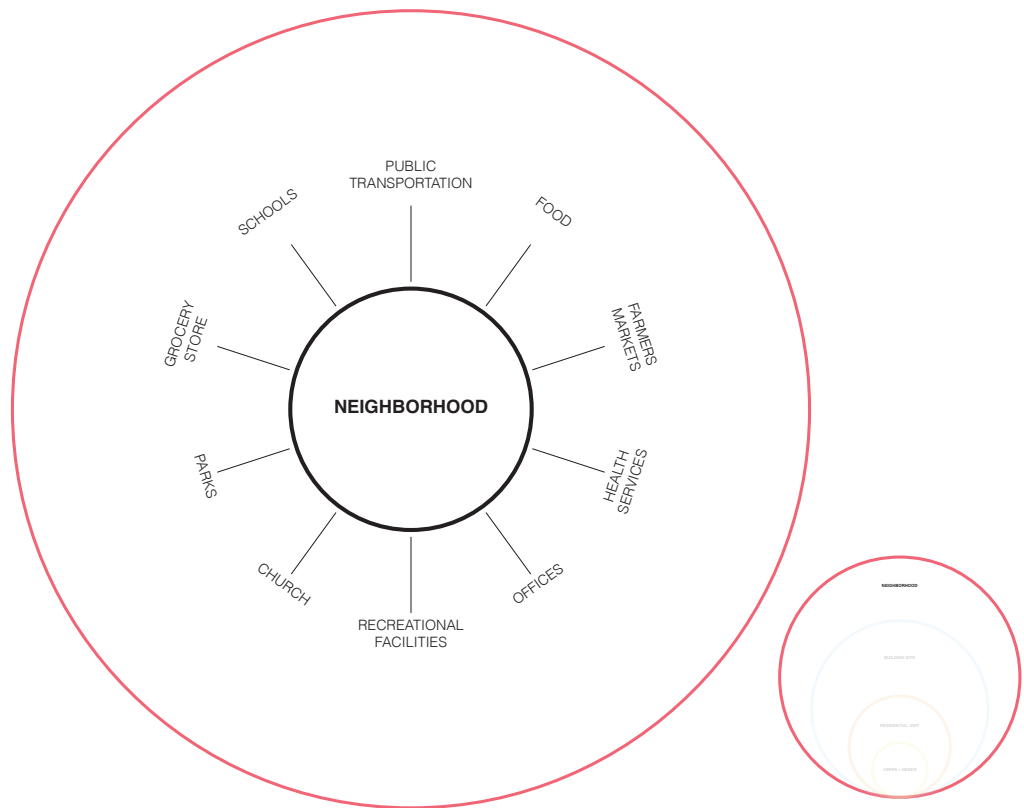


Figure 7.1 - Neighborhood scale diagram showing what amenities sustain a neighborhood.
Source: Author

Neighborhood Scale

At the neighborhood scale, specific amenities are needed for a thriving community. These amenities bring forth life and activity to the neighborhood. Essential amenities that sustain a neighborhood are:

- Schools
- Public transportation
- Grocery stores
- Parks

Amenities that bring attract people to the neighborhood are:

- Farmers markets
- Health services
- Offices
- Restaurants
- Church
- Recreational facilities

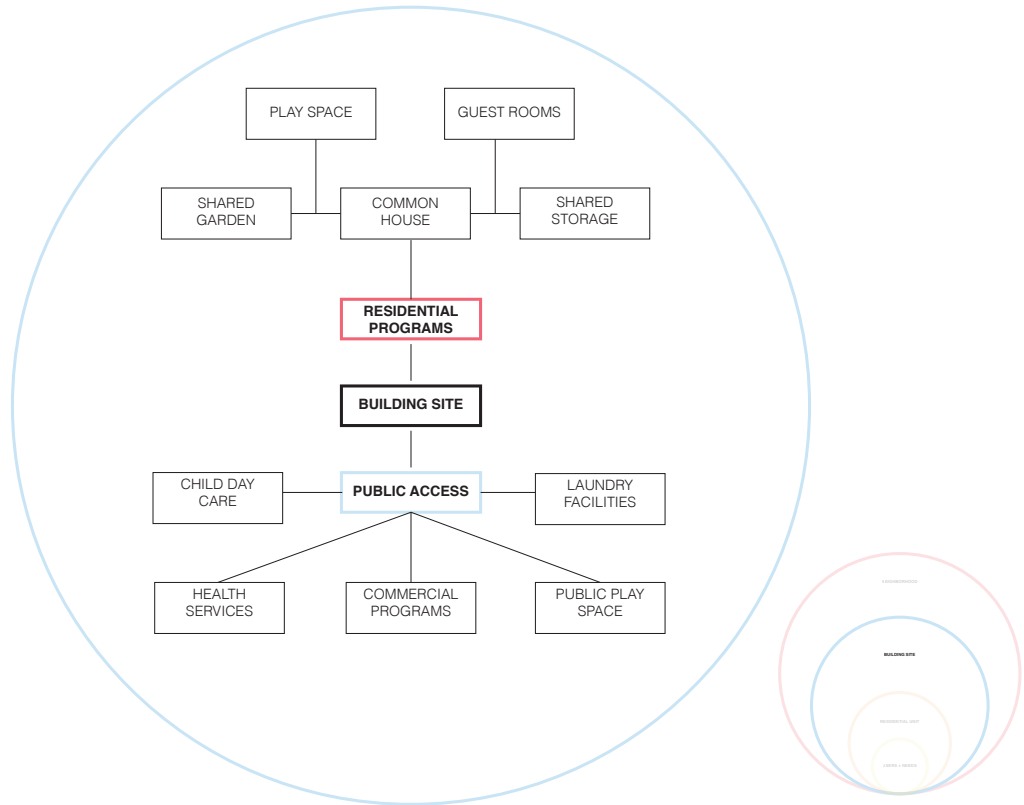


Figure 7.2 - Building/site scale diagram indicating what the different needs for the public realm and the residential needs are.
Source: Author

Building/Site Scale

Two main aspects must be addressed at the building scale: residential programs and public access. When addressing residential programs are semi-public programs that invite non-residents to interact with the residents, and private programs are only for the residents. Examples of this are the common house and shared gardens. Public access addresses potential commercial and business programs that would attract people to the site, including farmer's markets, health services, and child daycare.

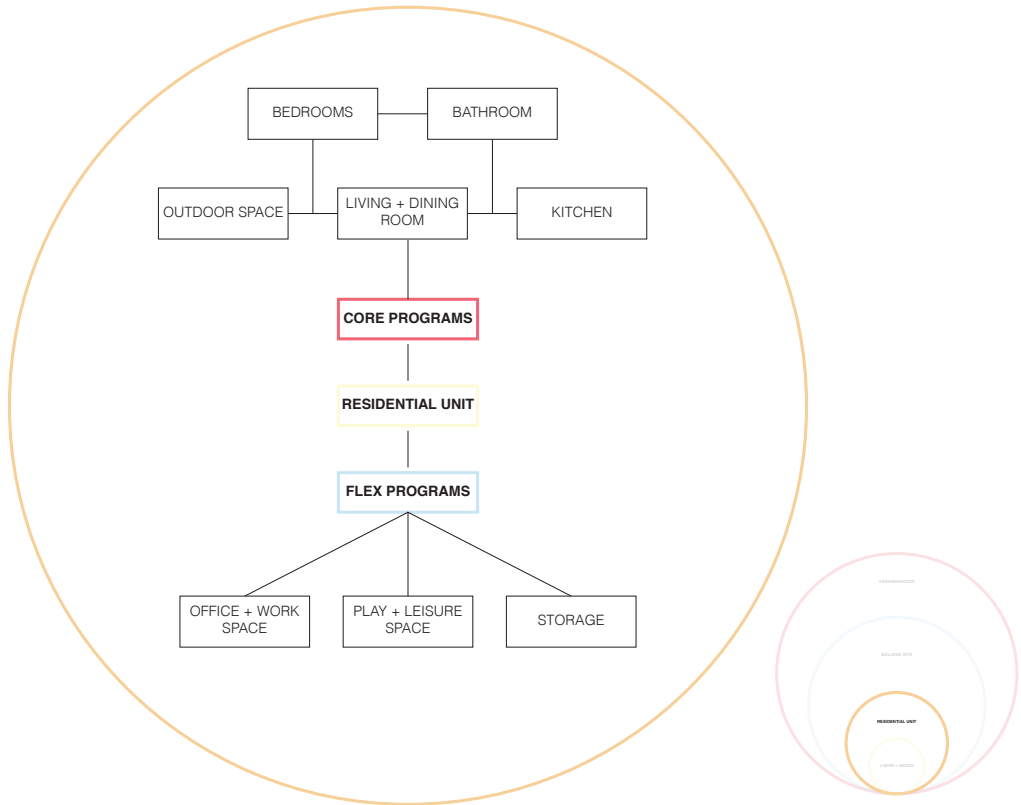


Figure 7.3 - Residential scale diagram indicating the different types of programs found within a unit.
Source: Author

Residential Scale:

At the residential scale, there are two main programs to address: core and flex programs. Core programs are necessary programs within the residential unit that is needed for the resident to live comfortably. These are the bedrooms, bathroom, living and dining room, kitchen, and outdoor space. Flex programs are additional programs to the residential space that add quality to the unit's life. Examples are storage, play and leisure space, and office/workspace. These are optional programs that bring additional versatility and value to the unit.

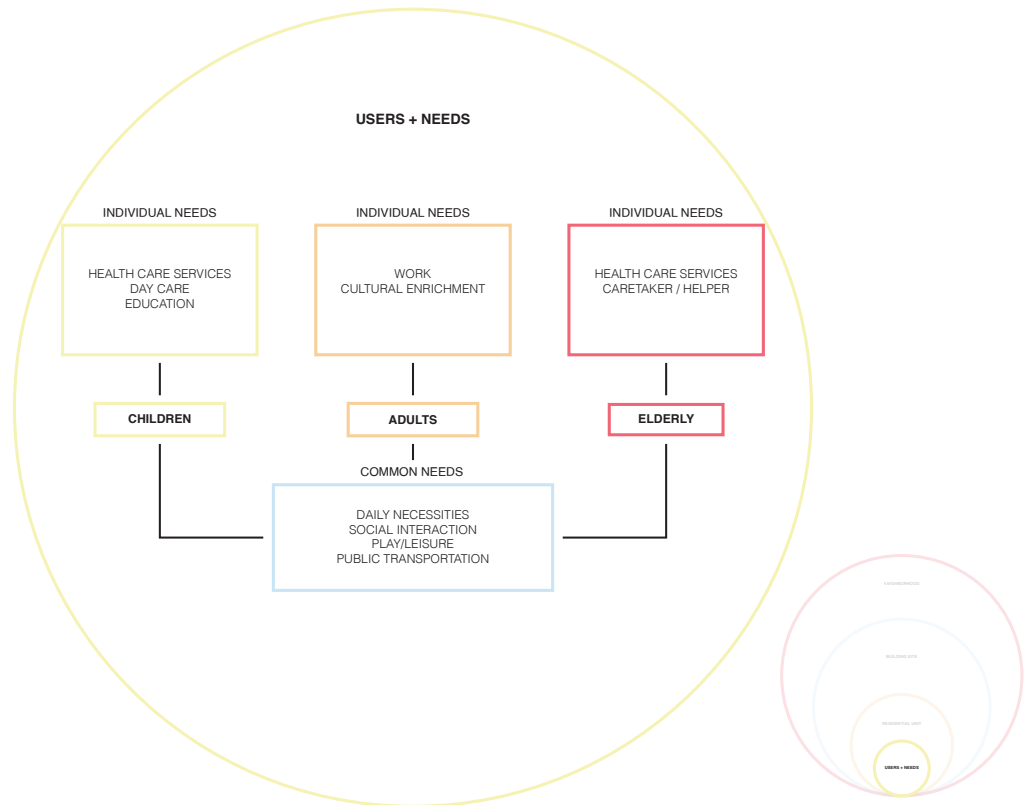


Figure 7.4 - The individual and common needs of each user age group.
Source: Author

User scale

At the user scale, you are addressing the needs of the different users. The users are organized by age groups: child, adult, and elderly. What are the everyday needs of these age groups? What are the individual needs of these age groups? Refer to Figure 7.4 below to see the individual needs for each age group and the common needs shared between each. I defined “daily necessities” as a place to rest, eat and relax from the public realm.

7.2 Site Selection:

When picking a site, there are two sets of factors that are needed to be taken into consideration.

Primary Factors:

- **Walkability:** Where are the neighborhood amenities located? Are they within the walking zone defined by the Transit Oriented Development (TOD) as a quarter-mile walking radius? Using the area defined as the walking zone by TOD ensures that the site will be a mix of residential, commercial, and institutional uses incorporating transit options, including walking, biking, and public transit.
- **Accessibility:** Is the site accessible from major roadways? How accessible is public transportation to and from the site? Accessibility to and from the site stresses the importance of a design for all age groups. This universal design should concern children, adults, and the elderly to prevent social discourse among family members and residents.
- **Demographics:** What type of demographic exists in the area? What kind of demographic are you trying to attract to the site? For an ideal multigenerational environment, it is necessary to include children, adults, and the elderly. Overall, designing for an evolving nuclear family is the primary setting when creating a multigenerational environment.
- **Neighborhood Amenities:** What are the existing amenities in the current neighborhood? (i.e., Schools, marketplaces, shopping centers, etc.)

Secondary Factors:

- **Views:** What are potential views around the area that can increase the value of the project?
- **Neighborhood context:** What buildings are located around the projected site? Understanding what type of buildings are in the area (low-to-high-rise buildings, industrial, commercial, etc.) will determine the scale of the building due to the

importance of the building to connect back to the surrounding neighborhood.

For this dissertation, I found three potential sites that can be used for co-housing development: Waipahu, Kalihi, and Kaka'ako. Each site was found using the HART rail stations as a focal point and TOD's walkability radius to set the range from these stations. Figures 7.5-7.7 are the potential sites shown with the intention of two different building scales in mind.

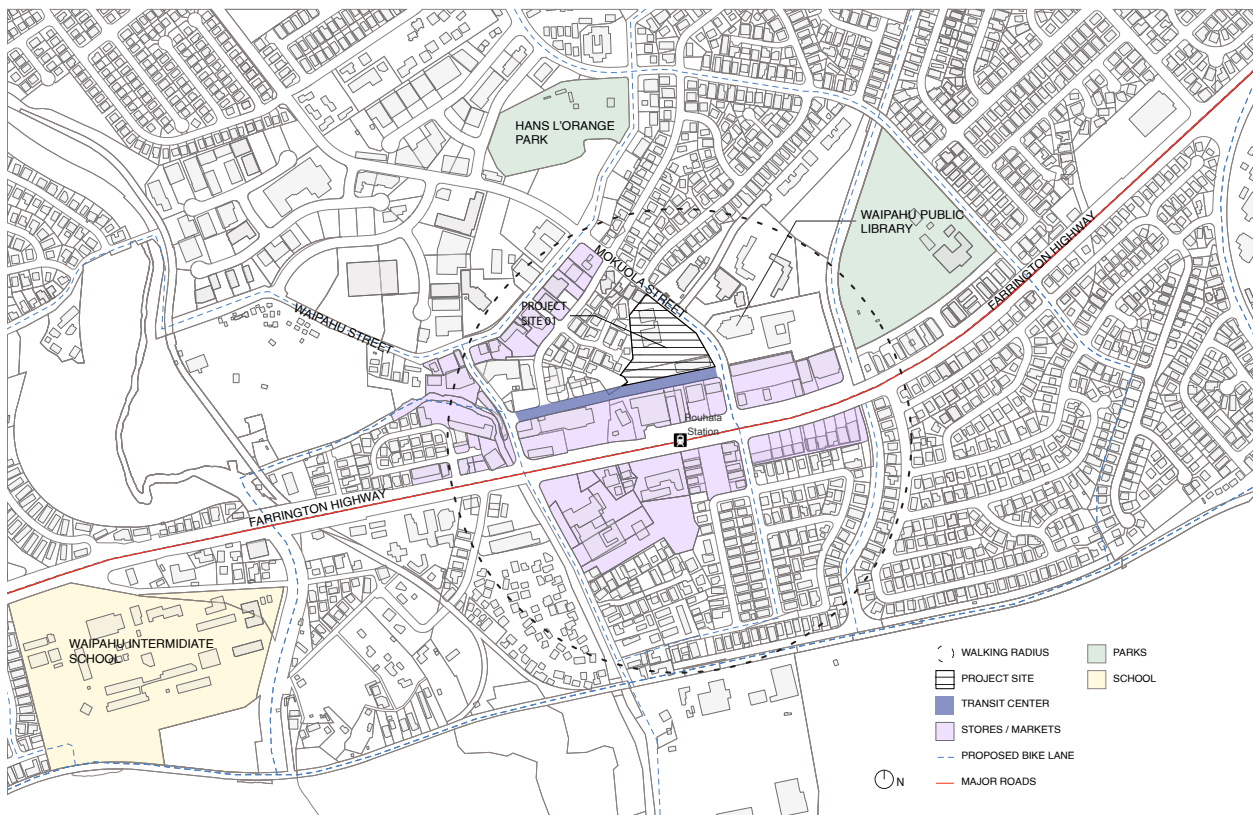


Figure 7.5 - Existing site plan of the potential site for Waipahu.
Source: Author



Figure 7.6 - Existing site plan for the potential site in Kalihi.
Source: Author

By applying the primary and secondary factors listed before and coordinating along with the existing TOD Neighborhood plans, both Waipahu and Kalihi sites are best used for low-mid-rise buildings due to the older characteristics of these towns. For Kalihi, this potential site was chosen as the future redevelopment for the area around the Mokuauia Station is envisioned with a greater active frontage with higher density in-fill housing, as stated in the Kalihi Neighborhood TOD plan.⁸⁵

⁸⁵ "City and County of Honolulu," Kalihi Neighborhood Transit-Oriented Development Plan, June 2017, https://www.honolulu.gov/rep/site/dpptod/dpptod_docs2/Kalihi_TOD_Plan_Summary_6-17_sm.pdf.

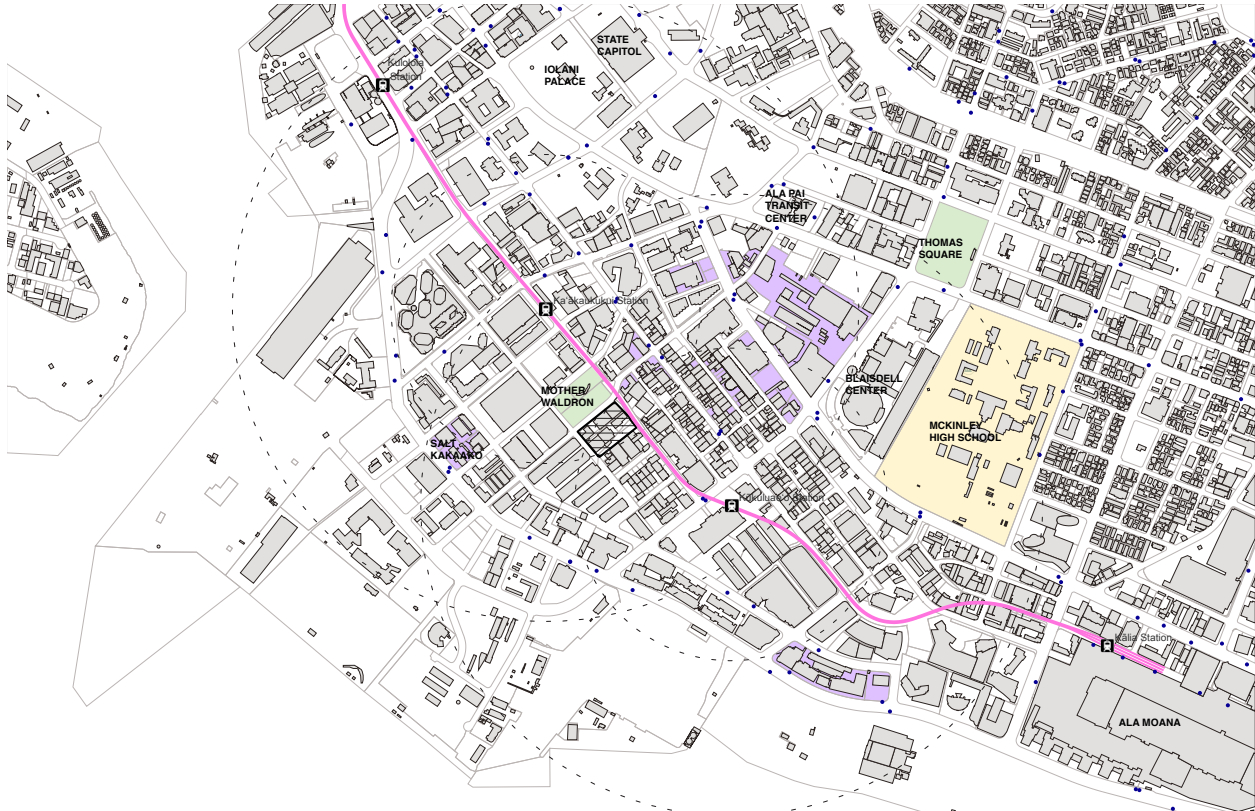


Figure 7.7 - Existing site plan of the potential site for Kaka'ako.
Source: Author

For the third site in Kaka'ako, the building scale intended here would be focused on a mid-to-high-rise building. This is because Kaka'ako is currently under redevelopment for a beautiful, healthy, and sustainable neighborhood reflective of the evolving, vibrant urban island culture. Using the Kaka'ako TOD overlay plan, I determined a potential site through their careful consideration of introducing both height and density to the area, and this is shown in Figure 7.8.⁸⁶

⁸⁶ "Kaka'ako Transit Oriented Development Overlay Plan," VIA, accessed October 14, 2022, <https://www.via-architecture.com/portfolio-item/kakaako-tod-overlay-plan/>.

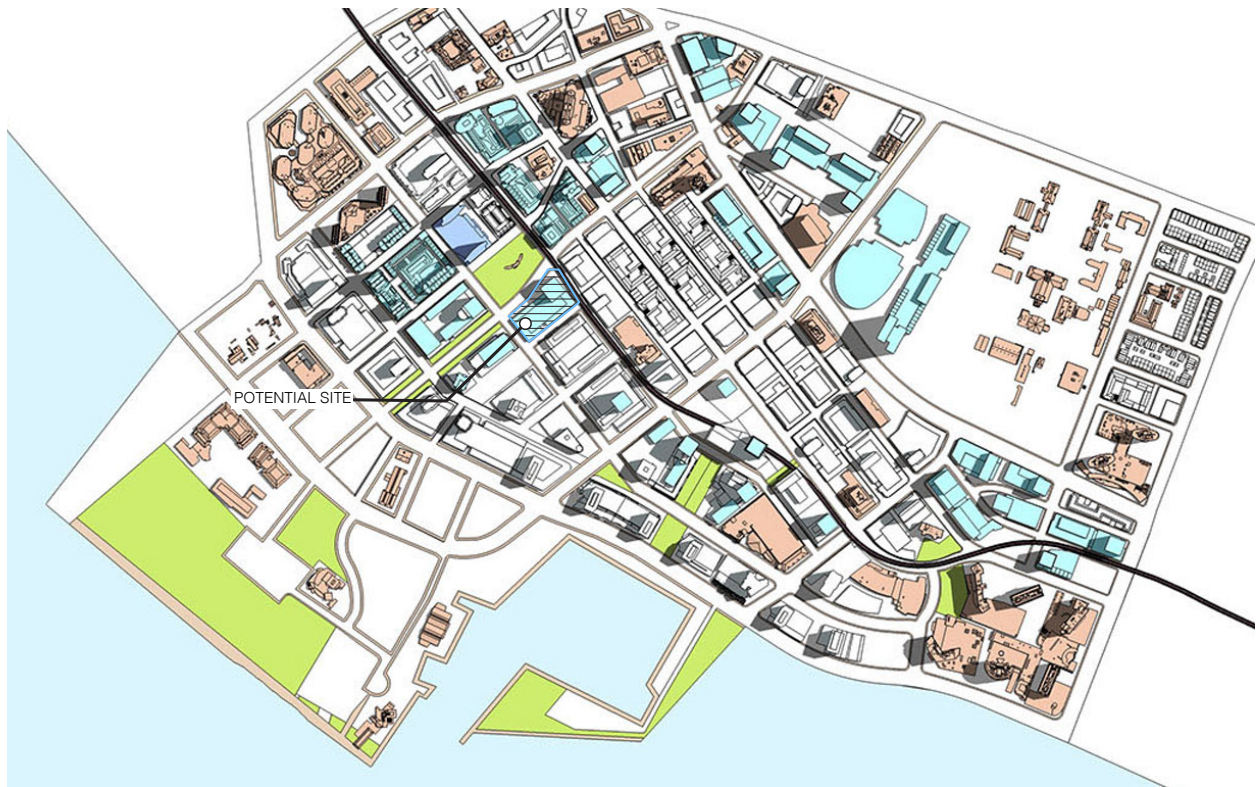


Figure 7.8 - Kaka'ako TOD Overlay Plan showing the introduction of height and density through the use of high-rise multi-family buildings highlighted in blue.
Source: VIA-Architecture.com

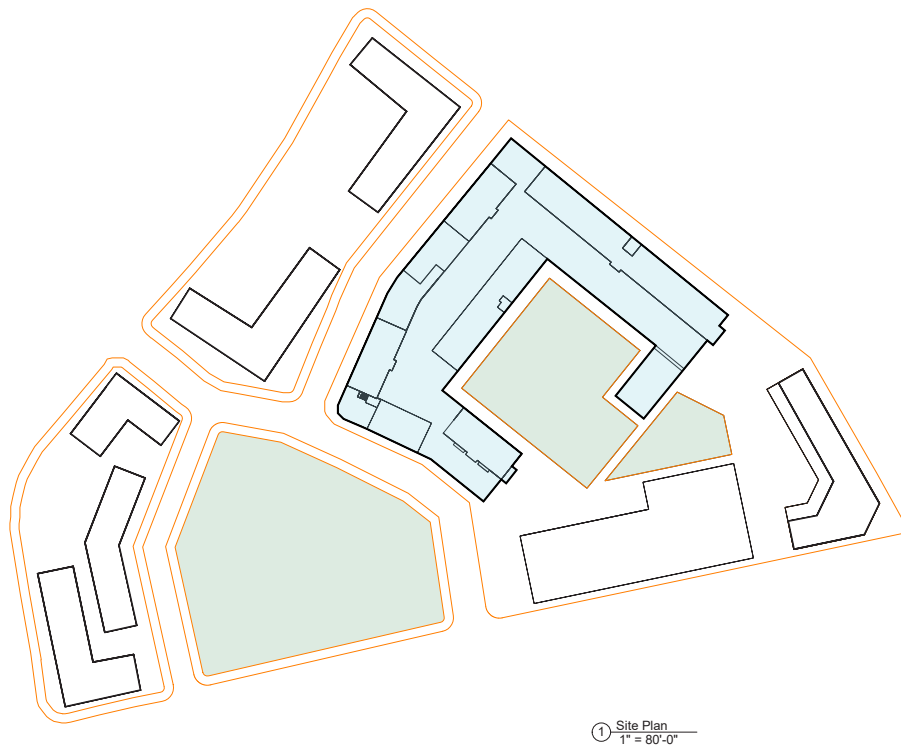


Figure 7.9 - Updated area for the Waipahu site using envisioned site from the Waipahu TOD neighborhood plan.

Source: Base map from Waipahu TOD neighborhood plan. Redrawn by Author.

For this dissertation, I will be focusing on the Waipahu site (figure 7.9). With the intention of using the Waipahu TOD Neighborhood plan as a starting point for this design, I will be using the envisioned site that this neighborhood plan has provided. With the changes to the area, a new park is introduced into the area while two new streets help break apart the large block. From the TOD neighborhood plan, some factors to keep in are:⁸⁷

- “Maintain the local character of the place.”
- Maximum building height is 60 feet (five stories) and 45 feet (four stories), respectively, if height setbacks at the street are provided for structures exceeding three stories in height.

⁸⁷ “Waipahu Neighborhood TOD Plan,” “Celebrate Waipahu”, 2014, https://www.honolulu.gov/rep/site/dpptod/dpptod_docs2/Waipahu_TOD_Plan.pdf.

7.3 - Design Guidelines

When developing the site, it is vital to consider what type of environment you are trying to create. In the co-housing precedents, three main principles were present: sociability, accessibility, and safety for its residents. These characteristics complement each other by addressing a multigenerational environment that integrates a diverse demographic. In addition to these three principles, adaptability is another critical principle in multigenerational housing. I will use these four principles to organize and develop the site.

7.4 - Sociability

To develop a social environment, creating multiple nodes for all generations to live and interact with each other is vital. For this to happen, two main objectives are needed:

- Addressing the needs of each age group (Refer to Figure 7.4)
- Providing frequent social opportunities as possible



Figure 7.10 - Design guidelines diagram.
Source: Author

By creating more social opportunities for people to encounter, the residents will be able to develop a sense of belonging and community, an essential aspect of co-housing. Creating these thoughtful and meaningful interaction points invites people into the space and spending time there. These gathering and assembly spaces can be informal or formal. Examples of informal spaces are seating alongside walkways and open areas because it does not have set activities for the space. Examples of formal spaces would be the common house and shared gardens where the clients and architects predetermine the activities.

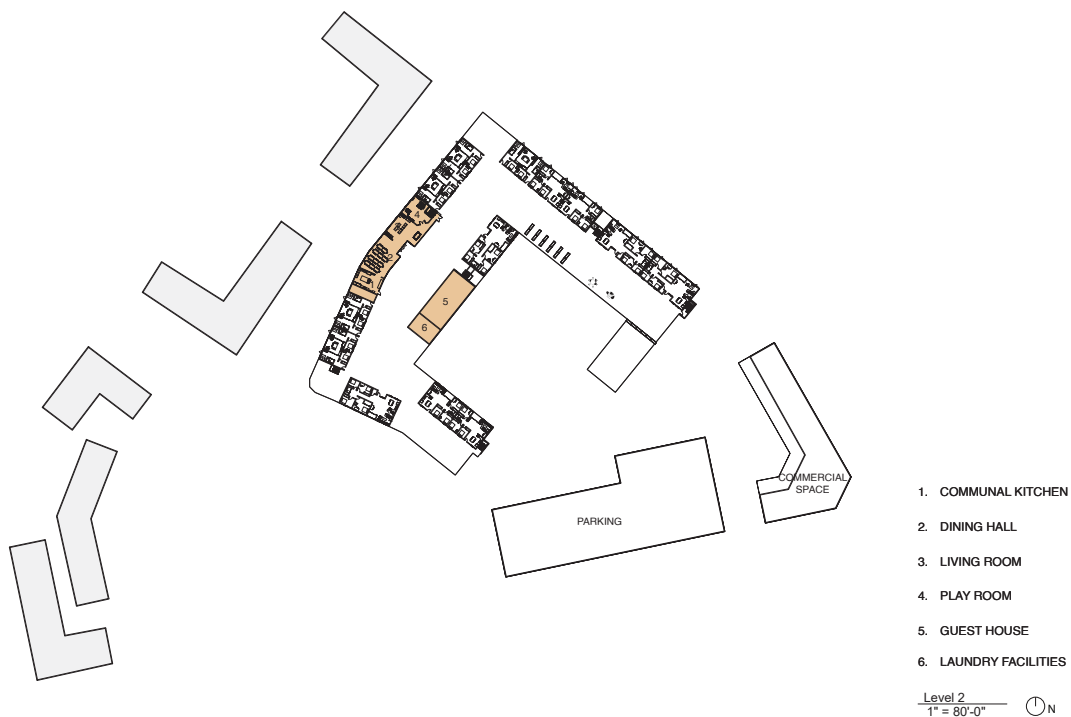


Figure 7.11 - 2nd level floor plan highlighting the five main spaces in the common house.
Source: Author

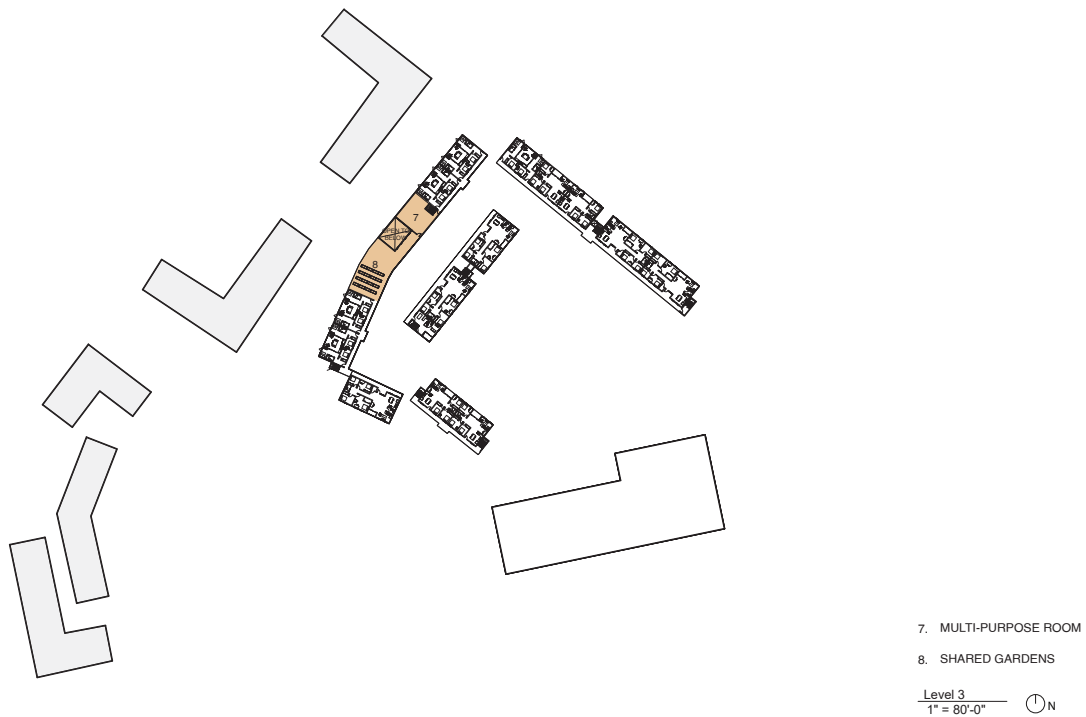


Figure 7.12 - 3rd level floor plan highlighting the second level of the common house.
Source: Author

Common House

As stated before, the common house is the heart of a co-housing community and serves as a space that hosts various community and private functions. The common house is composed of five main spaces:

- Communal Kitchen
- Dining Hall
- Living Room
- Playroom
- Guest Rooms

The communal kitchen needs to be designed with large-scale food production in mind. This is due to the weekly communal meals that are shared between the residents. With

large-scale food production in mind, it would require commercial-level appliances. A stove and preparation area should be located at the center of the kitchen to maximize utility for cooking teams. Other appliances include the commercial oven, refrigerator, and dishwasher. In addition to the commercial-level appliances, it is important to have a large pantry to store groceries and equipment for these meals.

Out of all the common house spaces, the dining hall is the most versatile space. In addition to being the location of the communal meals, the dining hall is typically used for a wide variety of activities, including community meetings, parties, and casual conversation.



Figure 7.13 - Communal kitchen and dining hall
Source: Author



Figure 7.14 - Common house living room
Source: Author

The living room of the common house functions similarly to the living room in a residential unit, and it is an area where residents can spend some leisure time with each other. This space can be used for movie nights, sports nights, and board games.

The playroom is the kid's room. This room allows the community's youngest members to interact and enjoy one another in a space designed for kids, an essential factor in growing children. As Christopher Alexandar states, "Children need children." The playroom is typically located near the dining hall or living room for easy supervision.



Figure 7.15 - Playroom and guest rooms
Source: Author

The guest rooms are used for co-housing communities to welcome guests without making space for them in each home. These guest rooms have basic accommodations, including beds, a shared bathroom with a shower, and access to the communal kitchen.

The common house typically included additional spaces beside the five main spaces, which varied considerably between each co-housing precedent previously mentioned. These additional spaces commonly include exercise rooms, craft rooms, and workshops.

Using the average spaces of the common house of the co-housing precedents mentioned in the last chapter, I found the average ratio for each typical common house space, as shown in Table 7.1. These ratios can be adjusted according to the needs of the residents.

Project Name	Communal Kitchen	% of area	Dining Hall	% of area	Living Room	% of area	Play Space	% of area
Marmalade Lane Co-Housing	740	15%	830	17%	620	13%	420	9%
R50	450	14%	300	9%	0	0%	580	18%
CHUC	140	9%	310	19%	178	11%	487	30%
Daybreak Co-Housing	230	8%	300	11%	460	17%	290	11%
	Avg % of area	12%		14%		10%		17%

Project Name	Guest Rooms	% of area	Additional Programs	% of area	Overall SF
Marmalade Lane Co-Housing	1906	39%	402	8%	4918
R50	1718	54%	120	4%	3168
CHUC	300	18%	230	14%	1645
Daybreak Co-Housing	641	24%	800	29%	2721
		34%		14%	

Table 7.1 - The areas of common house spaces and the ratios per precedent.
Source: Author

Play space

Designated play spaces allow users with similar situations or interests to come together and interact. The playroom of the common house is an excellent example of how this can happen within the residential scale. This is a designated space for children to interact with peers their age. It also gives the parents a chance to interact, building upon that sense of community when talking story with each other.

An example of this at the neighborhood scale would be the courtyard/plaza area on the ground floor. The courtyard invites users at the ground level to stop and spend time there from the various activities on the ground level. An event that was popular pre-covid in Waipahu was “Eat the Street.” This event invited local food truck businesses to a location and invited people in the community and outside of the neighborhood to come and spend time and talk story with friends and family. The courtyard/plaza is a great location that could host it. Refer to figure 7.18.

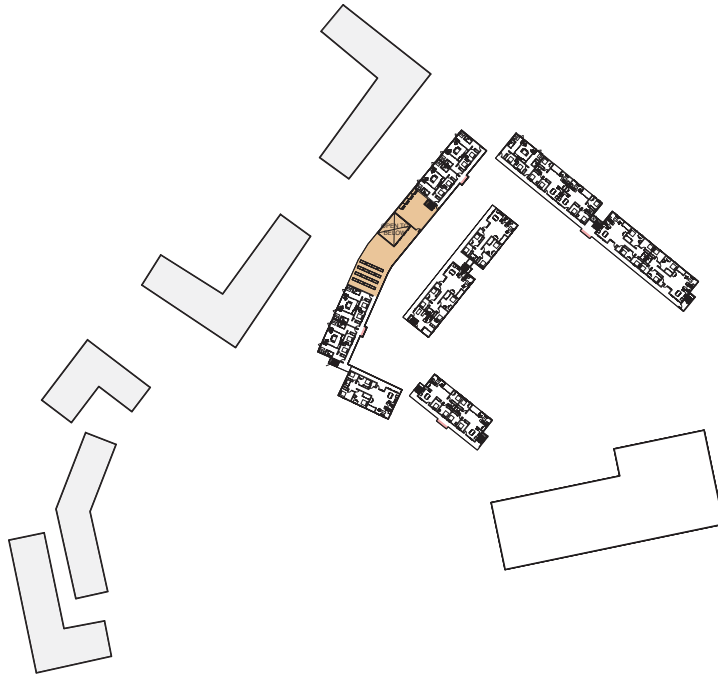


Figure 7.16 - Nodes highlighted in pink on the third level along the circulation
Source: Author

Nodes

Nodes are points throughout the site that allows users to stop and spend some time in the area. Along the walkways of the residential units are nodes that residents can use to stop and talk outside of their apartments. The residents can also configure these spaces by adding additional furniture and seating. Figure 7.16 shows examples of where nodes are in this schematic design.

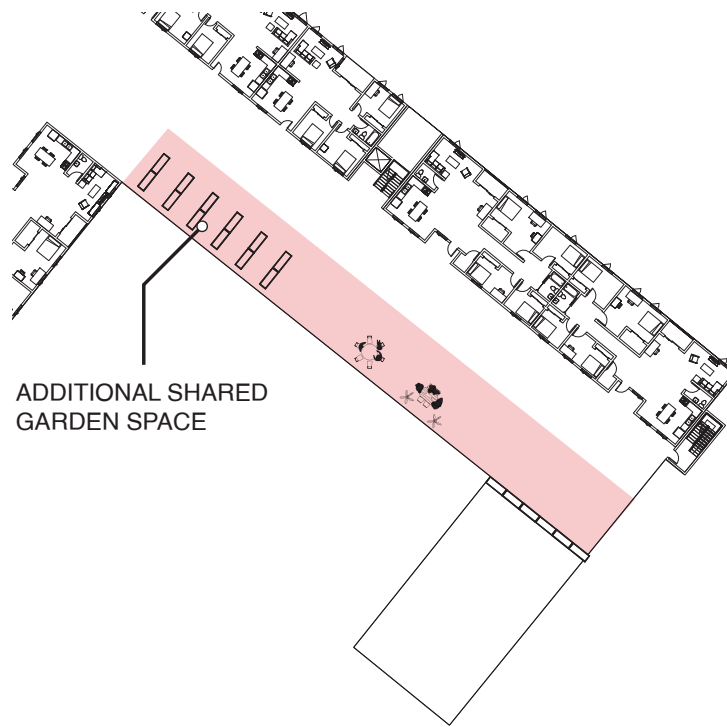


Figure 7.17 - Interpretable spaces at the building scale highlighted in pink. Residents adding their own touch to these spaces adds to their sense of belonging to the space.
Source: Author

7.5 - Accessibility

Accessibility within the site refers to physical access to the amenities and shared spaces on and off-site. The development and design of a co-housing project should allow all age groups to use these amenities, such as the Common House. The Common House is an essential aspect of a co-housing project, where most of the social interactions between residents will happen. Without easy access to the Common House, it is easier for residents to become isolated from the community.

Interpretable Spaces

At the building scale, interpretable spaces are empty spaces found within the site that the users can interpret to use however they see fit. Allowing the users to give purpose to these spaces

lets them add a little bit of themselves to the space, creating a sense of belonging within the community. This also allows them to expand the programs, such as the shared gardens, typically located near the common house, closer to units farther away.

Designated Access Points

At the building site scale, designated access points helps control the circulation within site. The pedestrian entrances to the site are marked in figure 7.15. To access the residential area of the site, residents must enter through the lobby on the first floor and exit through the common house.

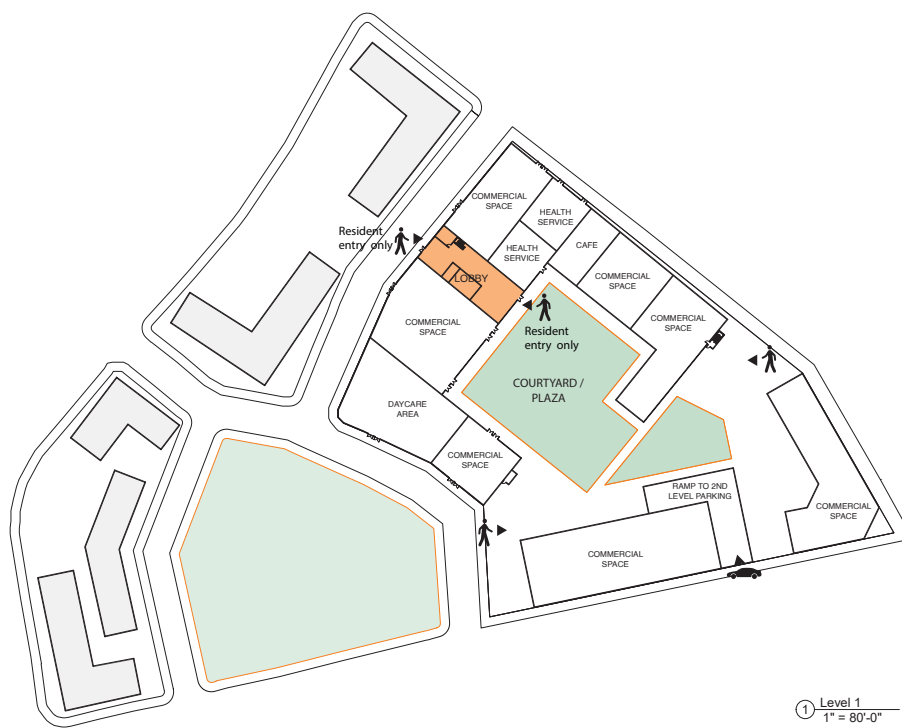


Figure 7.18 - Designated access points
Source: Base map from Waipahu TOD Neighborhood Plan. Redrawn by Author

7.6 - Safety

The design of a safe environment is meant to prevent accidents and crimes from happening on-site and within the buildings. Creating a visual connection between the residential units and the shared community spaces creates a sense of community and safety among the residents. This visual connection follows the concept of “eyes on the streets,” which follows the activity in city streets that keeps the movement and security of the street intact. This can be seen in figure 7.19.

Pedestrian-Only Spaces

A pedestrian-only space is an example of how the concept of “eyes on the street” can be applied, as shown in figure 7.19. This space offers opportunities for social interaction, active recreation, healthy living, and improved quality of life away from heavy automobile streets. This encourages residents and non-residents to slow down, stop and spend time, boosting local businesses.

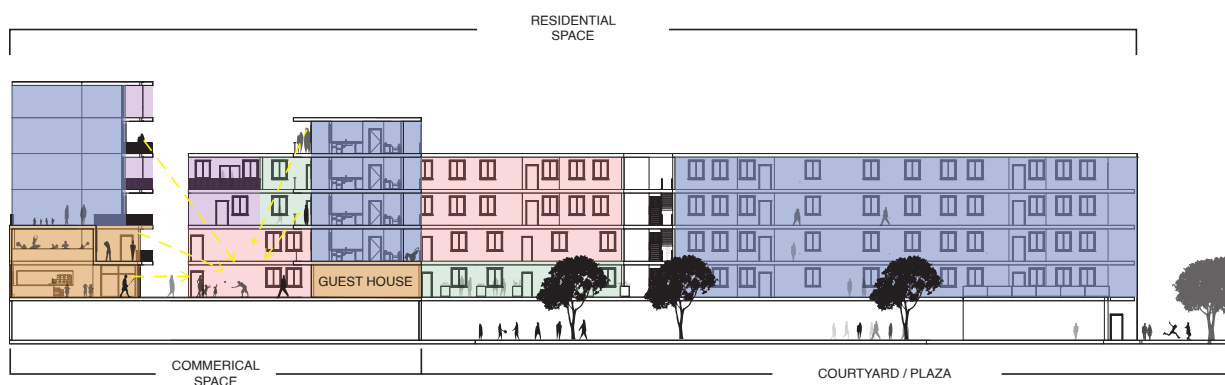


Figure 7.19 - Section diagram showing the concept “eyes on the street” and pedestrian only space
Source: Author



Figure 7.20 - Examples of signage that helps with reinforcing rules and boundaries
Source: Author

Wayfinding

Wayfinding encompasses how people orient themselves in physical space and navigate from place to place. This includes the use of physical landmarks and signage. Using signage throughout the site helps people identify what space they are in. Signage also helps establish and reinforce the community's boundaries, rules, and safety. Figure 7.20 shows examples of signage that can help regulate and reinforce boundaries.

Security

Security is a concern for every community. Growing up in Hawai'i, neighbors would always look out for each other, especially when children play on the streets, ensuring no one gets hurt or in trouble. In figure 7.18, the street experience is brought up to the second level. This is only possible due to the decision to use single-loaded corridor apartment buildings due to TOD's requirement of keeping the area an "old town Waipahu" character.

7.7 - Adaptability

Adaptability within the site refers to multi-use spaces. These spaces are adjustable to different needs and activities at other times. These spaces are for short-term needs, such as a communal hall that can be used for community meetings, dining, or game night. Adaptability also refers to unfinished spaces where the users address the space for their long-term needs.

Multi-Purpose Rooms

At the building scale, multi-purpose rooms allow the residents to host various events such as movie night, BINGO night, birthday celebrations, and communal dinners. Other programs/activities include exercise rooms, workshops, and meetings. Multi-purpose rooms need to be quickly adaptable to the different needs of the users and their events. A typical example of a multi-purpose room is the common house dining hall, which can serve as a community hall for meetings, celebrations, etc., rather than just a place for communal meals.

An Evolving Family

The residential units need to allow individuals and families to transition from each stage of their lives. The following proposed units follow a modular sizing of 20' x 30', allowing the residents to expand through the expansion of a 20' x 30' space. The following paragraphs will explain how the unit functions and what type of residents it will serve.

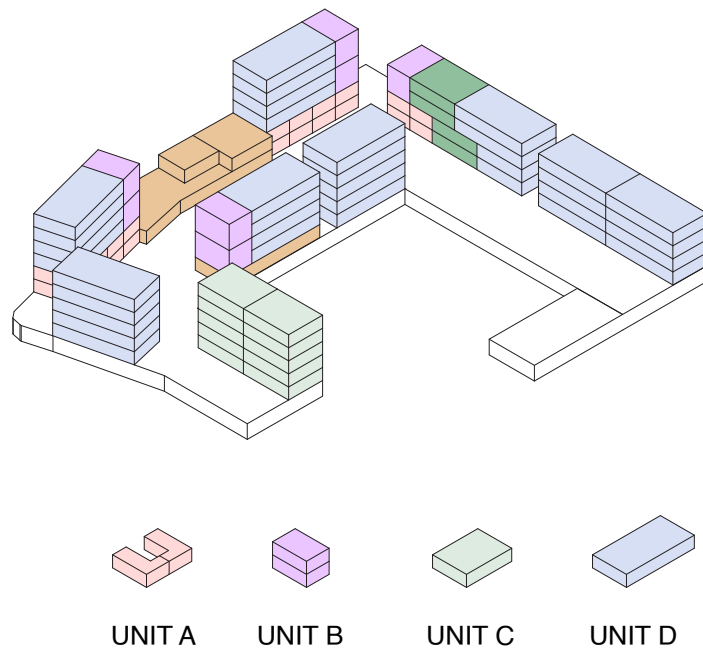


Figure 7.21 - Isometric view of unit types within the schematic design
Source: Author

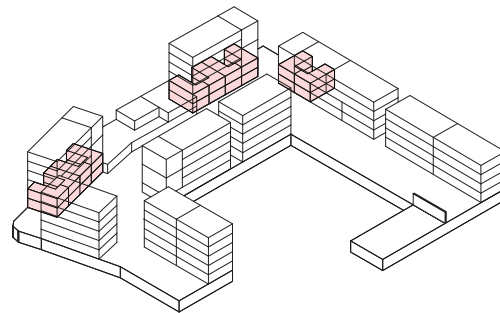
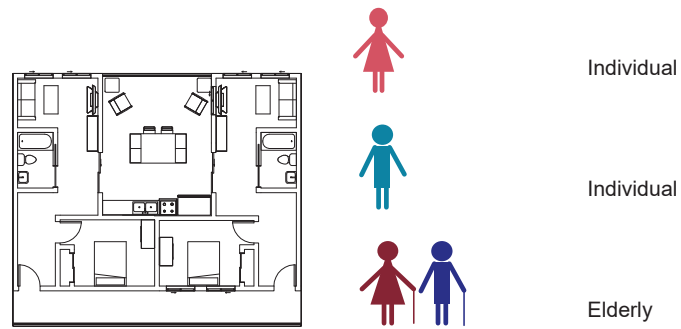


Figure 7.22 - Unit A
Source: Author

Unit A

Unit A is a 1-bedroom unit that is located near the common house. The target residents for this unit are individuals and the elderly. Locating unit A close to the common house strategically places the users near the heart of the development, allowing the users of unit A more opportunities to interact with others at the common house than if they were located away from the common house. Unit A provides all the necessities of a living unit: one bedroom, bathroom, and kitchen. The kitchen is not in the unit but in the open shared space between the two units. The purpose of the shared space is to encourage the users to spend some time in the company of others.

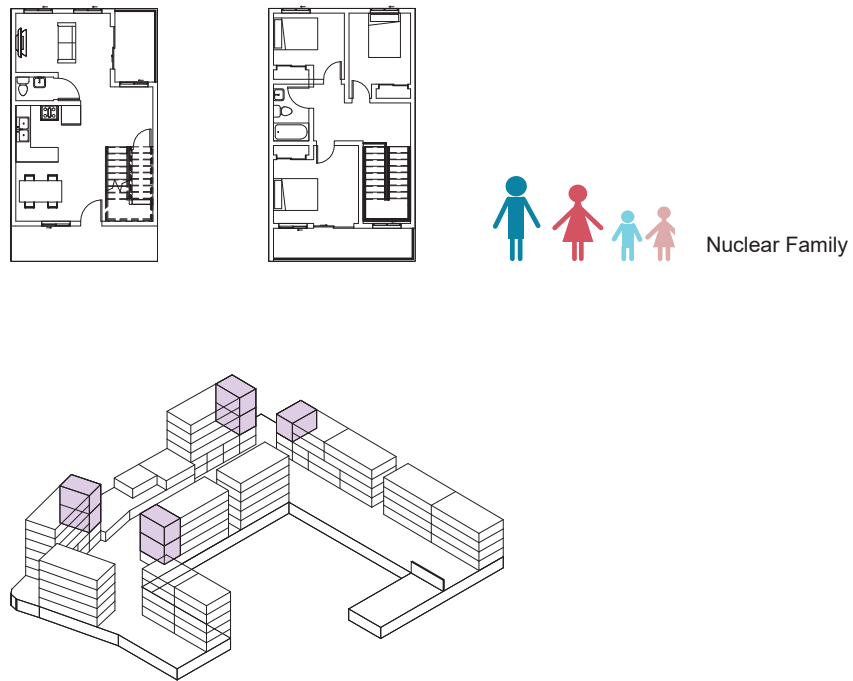
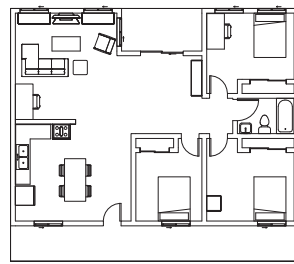


Figure 7.23 - Unit B
Source: Author

Unit B

Unit B is a 2-3 bedroom, 2-level unit. The target residents for this unit are small-medium-sized families. This unit separates the common spaces (the living room, kitchen, and dining room) located on the first floor and the private bedrooms on the second floor. By doing this, it gives a sense greater sense of privacy to the residents. The living room includes a foldable partition that temporarily converts it into another room.



Multigenerational
Family

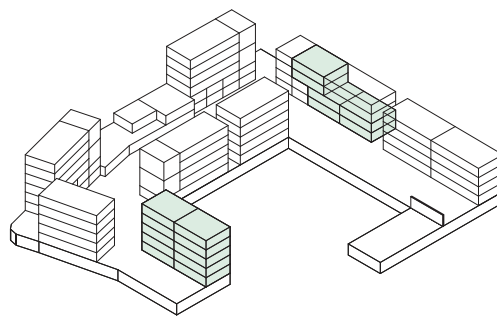
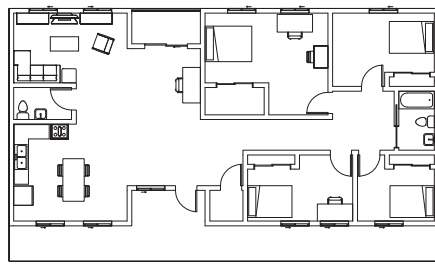


Figure 7.24 - Unit C
Source: Author



Multigenerational Family

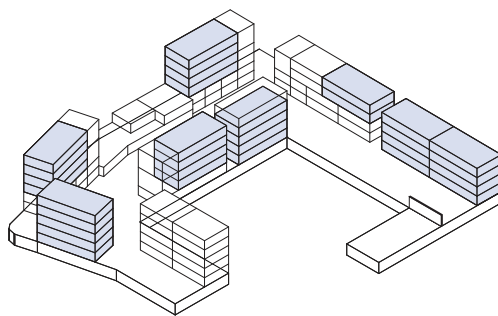


Figure 7.25 - Unit D
Source: Author

Unit C+D

The target residents for both units C and D are multigenerational families. Unit C is a 1200 square foot open floor plan unit. This unit initially has the entrance, kitchen, and bathrooms constructed in the unit. This allows the future resident to adjust the space to their current needs rather than having a pre-designed apartment that does not. Unit D functions the same way as unit C but with an additional 600 square feet. Figure 7.26 shows how blank units C and D can be converted to fit a family's needs.

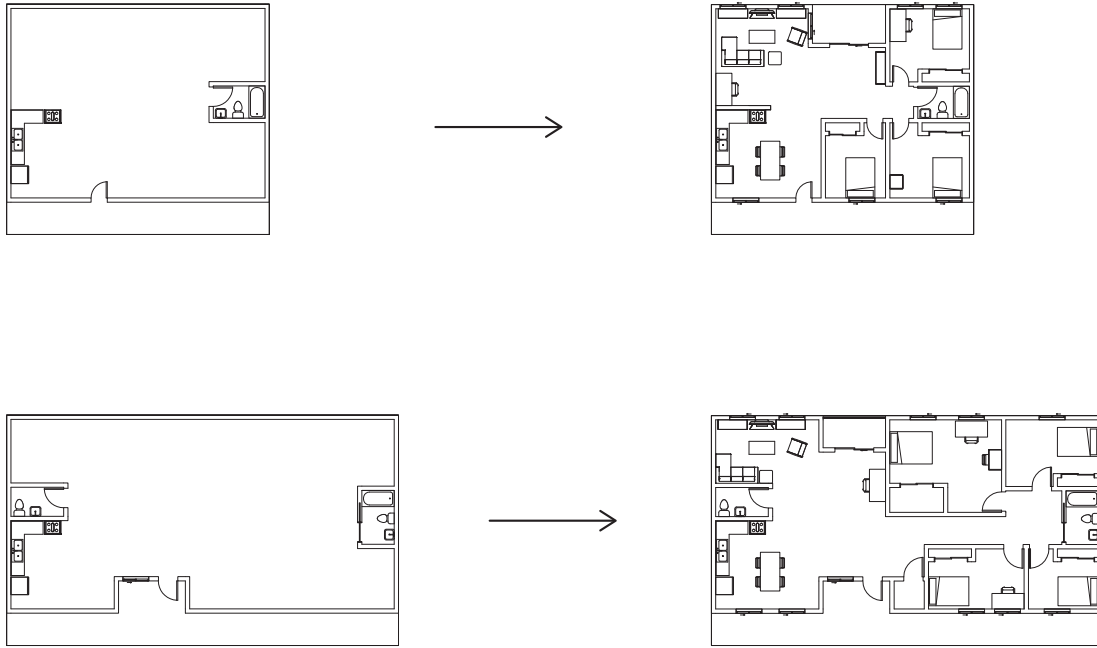


Figure 7.26- Units C + D being converted into apartments
Source: Author

	TOTAL AMT OF UNITS	TOTAL SF	UNIT SHARED SPACE (sf)	ADDITIONAL SHARED SPACE/UNIT (sf)	TOTAL AVAILABLE SF
UNIT A	20	480	120	184	804
UNIT B	7	1200		184	1391
UNIT C	16	1200		184	1400
UNIT D	31	1800		184	2015

Table 7.2- Increased unit square footage with addition of the shared space
Source: Author

Table 7.2 shows the amount of each unit and its area. The additional shared space per unit is calculated by taking in the area of all the shared spaces and dividing it by the total number of units. For these calculations, I took the areas I had defined (the common house, shared gardens, and shared terrace), totaling 13647 square feet. I did not include the open spaces due to the lack of a program definition. The amount of open space left over is 10135 square feet. If added to the calculation, the total amount of additional shared space per unit becomes 321 square feet.

As the family evolves and gets older, each user's common and individual needs must be addressed. The common needs of each generation, as stated in figure 7.4, are daily necessities, social interaction, play/leisure, and access to public transportation. Social interaction is achieved at the unit scale by organizing and separating the common spaces and private spaces, as shown in figure 7.27. Separating the private spaces from the common spaces ensures that the private spaces remain private. As unit A is intended for individuals and the elderly, most social interaction would occur in the shared space. The strategic placement of unit A near the common house encourages the users to socialize outside of their unit with other residents as well.

The need for play/leisure is addressed on the building scale, and leisure spaces are addressed through the use of common house. The common living room is one of the leisure



Figure 7.27- Organization of private and common spaces within each unit.
Source: Author

spaces designed into the building scale meant for users to unwind and relax while socializing with others. The interpretable spaces can add additional seating around the building for users to relax outside, as shown in figure 7.17. As stated before, play spaces allow users with similar situations or interests to come together and interact. This is seen in the common house playroom, the plaza, and the “street” on the residential level shown in figure 7.19.

Finally, the need for accessible public transportation is addressed through the site’s location at the neighborhood scale. Using the HART rail stations as a focal point and the walkable radius of a quarter-mile ensures that the site will always have an accessible form of public transportation.

The needs of each user are addressed at either the neighborhood scale or the building scale. In this schematic design, to address the need for daycare and healthcare services, these services were incorporated at the building scale as part of the ground floor businesses (refer to figure 7.18.) This provides quick and easy access to these services for the users and provides new services for the neighborhood. Cultural enrichment is achieved through the interactions between residents at the building scale. Through these social interactions, adults learn about different cultures due to different cultural upbringings. A child's need for education and an adult's need for work is addressed at the neighborhood scale. Although there are no schools within walking distance of the site (as shown in figure 7.5,) schools are accessible through the bus system. With TOD's Waipahu Neighborhood Plan, the site's surrounding area will incorporate new businesses and opportunities for work.

08 | CONCLUSION

8.1 - Conclusion

This dissertation aimed to illustrate how co-housing can be an alternative housing solution for revitalizing and redeveloping Hawai'i's communities. With the increasing life expectancies of the elderly, the common culture of taking care of family elders, and the increasing cost of living in Hawaii, co-housing helps solve these issues.

The research looks to develop a schematic framework that addresses and applies components to create a successful co-housing prototype while encouraging common values to tackle housing demands. This research aims to provide design guidelines applicable to the different scales mentioned in this dissertation. Co-housing offers the social and practical advantages of a closely-knit village in the twenty-first-century context.

By analyzing the Hawai'i and the co-housing precedents, quantitative data were obtained to understand the minimum spatial ratio of the different spaces within the unit. A minimum ratio of the five main spaces was obtained by analyzing the common houses in the co-housing precedents.

A schematic design was developed applying the different ratios for the housing units and the common house spaces. With additional space of the defined shared spaces, the total area for each unit respectively increased by:

- Unit A: 184 SF or 30%
- Unit B: 184 SF or 15%
- Unit C: 184 SF or 15%
- Unit D: 184 SF or 10%

8.2 - Future Work:

With the development of the co-housing design guidelines, potential future topics can be taken from. Finding concrete numbers on how co-housing projects are affordable can bring a more realistic take to this thesis, as this dissertation only listed different ways in which previous co-housing projects had saved residents money. Co-housing is cooperative ownership between its residents, so understanding the finances and operations requires another level of research and understanding.

The schematic design is intended as a foundational source in the development of multigenerational communities. As this schematic design has the potential to apply to different sites on 'Oahu, working with TOD can support and enforce the value of community.

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