ADAPT: A Collaborative Approach to Accessible Affordable Housing

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ABSTRACT: This paper describes the outcomes of an interdisciplinary research collaboration focused on a call issued by the United States Department of Housing and Urban Development (HUD) to address a need for designs for accessible affordable housing and plans for modifications necessary to make homes readily adaptable to meet the needs of individuals and families seeking to age-in-place (AIP). Specifically, the research team was directed to considered housing types with four or fewer units, commonly described as 'missing middle' or 'middle density' housing types, which fall outside of the purview of United States Fair Housing Agency (FHA) and the Americans with Disabilities Act (ADA) guidelines.

Two working groups established foundational research for the team and advisory council's review before moving into design work. One working group's literature review revealed numerous scattered high-quality resources addressing a range of topics from spatial considerations to financial resources and funding programs for aging-in-place renovations and new construction. The second working group conducted a series of focus groups with individuals with mobility and visual disabilities seeking to age-in-place.

After presenting these findings to HUD, the project team shifted approach from developing renovation design plans and singular housing prototype designs to the development of a web-app that consolidated AIP best practices and resources and to a consideration of aging-in-place more broadly than the specific design of non-detached single-family homes, semi-detached townhomes, and structures with four or fewer residential units. The team explored housing prototype design solutions that reinvested in neighborhoods with substantial vacancy by identifying land banked properties and zoning changes that would allow infill development of a range of middle density housing types. The design studies propose infill development of middle density housing types in neighborhoods with land banked properties and a return to prior land use scenarios through zoning modification.

KEYWORDS: affordable housing, accessibility, aging in place, interdisciplinary research

INTRODUCTION

Affordable, accessible housing is in great need in the United States. The elder population is growing as "Baby Boomers" retire, as well as individuals live longer. Overwhelmingly, Americans would like to remain in their homes as they age, referred to as "Aging in Place", or AIP. Homes must be accessible, safe, and affordable for individuals to successfully age in place, yet many homes were not originally design to allow for this possibility. These homes would need to be retrofitted with the appropriate features to allow for accessible, independent living.

The demographics in the United States are continually, but predictably, changing. The US Census Bureau estimated that in 2019 nearly one out of every three Americans (29.4 percent) was over the age of 55 (Bureau, US Census. n.d.). This segment of the population has steadily increased since 2010, when approximately 25 percent of the population was over the age of 55.

As we grow older, though, our physical needs may change. We may no longer be as mobile as we once were, or our vision may not be quite what it used to be. If our physical needs change, the homes we live in may no longer suit those needs. For example, the American Association of Retired Persons (AARP) found that approximately one in three adults that own their own home (of any age group) would need to complete "major modifications" to accommodate aging needs (Shinkle 2011). This is due to the fact that historically, single-family attached and detached homes have not been built with accessibility in mind, meaning they were not built in ways that would allow a person with disability to safely and independently live there.

The American Association of Retired Persons (AARP) found in their 2018 Home and Community Preferences Survey that nearly 80 percent of adults age 50 and older want to remain in their communities and homes as they age (Binette 2021). The concept of adults staying in their homes as they get older is commonly referred to as "Aging in Place" which can be defined as he capacity to reside in one's home and community securely, autonomously, and comfortably, irrespective of age, income, or ability level.

1.0 FRAMING THE QUESTION

In early 2016, the United States of America Department of Housing and Urban Development (HUD) issued a notice of funding related to "Accessible Housing and Technology Research and Demonstration[1]" with the following call:

> The objective of the research funding is to support studies on innovations in the design and construction of affordable, accessible, and aesthetically pleasing housing with a particular focus on technological adaptations that could be made to existing housing designs for persons with disabilities, and to identify, evaluate, and test the home modifications and technology innovations necessary to make existing housing accessible. Additionally, the studies were to focus on non-detached single-family homes, semi-detached townhomes, and structures with four or fewer residential units. The researchers were to be guided by interdisciplinary advisory teams representing a variety of interests in the field of accessible housing. (FR-6000-N-29, United States Department of Housing and Urban Development)

In response to the agency's call for research the authors developed a team of faculty, graduate and undergraduate student researchers from multiple schools within the university. While the core research team was comprised of faculty from Architecture, Construction Management, Industrial Design, and Auburn University's Center for Disability Research and Policy Studies, an advisory panel of individuals representing a variety of perspectives in the area of accessible housing and design was developed to help guide the research. The research team answered the call and explored (1) what aging-in-place (AIP) best practices should be implemented in the renovation of existing homes, (2) how AIP best practices can be disseminated to homeowners, designers, and contractors, and (3) the development of prototype middle density housing designs that incorporate AIP best practices.

1.1 Identifying resources

Two working groups were formed to understand the call and identify already available resources. A working group led by the Director of the Center for Disability Research and Policy Studies conducted a policy review and hosted a series of focus groups. The feedback from the focus groups were the most instructive for the team as much of the policy was known or not applicable. The focus group leader identified two filters to apply to the discussion of aging-in-place, mobility and vision, noting that visual acuity and ambulatory steadiness decline with age and significantly impact an individual's ability to perform instrumental activities of daily living (IADL).

Responses from the focus group confirmed the impact of declines in visual acuity and ambulatory steadiness on an individual's ability to age in their own home without making minor and more substantial changes to their residence. In many cases these changes are simple and inexpensive, however in some situations (rental, restrictive covenants, etc.) modifications to a residence face significant challenges. Most of the participants in the focus groups rented their home. As they noted, changes to the building (doorways, hallways), fixtures, appliances, hardware were elements that could not be altered without the agreement and consent of the building owner. For those who owned their own homes, many had developed their own adaptations of their own spaces and appliances.

The focus group leader noted that participant responses varied based upon both type and severity of impairment, however there was significant overlap in common areas of the home. Focus group participants were asked to provide feedback about specific spaces, items and concerns faced in their homes. Both groups identified specific challenges with respect to their particular physical ability, however the magnitude of responses varied as can be seen in the graph in figure 1.

Figure 1: Physical ability challenge overlay. blue:visual acuity, pink: mobility. Source: (Authors 2022)

The responses from the participants in the focus groups provided the second working group a valuable lens through which to survey of available resources for those seeking to adapt a home to anticipate age-related declines in mobility and visual acuity encountered while aging in place. This working group, led by the principal investigators (Pi) and graduate research assistants from the Auburn University's College of Architecture, Design and Construction, sought to determine what aging in place resources, including federal guidelines[1], academic journals[2], web-based resources, and published guidelines were available for reference to designers and contractors when embarking on an aging in place-related project. A literature review was undertaken to answer this question, which included broad Internet searches, as well as searches through academic databases, libraries, and bookstores.

It quickly became clear that there is an abundance of easily accessible publications (meaning available for free download on the internet, or a widely published book) on aging in place. The publications come from a variety of

sources, including the National Association of Homebuilders, the New York City Department on Aging, the American Society of Interior Designers, and Harvard Medical School, to name a few. Some publications addressed just the built environment, meaning how homes can be adapted to meet aging in place needs. Other publications took a more holistic view, describing general topics such as physical, mental, and financial health, as well as how to become part of a community.

In total, the ten publications identified by the research team provided 184 best practices, or recommendations, of certain physical items or configurations of items to be incorporated into a home to allow the homeowner to successfully and safely age in place. To visualize and evaluate the 184 recommendations identified in the literature review, the research team created a series of drawings depicting generic space types commonly found in residential buildings and mapped the recommendations to these spaces when applicable. Where not spatial, the recommendations were included as annotations. This process allowed the team to identify patterns of recurrence as well as to further distinguish between recommendations focused on mobility or visibility. The drawings and reviews with the research team aided in the process of distilling the initial list down to a final list of 50 recommendations.

The research team then surveyed industry professionals to determine which of the 50 aging in place best practices were currently being implemented by contractors and designers when engaged in complete renovation or new construction projects. It was found that the most prevalent reason that AIP best practices are not integrated into renovation and new construction projects was that the homeowners did not request them.

2.0 DESIGN PROPOSALS

Following the exploratory phase of the research, the team met with the advisory group and HUD to discuss the next phase of research. In advance of this meeting the teams review of the research led to two parallel trajectories.

The first was to develop an interactive web-app designed to educate and inform the public on AIP best practice implementation, consolidate scattered information and connect the public to professionals and locally available financial resources for AIP and accessibility home modifications.

As the team reviewed design guidelines and developed plans of existing attached and semi-attached housing it became clear that single solutions would only resolve issues for a small minority of residences. Rather than prototypical solutions to uncommon conditions the team sought to address the fundamental obstacles in homes and identify strategies and resources for adapting a home to meet a specific user's needs.

The team decided that a web-app would aggregate and make available to a wide audience the best information, resources, and contacts for adapting a home for aging in place. The overarching goal is to enhance the capacity for independent living among people with disabilities and those seeking to age in place through new and existing home design solutions that are affordable, sustainable, and capable of adaptation to meet individual needs. The app, called ADAPT, focuses primarily on assisting people to adapt their homes to accommodate disabilities.

The second emerged from the observation that the notion of aging in *place* was not necessarily tied to the residence as was revealed in the literature review and the responses of many in the focus groups and advisory panel. The team began to consider this in the approach to the design of housing prototypes and made a suggestion to evaluate a specific location to ground the design process in a place.

A significant finding from this exploration was that current land use regulations (zoning restrictions) in many municipalities limited the development of middle density housing or only allowed it in areas that were not close to the types of necessary services or amenities desirable for individuals with physical disabilities seeking or seeking to age in place.

With feedback and approval from HUD the team began the development of the web-app and began exploring designs for middle density housing prototypes that would stretch zoning and suggest alternatives to current models based on input and feedback from the research advisory panel, focus group, as well as non-profit affordable housing developers.

2.1 Adapt web app

The word "adapt" is defined as "to make fit (as for new use) often by modification." ("Definition of ADAPT." n.d.) research team decided to title the web-app "ADAPT" as we felt this sentiment was exactly our charge; to educate the populace on how our practices as homeowners, designers, contractors, and educators should be modified to address the ever-growing need for AIP-friendly housing, as well as how the structures themselves should be altered.

The ADAPT app (figure 2.) was conceived with a diverse potential audience of app users each seeking overlapping yet also different information, navigation through diverse yet interrelated information sets became a driving factor in the design of the app. The target audience of the app includes the elderly, people with different types of disability, the adult children of the elderly, family members of people with disability and building professionals such as builders, interior designers, architects, and building contractors. This variety of potential app users influenced, navigation, access routes, and information retrieval and distribution needs and led the app design to be organized around three main categories of information: recommendations, tips and resources.

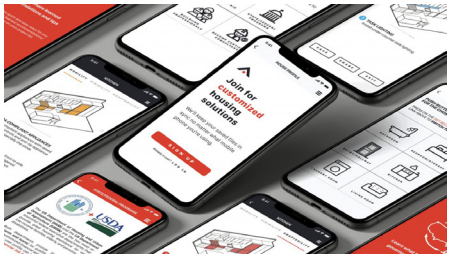

Figure 2: Adapt web-app. Source (Authors 2022)

Recommendations provides spatial recommendations organized around three categories: mobility, visibility, and adaptability. These room recommendations are accompanied by an illustration indicating the areas in the room impacted. As each recommendation represents an adaptation to one's home aimed at improving one's ability to use a space by focusing on mobility and visibility in each room, the final section (adaptability) describes a scope of work necessary to implement desired changes to the room.

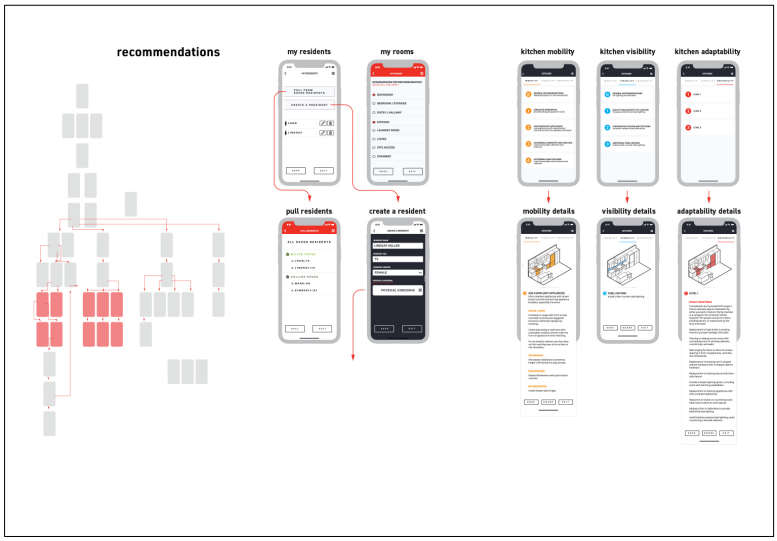

Figure 3: Adapt web-app Recommendations navigation. Source (Authors 2022)

Tips provides information about seeking financial aid, or state and federal programs that support aging in place housing renovation or construction. The tips are saved to a user profile (if created) and are searchable within the app as a checklist.

Figure 4: Adapt web-app Tips and Resources navigation. Source (Authors 2022)

Resources provides links to professionals with expertise in aging in place design and renovation, the app links to a national directory of certified aging in place professionals (CAPS).

As part of the development of the ADAPT web app, the research team developed a series of space type studies based upon AIP best practices. Through several iterations the team revised the recommendation drawings and applied them to designs for new construction of middle density (two, three, and four unit single-family attached and detached homes) that incorporate aging in place best practices. The prototype designs were developed with a team of students working with the researchers over several months and were reviewed and revised with input from the entire team. As the designs developed from the interior the team also began to evaluate potential infill opportunities

that would expand the ability to age in one's community, which led to the decision to use a neighborhood in Birmingham Alabama as a site for the home designs.

2.2 Adapt design prototypes

The research team entered this phase of work with the following question. If the place in which one lives, includes the home as well as the neighborhood and community in which one is a member, how might our homes and our physical communities be adapted to provide a broader range of accessible, affordable places in which one can age?

Working iteratively prototypes were developed that would infill into existing neighborhoods with existing physical and social infrastructures. These middle density types (ADUs, du-, tri-, quad- plexes, and townhomes)[3] share a similar scale with single family housing and have traditionally been found in most pre-1950's U.S. urban neighborhoods. These types allow for smaller and more varied housing options with increased density and access to shared amenities.

The team decided to study an urban neighborhood in Birmingham, Alabama. East Lake was selected due work by local nonprofits spurring redevelopment efforts in the neighborhood and surrounding neighborhood. Both Habitat for Humanity and the Woodlawn Foundation have increased affordable housing options in the area with attention given to aging in place concerns. Additionally, East Lake is located within an opportunity zone[4] and has over 4,000 parcels held by the Birmingham Land Bank Authority, which currently holds 8,000 properties[5].

Birmingham is one among many U.S. cites that has a Land Bank Authority. Land banks are governmental entities that obtain vacant, abandoned, tax-delinquent and foreclosed properties with the goal of returning them through sale into productive use, including housing developments or public amenities. The idea of land banks came about during the 1970's as a way for municipalities to collect (i.e., bank) inner-city properties that were abandoned or deemed undesirable as a function of urban sprawl, for future use. This focus has shifted in recent years to the accumulation of properties that have been deserted by their owners due to a variety of reasons, such as poor functional conditions of the structures on the properties, property value depreciation due to neighborhood blight, or severe tax delinquency. Land bank authorities acquire the properties and assist with clearing title and tax delinquency for future public or private use. Over half of all states have at least one land bank authority.

As the team developed the prototype designs it became clear that smaller housing options (specifically ADUs) would provide a flexible and reconfigurable solution for accessible, affordable housing. Under current zoning regulations, these types of dwellings would not be permitted by right. While it is not impossible to petition for permission to construct an ADU or -Plex, the additional steps required to do so places these kinds of projects out of the reach of many, as the additional steps add cost and time to the process of permitting and constructing an addition or developing an affordable and accessible project. The team explored a small adaptation of the zoning, by simply up zoning the current neighborhood to allow slightly higher density development. Of note, the neighborhood contains many examples of middle density development that existed before current zoning was established.

As the team began to study land bank parcel locations other members of the team assessed the East Lake neighborhood. The neighborhood has existing parks, sidewalks, schools, restaurants, churches, and small retail establishments that serve the community. The community consists of 3,336 individuals. Of that group 474 (14%) are in the age category of 65+. 213 (45%) of this group own their homes. Of the 474, 152 (32%) are disabled. The U.S. Census Bureau defines a disability as a physical or mental impairment that affects one or more major life activities, such as walking, bathing, dressing, eating, preparing meals, leaving the home, or doing housework.

Eastlake's location within the city and larger transportation network provides for good connectivity with the surrounding neighborhoods, central city airport and large recreational areas (Ruffner Mountain and East Lake Park and Wahoma Park). Neighborhood amenities along with municipal bus route walk radii were mapped to identify potential prototype test sites. These sites provided opportunities to consider infill development patterns that took advantage of specific conditions of their concentrations of landbank sites and relative proximity to transit and local amenities.

Four sites were identified, and a series of studies were undertaken to understand the potential impact of the proposed zoning shift on the urban fabric and connection to identified amenities and transportation networks. Additionally, the team quantified the number of potential middle density unit types that could be built on landbank, and tax delinquent properties compared to a single-family residence infill. These types of changes are already taking place with several cities leading this effort. Austin's Alley Flat initiative restructured zoning and streamlined permitting for alley flats (ADUs). Seattle, Portland, and Los Angeles have modified their zoning to increase housing options in the face of a housing crisis and aging population. In many ways the designs of the individual homes are less important, than the social landscapes that are created. Pocket courtyards, repaired sidewalks, shared porches, micro retail, or satellite medical centers that provide opportunities for the young and the young old to engage with their community.

As an example, one of the sites studied (figure 6) is comprised of 75 parcels that cover approximately 15-acres, with individual parcels being approximately 0.2 acres in size. The tax value of the total site is approximately $88,000 per acre, and the current potential density is 4.9 residences per acre. 24 of the 75 parcels, or 32%, are land-only, and have no habitable structures on them. The remaining 51 parcels have vacant homes that were originally built around 1930, and each have a current tax value of approximately $33,000. The average home size is 1,400 square

feet, has 2-3 bedrooms, and 1 bathroom. 28 of the 75 parcels, or 37%, are land bank-owned, or land bank-eligible due to severe tax delinquency.

The team developed a proposal for the site that suggested nine structures totaling over 12,08 square meters (13,000 square feet) would be removed. Approximately 80% of the existing building stock would remain. 28 new main structures totaling nearly 8,175 square meters (88,000 square feet) would be built, plus 58 ADUs totaling over 4366 square meters (47,000 square feet). This would equate to 8.5 housing units per acre of land, and 3.8 ADUs per acre of land. 93 housing units would be built, which would be a mix of unit types. The average home would have 2 bedrooms, and one bathroom. Average home size would decrease to approximately 116 square meters (1,250 square feet), or 11%. The proposed design would increase the average tax value of the land to approximately $94,000 per acre, or a 7% increase. The average tax value of the buildings (per parcel) would rise to approximately $131,000, or a 296% increase. (figure 7)

Figure 5: Site study area. blue: proposed middle density housing types. Source (Authors 2021)

The new residential buildings in the plan are bordered by a commercial corridor. Public transit stops are located within the study neighborhood. The prototype site design focuses on the opportunity to engage the transit and introduce micro retail into the neighborhood and provide an additional amenity to the neighborhood. (figure 8)

Figure 6: Site study area. blue: proposed middle density housing types. Source (Authors 2021)

CONCLUSIONS

Had the research team been centered in one disciplinary domain the questions brought to bear on the research would have been narrowly focused and would have been slow to access outside domains of knowledge. Methods

of gathering and testing information and ideas were discussed and considered through multiple points of view. And most significantly the broad agreement across the multidisciplinary team to shift direction bolstered confidence in the direction of the research.

Major findings the team identified ranged from policy and guideline limitations. FHA guidelines were designed for multi-family structures with greater than four housing units. ADA guidelines were designed for public, commercial spaces. Hence, these guidelines do not sufficiently address AIP best practices, especially those applicable to “missing middle” and single-family residences, as they were not designed to.

Academic journals revolving around research into aging exist, are robust and growing rapidly. Unfortunately, articles in these types of publications are mainly written by academics, for academics. Furthermore, these journals are not always available for public consumption.

There are a substantial number of easily accessible books and web-based resources on AIP which are intended for public use. Many best practices are provided in these numerous yet scattered resources. The research team found 50 AIP best practices through analysis of these publications, which are applicable to renovation and new construction residences.

Paralleling demographic trends, an increasing aging population, later ‘family formation and expansion, as well as an increase in multi-generational living provide an impetus to revisit housing types. The prototype designs were developed using the AIP best practices contained in the ADAPT app and suggest that small adaptations to zoning allow for slightly increased density opening districts to a wider variety of housing options for residents. Utilization of land banked properties allows for a finer great redevelopment that infills within the existing context, reinforcing existing physical infrastructure and enhancing the social infrastructure.

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ENDNOTES

1. The United States congress enacted the Americans with Disabilities Act of 1990 (United States 1990), with the intention to “provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities.” ADA design standards were developed, and first published in 1991, with updates to the standards published in 1994, and in 2010. The standards were made applicable to “places of public accommodation and commercial facilities by individuals with disabilities.” The Fair Housing Act was enacted in 1968, and is meant to “protect people from discrimination when they are renting or buying a home, getting a mortgage, seeking housing assistance, or engaging in other housing-related activities.” The Fair Housing Act prohibits discrimination based on an individual’s race, color, national origin, religion, sex, familial status, and/or disability. Regarding disabilities,

The Fair Housing Act Design Manual published in 1996 (and updated in 1998) (U.S. Department of Housing and Urban Development 1998) states that: “The design and construction requirements of the Fair Housing Act apply to all new multifamily housing consisting of four or more dwelling units. Such buildings must meet specific design requirements so public and common use spaces and facilities are accessible to people with disabilities. In addition, the interior of dwelling units covered by the Fair Housing Act must be designed so they meet certain accessibility requirements.”

2. The academic aging in place literature generally falls into six categories: (1) technology to assist aging in place, (2) building or naturally occurring communities to support aging in place, (3) older individual’s perceptions of aging in place, (4) governmental policies, (5) the efficacy of home care services, and (6) rural aging in place. The research into these topics is abundant, and ever increasing, especially technologies to assist AIP. One interesting highlight of the academic literature is a finding from Wiles et al. (2012), that the phrase “aging in place” is extremely popular among policy makers and service providers, but not familiar to most older people.

It is worth noting that academic publications are oftentimes written and published in a manner that is only useful to other academics. The general population may not even have access to these publications, as many academic journals are only accessed on a subscription basis, with university libraries being the top subscriber. (Wiles 2012).

3.ADU+, Accessory Dwelling Units (ADUs) are small independent dwellings located on the same property as a detached residence. ADUs can be a detached structure, attached to the principal structure, or within the existing structure. The size of an ADU is dependent upon local ordinances and these are changing rapidly as many municipalities see the value of this form of development. For homeowners they offer the opportunity for passive income in retirement, for extended families to live near one another while maintaining privacy, and as smaller structures are an affordable option as site infrastructure is shared with the principal residence.

adu cluster, the adu+ prototypes were designed to accommodate scenarios around changing family structures and population demographics, and to be utilized in cluster or cottage developments. In these types of developments, a cluster of typically 4-12 units are arranged around a common exterior space, (p. 104) and a homeowner's association (HOA) is formed for maintenance of the common. The HOA if written carefully could be a useful entity in maintaining the development and lessening the need for elderly residents to be responsible for exterior maintenance. At the same time this type of development is organized around common exterior spaces which provide an opportunity for residents to gather and socialize.

plex+, Plexes are small scale multi-unit housing on a single property. The individual units are often organized as side by side, front to back, or stacked units. Rather than stacked flats, the prototypes are based on a series of small units that can be configured front to back in order to maximize accessible ground floor units. The units aggregate to create front-to-back and stacked duplexes, as well as triplexes and fourplexes following the same pattern. The triplex was designed with the ability to create a micro retail space on the ground floor. These spaces (600-800 sf) could be outreach healthcare facilities, coffeehouse, or small neighborhood shops.

townhouse+, A townhouse is an attached single-family residence usually consisting of 4 to 16 multi-story units sharing one or two fire walls with an adjacent dwelling. Each unit is located on its own individual parcel, usually with a front and back entry and parking on site. In some cases, a homeowner's association (HOA) is formed if there are shared amenities. Typically, a townhouse is configured as a linear cluster lining the street (left), however there is no requirement to do so. The prototype townhouses utilize the ADU+ plan as a basic unit reconfigured based upon site opportunities to create more defined common areas. This effectively creates the need for an HOA, which alleviates the need for individuals to maintain the structure and maintains a shared common area as seen in the 'j' and 'u' configurations at left. As with the ADU+ in the cluster or cottage housing configurations the HOA could be leveraged to convert a ground floor unit into an amenity space shared by the building residents.

4. Opportunity Zones: Created in 2017 under the Tax Cuts and Jobs Act (United States 2017), an opportunity zones are defined as "an economic development tool that allows people to invest in distressed areas in the United States." These zones are defined by census tracts boundaries and are intended to "spur economic growth and job creation in low-income communities while providing tax benefits to investors." Opportunity zones can be found in both rural and urban communities, and in all 50 states.

5. Birmingham has nearly 5,000 tax delinquent properties. Properties that have been in delinquency more than 5 years can be cleared of these taxes and liens and banked for future development.