

**Design for 203X:  
Living Architecture for the Sustainable Transition**

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Program Authorized to Offer Degree:  
Architecture

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University of Washington

**Abstract**

Design for 203X: Living Architecture for the Sustainable Transition

George Lee

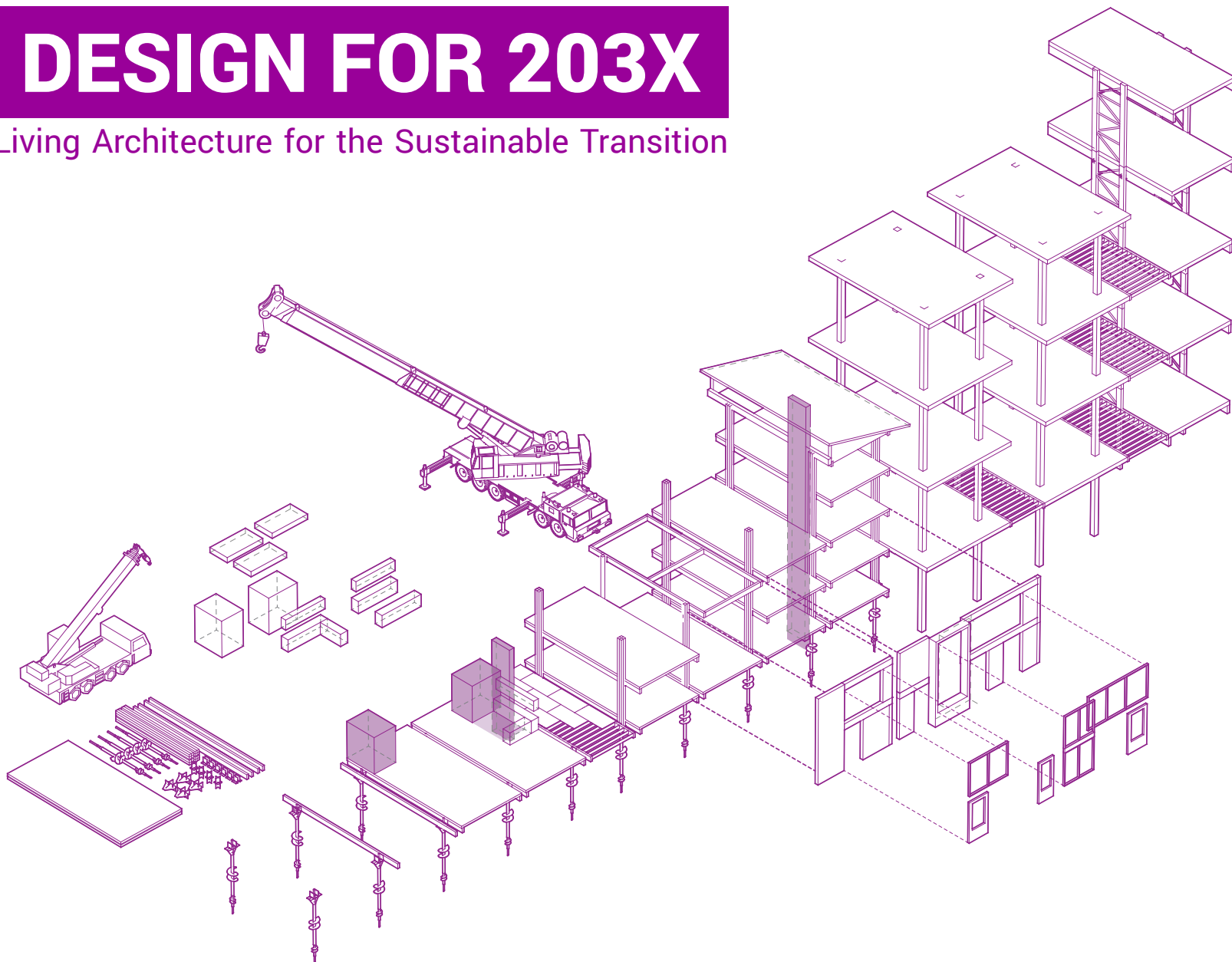
Chair of the Supervisory Committee:  
Professor Jeffrey Ochsner  
Department of Architecture

This thesis presents a vision of how residential architecture must change to address the challenges of climate change and housing affordability while accommodating growth. The investigation spans the past, present, and future of the American single-family housing typology to understand and engage the dominant vernacular in the United States and Seattle. The project imagines what residential architecture would be if long-term sustainability and equity were the key drivers of design by exploring social, economic, and technological aspects including community land trusts, densification, carbon emissions, community development, and construction technology. The result is a framework called “Design for 203X” which proposes an incremental and flexible approach towards architecture, integrated with advances in other fields to increase human and environmental well-being for a more sustainable and equitable future.

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# DESIGN FOR 203X

Living Architecture for the Sustainable Transition





# Acknowledgements

The background of the page is a light purple architectural illustration. It features a grid of dashed lines representing streets. Various buildings of different shapes and sizes are scattered across the grid, some with multiple stories and others with flat roofs. Small, stylized evergreen trees are interspersed among the buildings. The overall style is clean and modern, with a focus on geometric forms and perspective.

I would like to thank Jeffrey Ochsner and Gundula Proksch, for serving on my thesis committee and for your incisive guidance and insights. I would also like to thank my partner Elizabeth, my family, and my friends for supporting me throughout this journey and my education.

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FIGURE 1.1 -A visualization of Design for 203X.



# Preface

I moved to Seattle a few years ago. I have been impressed by the abundance of evergreen trees and the little moments of individuality in each home. While the single-family house and the suburban neighborhood are problematic, I have come to respect these models as a result of the idea that architecture is most powerful when it is aligned with culture.

Throughout my education as a designer, I have sought to learn how to build affordable, sustainable, and creative environments. I became interested in alternative construction methods, ownership models, and development processes for their potential to enable architecture with more community and individual agency. I am inspired by the opportunities for a more sustainable world when architecture is allowed to engage with the questions of everyday life and culture.



FIGURE 1.2 - A typical post-war suburban home in Olympic Hills, Seattle.



FIGURE 1.3 - An incremental and flexible housing design in Munich.

Design for 203X

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**Living Architecture for the  
Sustainable Transition**

# Chapter 1: Introduction

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This thesis presents an examination and provocation addressing design in the face of today's challenges of sustainability and affordability. Architecture may not have all the answers, but design thinking plays a key role. Architectural design should focus on improving human well-being. This thesis explores how sustainability in residential architecture can be addressed because the manner in which people live has the greatest impact on culture, which ultimately shapes their actions.

FIGURE 1.4 - Architects Declare, an international movement for urgent climate action.

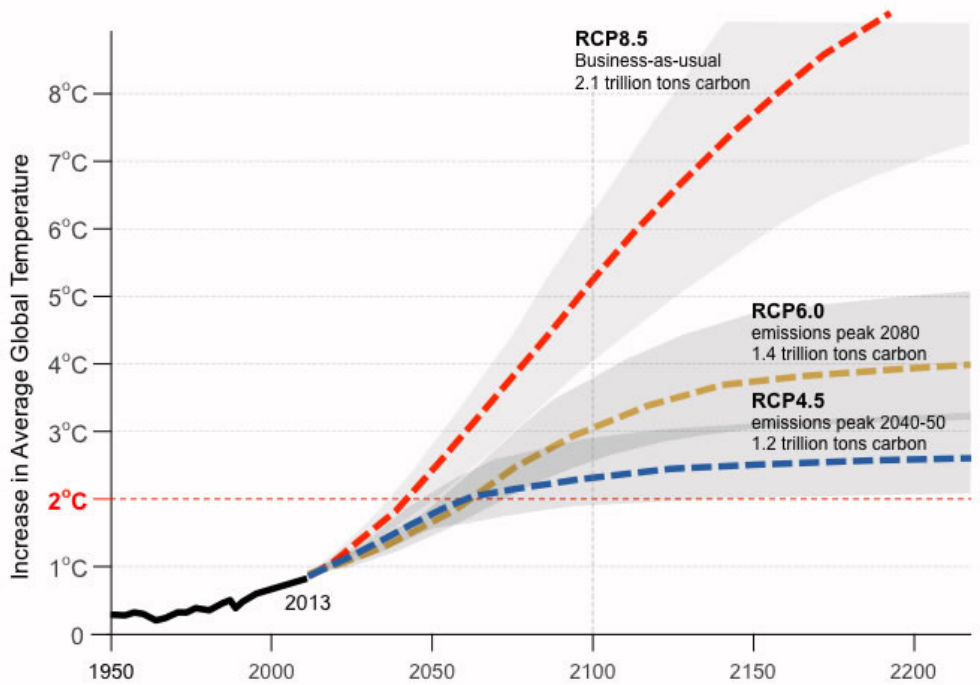


US Architects  
Declare Climate  
& Biodiversity  
Emergency

# The Carbon Problem

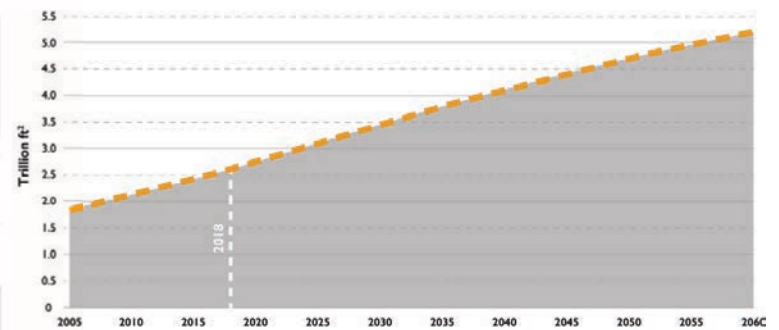
Architecture is increasingly involved in addressing climate change. The impact of the relationship between human habitats and the environment is identified here as the “The Carbon Problem.” By most estimates, 50% of all carbon emissions come from buildings.<sup>1</sup> Scientists estimate only a short period of time is left to reduce carbon emissions to avoid irreversible ecosystem damage. At the same time global building stock is projected to double by 2060.<sup>2</sup> Given these issues, all stakeholders in the built and natural environment must consider how growth could take place very differently.

FIGURE 1.5 - Critical statistics regarding the state of climate change and the building sector.



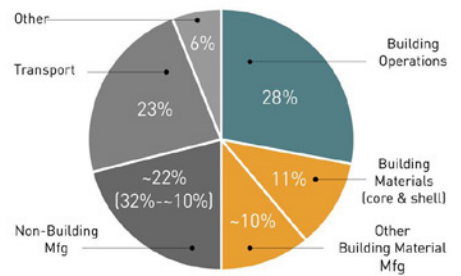
**Global Temperature Projections for various RCP Scenarios**

Source: Architecture 2030; Adapted from IPCC Fifth Assessment Report, 2013  
Representative Concentration Pathways (RCP), temperature projections for SRES scenarios and the RCPs.



**Global Floor Area Growth**

© 2018 2030, Inc. / Architecture 2030. All Rights Reserved.  
Source: UN Environment Global Status Report 2017  
Data Source: IEA (2017), World Energy Statistics and Balances



Adapted from 2019 Global Status Report, Global Alliance for Building and Construction (GA3CI) and Architecture 2030.



# The Research Question

The carbon problem in the built environment is imminent and urgent, while change to architecture and the design and construction of human settlements, occurs slowly. Therefore, the research question of this thesis is:

**What might architecture be – if all involved truly put triple bottom line\* sustainability first?**

**\*social, economic, and environmental sustainability**

# Chapter 2: Yesterday

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## **How Did We Get Here?**

FIGURE 2.1 - Aerial view of suburban development in Levittown, NY.



# How Did We Get Here?

The house (or the residential unit) is a universal building type that is a foundational element of culture. In 1942, Louis Kahn suggested that planning for single-family homes in the United States is the basis of all planning, from the neighborhood scale to the national scale. This thinking has become a driving force in shaping the character of residential architecture in the United States, permeating all aspects of housing production from zoning to design to resource management. Homeowners, business leaders and policymakers often fiercely mobilize in defense of single-family neighborhood land use. Single-family homes dominate the vast majority of US residential land and characterize our collective concept of “home.” By one estimate, 75% of land in most American cities are restricted to a single dwelling per lot.<sup>1</sup>

FIGURE 2.2 - Planning diagram by Louis I. Kahn, ca. 1944.



# The Legacy of the Post-War Period

The single-family suburban neighborhood originated in the 19th century, but assumed its current form in the building boom after World War II. During the war, new materials and technologies fueled a creative period as architects and builders began to speculate about designing for “194X,” the anticipated end to the war. This creative period is exemplified by two well-known design competitions: “The New House for 194X” in *Architectural Forum* and the “Case Study Houses” in *Arts & Architecture*.<sup>2</sup> These projects imaginatively explored the possibilities of steel, plastic, and prefabrication, while addressing the constraints of severe scarcity and mass production. Although “The New House for 194X” focused primarily on design and did not build many entries, the Case Study Houses produced many built experiments of how structural steel and other innovations could be integrated into modern American house design.<sup>3</sup>

**FIGURE 2.3** - (top left) “House of the Future” by Paul Thiry for *Architectural Forum*, incorporating new technologies such as plastic and a central elevator.

**FIGURE 2.4** - (bottom left) Case Study House No. 8 - The Eames House by Charles & Ray Eames, an experiment in prefabricated aluminum structure.

**FIGURE 2.5** - (right) The iconic Julius Shulman photograph of Case Study House No. 22.



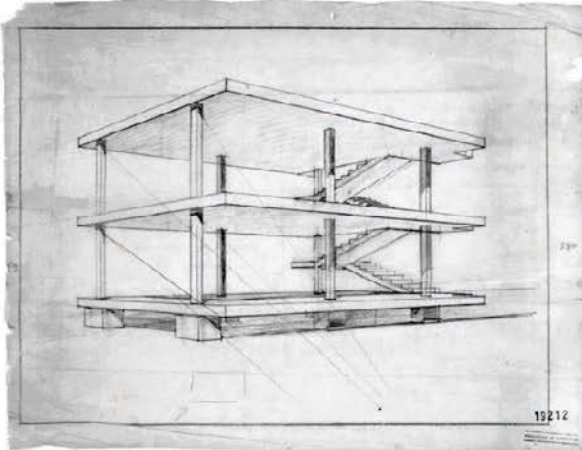
# Visionary Fiction in Architecture

The design competitions of the 194X period reflect a long tradition of architects presenting visionary projects to make an impact by suggesting directions for the future. Some of the most well-known architects in history, such as Le Corbusier or Buckminster Fuller, often made claims about their inventive designs which far outstripped actual reality. However, the power of the ideas embedded in their projects always addressed real-world problems with creativity and new design thinking. These ideas lived on to influence multiple generations of designers and foster additional innovation. While visionary projects in architecture may fall short, they are important intellectual vanguards prompting transformations in the built environment. These types of projects establish key interactions between the design world and the challenges of a particular era.

**FIGURE 2.6** - Allegorical illustration of "The Primitive Hut" concept from *Essay on Architecture* by Marc-Antoine Laugier, 1753.

**FIGURE 2.7** - Drawing of the *Maison Dom-ino* by Le Corbusier, a prototype for the mass production of housing, 1915.

**FIGURE 2.8** - Photograph of the *Dymaxion House* by Buckminster Fuller, 1946.



# Post-War Housing: A Confluence of Innovations

Although post-1945 housing did not adopt the widespread use of steel or prefabrication, many of the ideas from the creative period of 194X influenced what did come. Post-war housing was successful because it was a confluence of many innovations in all fields. For example, in technology, there were new consumer appliances and goods; in construction, there were power tools, light-wood framing techniques, and sheetrock walls; in finance, there was the 30-year mortgage and a new national lending infrastructure; in social aspects, the GI Bill and a massive subsidy of middle-class home ownership, in infrastructure, the advent of affordable cars and highways; and so on.

technology

construction

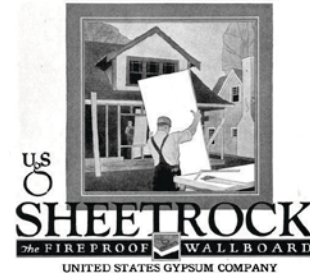


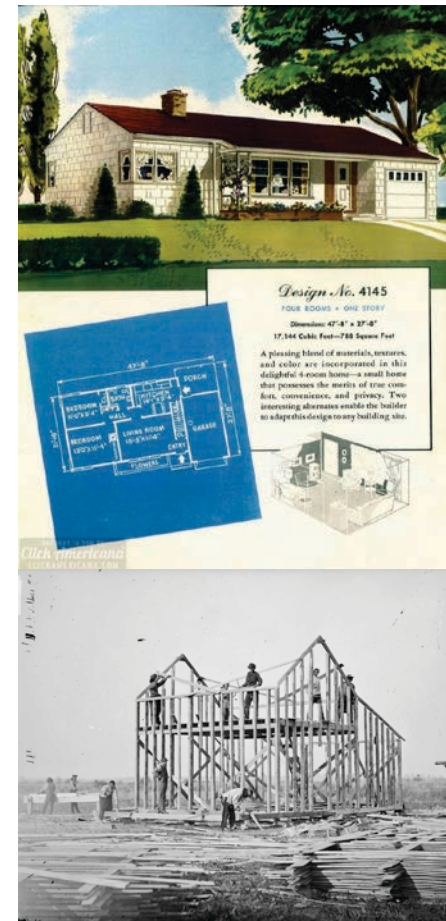
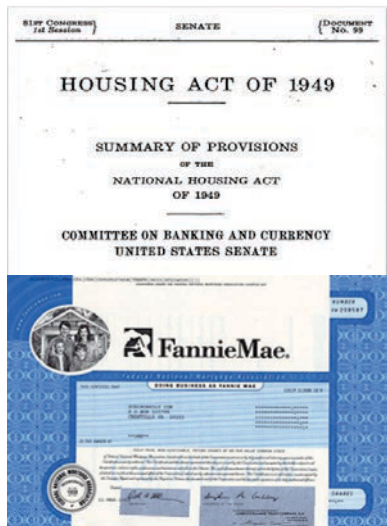
FIGURE 2.9 - Innovations supporting the appearance of the suburban house.

finance

social

infrastructure

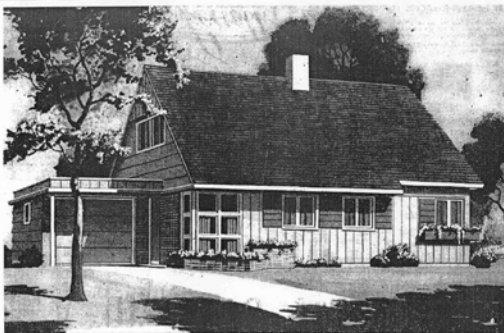
architecture



# Post-War Housing: Development Patterns

The displacement of agriculture in areas close to the city by industrialized agriculture in more rural areas enabled by a new interstate highway system and mobile refrigeration allowed suburban development of vast swaths of previously undeveloped agricultural land. This development pattern aligned with American attitudes of “spatial generosity,” an idea that may date back to the founding of the country, when European settlers took abundant land from Native Americans to establish the new nation.<sup>4</sup> As a result, single-family suburban development became the primary housing form in the United States. One of its biggest strengths was speed of construction and affordability to the middle-class. This typology of single-family homes still defines the US housing market today. Many variations exist, but the basic formula remains: large homes with private yards on individual lots.

**FIGURE 2.10** - Advertisement and photograph of Levittown, NY, the famous tract house development, 1958.



**Value, Beauty, and Charm**  
**FOUR BEDROOMS, TWO BATHS**  
**\$11,990; \$87 a Month!**

► In Summit Park at Levittown, New Jersey, we're building the pretty houses pictured above. In the two generations that we've been creating suburban communities, never have we produced anything as attractive as this house.

► Downstairs there's a spacious living room, a turquoise kitchen, two bedrooms, a exercise bathroom, a charming dining alcove, and an over-size garage.

► Upstairs there are two more bedrooms, another complete bathroom, and some really large closets.

► But honestly, folks, that's only part of the story. Anybody can build rooms. It's how those rooms are arranged, how they're decorated, what appliances and appointments they have, how the landscaping looks, what the community is like.

—It's all those things that really matter.

► Come on over and learn about our brand new schools, our swimming pools, our smart shopping center, our convenience to downtown Philadelphia (just an easy 30 minutes), our rapid transportation facilities.

► With everything, this house sells for \$11,990 plus a ten-dollar bill for all settlement charges! That's all, not a penny more! For that you get the whole house, the plot of 64 by 100 exquisitely landscaped, a General Electric refrigerator, range, and sink. Total cash required is \$400—yes, just four hundred dollars—and carrying charges are \$87 a month!

► It's a bargain and everybody knows it. You'll need \$100 with your application, and occupancy is this Fall or later if you wish.

*Our Exhibit Building and six exhibit homes—priced from \$11,990 to \$14,650—are open seven days a week until 9 P. M. Drive over and take a look. You're always welcome.*

**Levitt and Sons**  
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50 LEVITTOWN, NEW JERSEY

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From New York: Drive West on Route 130 to the Levittown Exit. Turn Right on Route 120 to Levittown. Levittown is 10 miles West of Philadelphia.

From Philadelphia: Drive West on Route 130 to the Levittown Exit. Turn Right on Route 120 to Levittown. Levittown is 10 miles West of Philadelphia.

From Philadelphia: Drive West on Route 130 to the Levittown Exit. Turn Right on Route 120 to Levittown. Levittown is 10 miles West of Philadelphia.

From Philadelphia: Drive West on Route 130 to the Levittown Exit. Turn Right on Route 120 to Levittown. Levittown is 10 miles West of Philadelphia.



# An Enduring Legacy

Seventy-five years later, the American housing landscape has not changed. While many people have benefited from the innovations of the affordable suburban house, this housing form is not able to address today's challenges. In addition, many of the benefits of affordable suburban housing were intentionally denied to minorities on the basis of race, contributing to inequality and systemic injustice. The residual impacts of deed restrictions and discriminatory housing policy remain in the disproportionate racial mix of American suburbs today. As home ownership has been the primary method of wealth-building for middle-class Americans while housing costs and rent are the single biggest cost for households, this discrimination has been doubly harmful to building an equitable society. In addition, the unsustainability and inefficiency of car-dependent suburbs and the consumer-oriented lifestyles on which they are built are increasingly apparent.

FIGURE 2.11 - Suburban life in the post-war period.

FIGURE 2.12 - A typical suburban street today.



# Chapter 3: Today

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## **The Need for a New Visionary Era**

FIGURE 3.1 - Satellite image of a suburban neighborhood today.



# Residential Form & The Architect as Artist

Today, the energies of architects in the residential sector are too often focused on upscale custom-homes and artistic expression serving those with means. This focus is deeply embedded in the processes of architectural practice and discourse, which regularly upholds laborious, one-off designs as the pinnacle of what the profession has to offer. By some accounts, architects only contribute their efforts to 1-2% of total residential construction projects, the majority of which cost well over \$500,000.<sup>1</sup> Architects are not innovating residential development at scale as they did previously in the post-war boom and the prior “194X” period. Therefore, architects today are not well-positioned to engage the key issues in the built environment with the full potential of their skills.

FIGURE 3.2 - Magazine covers showing residential architecture today.

**dwell**  
At Home in the Modern World

Water Wise  
New Tactics for  
Sifting Tides  
Set in Stone:  
Life in an Ancient  
Quarry in France

**Design Matters**  
The Possibilities Are Endless

**dwell**  
At Home in the Modern World

Will Arnett's Home  
The Hollywood Actor  
Opens His Doors

Shipping Containers  
Building a House  
Out of Boxes

**New Horizons**  
Find What Works for You

**dwell**  
At Home in the Modern World

The Dwell 23  
Rising Talent in Furniture,  
Lighting, and More  
Into the Woods:  
A California Couple  
DIY Their Dreams

**The Next Big Thing**  
Emerging Designers and New Ideas

**dwell**  
At Home in the Modern World

**A New Beginning**

Universal Technology  
Smart, Intuitive Apps to  
Serve All People

Community Matters  
The Power of Design Can  
Change the World

**dwell**  
At Home in the Modern World

Bringing It Home  
Design as Self-Portrait

Interior Makers  
All New Home Goods  
Made in the U.S.

A World of Ideas  
Modern Living From  
North to South

**dwell**  
At Home in the Modern World

Down to Earth  
A Peckish Prairie House  
Takes Root in New York

British New Wave  
How a 12,000-Square-Foot  
Garden Became a  
Pulsating Heart

**Wild Life**  
4,000 Outdoor Spaces

**dwell**  
At Home in the Modern World

Schindler Boxes  
Author Susan Orlean  
Revisits an L.A. Classic

Outdoor Vibes  
Open-air kitchens, barbeques,  
chairs, and more

**The New Landscape**  
Designing With Nature in Mind

**dwell**  
At Home in the Modern World

Making Room  
New Case Studies for  
Smaller Spaces

Born in the USA  
American Manufacturing  
Turns a Page

**Visionary Design**  
Architecture Moves Forward

Wooden exterior living  
and dining area home built  
with a hidden in  
Mill Valley, California.

**dwell.com**  
January-February 2017

**dwell**  
At Home in the Modern World

**Interiors We Love**

Color Comes Home:  
Using Vibrant Tiles to  
Maximize Space

Design Icon:  
Joel Frank

Trend Forecast:  
The Latest Looks  
in Furniture,  
Textiles, and More

**dwell**  
At Home in the Modern World

**The New Landscape**  
Designing With Nature in Mind

Schindler Boxes  
Author Susan Orlean  
Revisits an L.A. Classic

Outdoor Vibes  
Open-air kitchens, barbeques,  
chairs, and more

**dwell**  
At Home in the Modern World

Tech Boom:  
How Ingenious Design  
Can Transform Cities

Plug In:  
The Best Strategies for  
Our Connected Future

**Get Smart**  
The Latest in Home Automation, From Carmel to Finland

A new retreat  
for a family of four  
in Carmel, Indiana

**dwell.com**  
March/April 2017

**dwell**  
At Home in the Modern World

Young Guns  
The Next Wave of  
Emerging Talent

PreFab on Tassanani  
An Island State  
Offers a Fresh Start

**Design the Future**  
Enhance the World

**dwell.com**  
May 2017

**dwell**  
At Home in the Modern World

Canal Cutting  
Gear for the New Wave  
of Home Entertainment

**A Sense of Place**  
Design for Where You Want to Live

**dwell.com**  
June 2017

**dwell**  
At Home in the Modern World

Kitchens & Baths  
Check, Groceries  
Delivered, and Other Pross  
Share Their Spaces

Island Escape  
An Architect's Dream  
Retreat on a Chilean Islet

**Bold Perspectives**  
Reimagining the Home

**dwell.com**  
July/August 2017

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At Home in the Modern World

Design Icons  
Susan Orlean and  
Michael De Looze

Happy Places  
Amplifying Housing  
and Emerging Concepts

**Make an Impact**  
Architecture for Tomorrow

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From Around  
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in Furniture,  
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Diocese of Smart Ideas  
for Breaching New Life  
into Older Structures

Case Studies:  
Homes and Spaces  
Reborn

**Make It Modern**

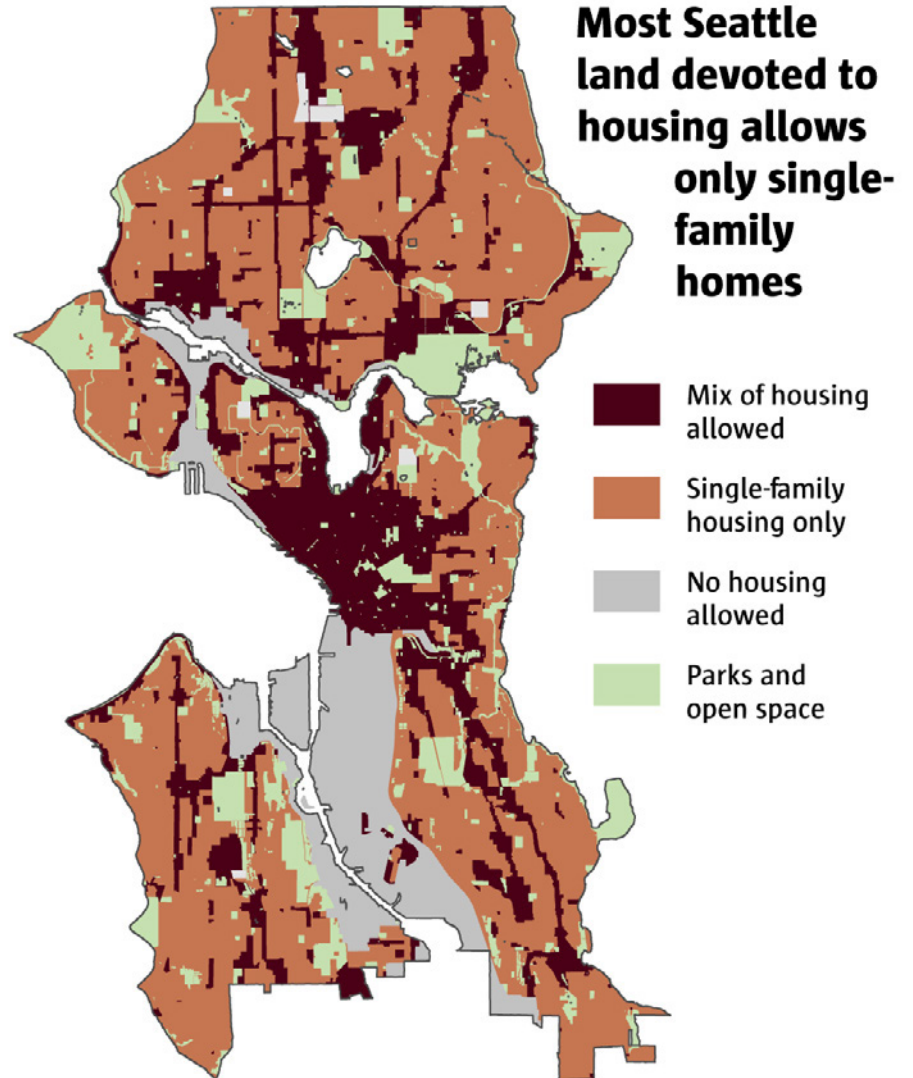
# Context - Seattle's Housing Crisis

In Seattle, like many desirable metropolises today, the crisis in affordable housing is intensifying. The need for affordable housing far outstrips the capacity and ability to produce units, while the market produces ever larger and unaffordable new houses in single-family neighborhoods. The city's policy response has been to concentrate growth primarily in up-zoned "urban villages" where 7% of land area has accounted for 77% of new units in 2017.<sup>2</sup> While up-zoning is a positive step, these units are generally not affordable because their sites are expensive and developers build higher-cost apartments to maximize profits. To address affordability and accommodate residential demand, new strategies must address single-family neighborhoods and open them to more affordable development, particularly because they encompass the majority of American residential land area.<sup>3</sup>

FIGURE 3.3 - Statistics showing Seattle's housing challenges.

### Average Size of New Houses by Year Built

Source: King County Assessor Parcel Data



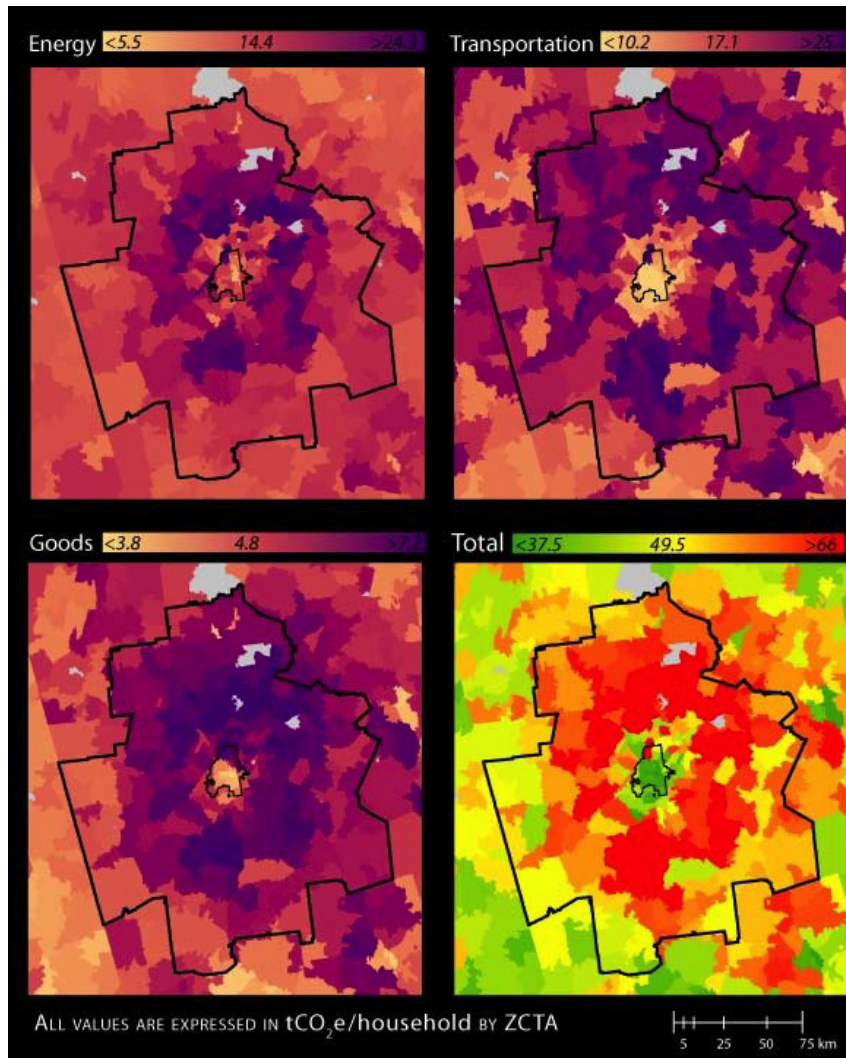
Source: city of Seattle

EMILY M. ENG / THE SEATTLE TIMES

## Is Higher Density the Simple Answer?

The current strategy of densification in “urban villages” implies that higher densities in compact neighborhood urban centers are a simple answer to the challenges of growth and sustainability. However, research shows that although urban cores have much lower carbon emissions, they have historically attracted and supported much larger areas of higher carbon suburban sprawl. Many more people live in suburban and exurban regions than in the urban centers. While denser urban environments are undoubtedly much more efficient, they have attracted a far larger amount of high-carbon suburban communities.<sup>4</sup> Today this pattern is found in almost every American city, where surrounding suburbs and “edge cities” more than cancel out the efficiencies of the urban core. Clearly, strategies responding solely to the denser parts of cities will not be enough.

**FIGURE 3.4** - False-color images comparing estimated carbon emissions in Atlanta’s urban core and suburbs.



# Density and Carbon in Seattle

The pattern of high-carbon suburbs surrounding the more efficient urban center is apparent in the Seattle metropolis. In mapping annual household carbon emissions by postal code, urban core households are found to be more efficient, but a much greater number of households in the surrounding suburbs of King County are responsible for almost twice the carbon footprint (on average).<sup>5</sup>

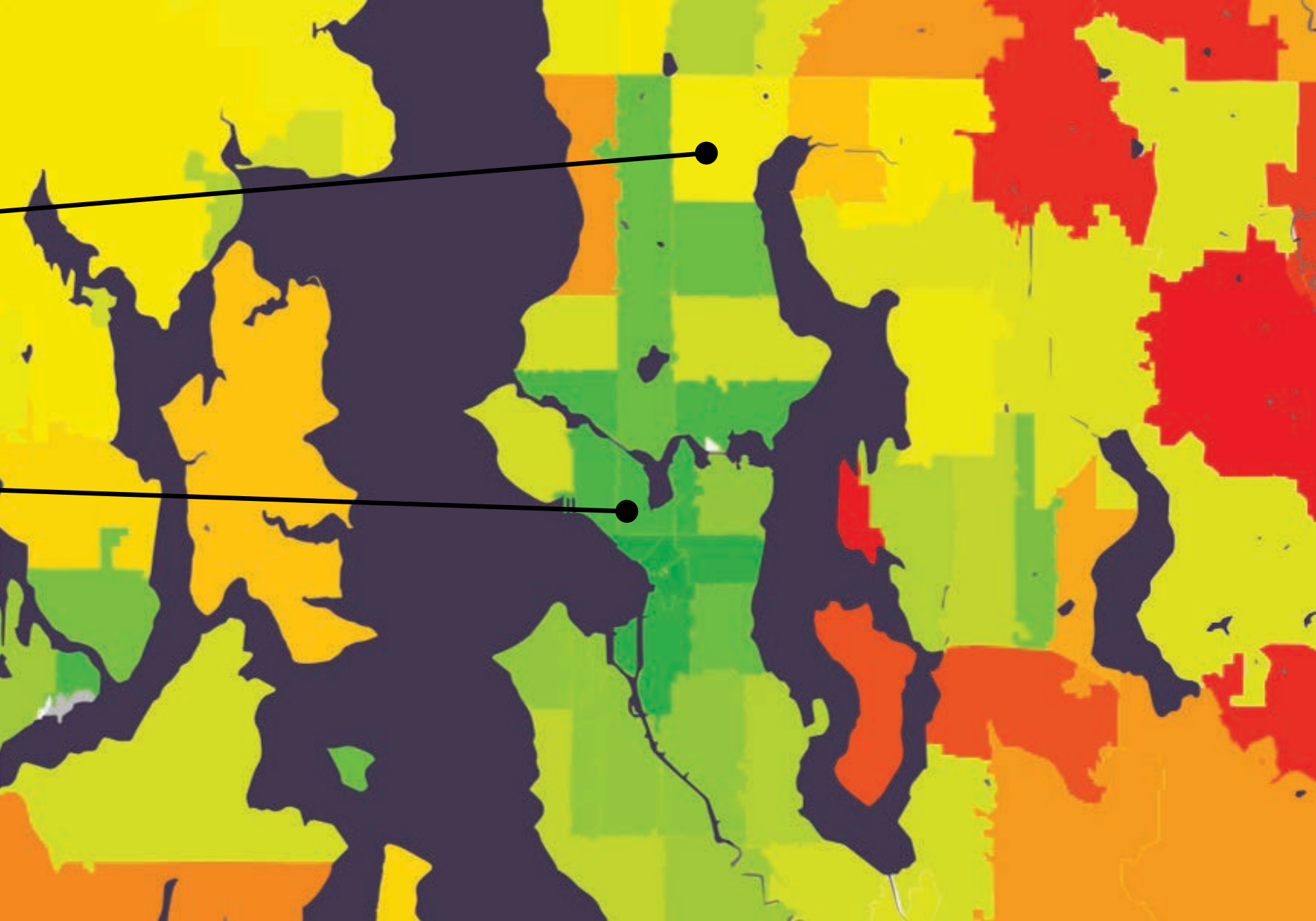
## SUBURBAN



## URBAN



FIGURE 3.5 - Estimated annual household carbon emissions in and around Seattle.

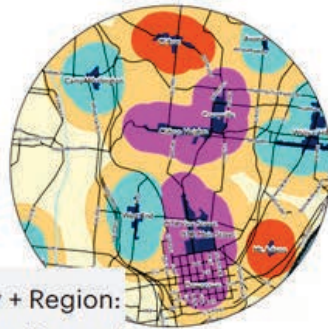


# The Missing Middle Housing Movement

In considering the growth of cities, some architects advocate for the return of “Missing Middle” Housing typologies to single-family neighborhoods, including low-rise housing options such as duplexes, townhouses, and small apartment buildings.<sup>6</sup> Historically, before the advent of restrictive single-family zoning ordinances and private deed restrictions, these typologies were permitted in most residential areas of American cities. Many examples (for example, corner stores with apartments above) still stand today in restricted single-family zones. Proponents of missing middle housing argue that doubling density within these areas could eliminate up to 18% of CO<sub>2</sub> emissions and provide additional housing in these areas.<sup>7</sup>

**FIGURE 3.6** - Neighborhood transect diagram showing “Missing Middle Housing” types.

**FIGURE 3.7** - Chart showing estimated carbon savings from through “Missing Middle” housing in single-family zones.



City + Region:  
Comp/General Plans



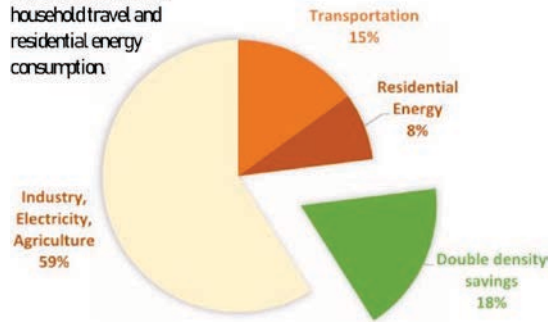
Neighborhood:  
Area Plans + Zoning



Lot + Building:  
Architecture + Site Planning



42% of total US carbon dioxide emissions are household travel and residential energy consumption.

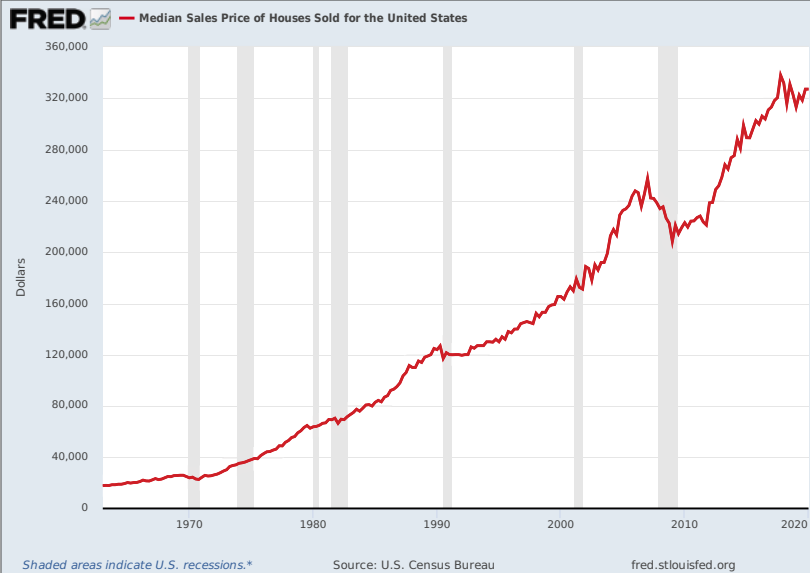


# The Scale of the Problem

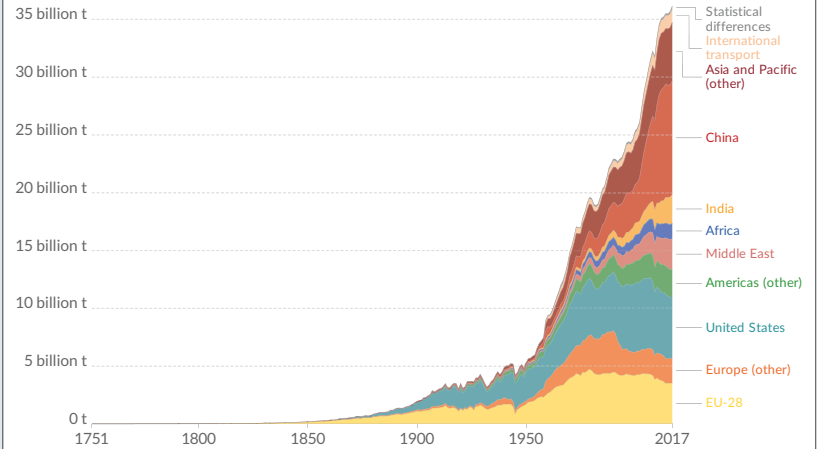
Unfortunately, the scale of our current challenges far exceeds an 18% decrease. Missing Middle Housing is part of the answer, but not a complete one. To adapt the built environment to climate change and address systemic inequity requires developing a broader set of solutions. The current paradigm, a legacy of the post-war period, has only existed for less than seventy years, even greater change will most likely happen in the next seventy years. Today, as the dual crises of housing affordability and anthropogenic environmental degradation escalate to unprecedented levels, the efforts and decisions that professionals, policymakers, builders, and, most importantly, that citizens make must radically reshape the suburban landscape.

**FIGURE 3.8** - (left) graph showing historical rise in median housing prices in the US.

**FIGURE 3.9** - (right) graph showing global carbon emissions over time by region.



### Annual total CO<sub>2</sub> emissions, by world region



Source: Carbon Dioxide Information Analysis Center (CDIAC); Global Carbon Project (GCP)  
 Note: The difference between the global estimate and the sum of national totals is labeled "Statistical differences".  
 OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

# An Inflexible System, A Harmful Trajectory

While urban densification and Missing Middle Housing are important and executable today, these efforts are still firmly on a trajectory towards environmental catastrophe. The majority of new construction today tends towards the minimum acceptable performance of building codes. Even with stricter energy codes, as in Seattle, most projects fail to meet important emissions reduction targets as the American Institute of Architects' 2030 Challenge.<sup>8</sup> According to estimates from the AIA, 90% of buildings that will be standing in 2025 are already standing.<sup>9</sup> What is built today and what is already standing today will remain standing for a long time, "locking in" these unsustainable buildings and the culture that goes with them. Therefore, a new visionary era is needed.

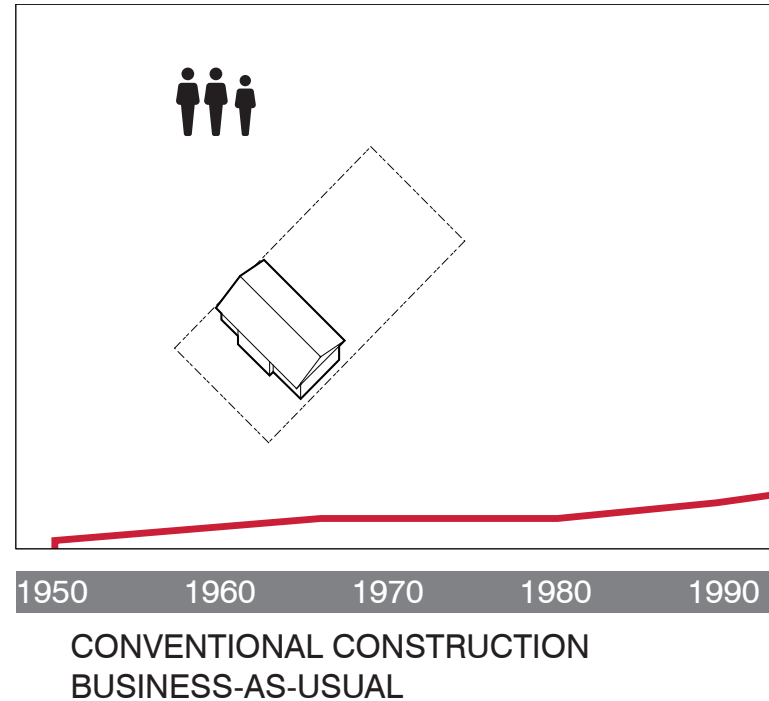
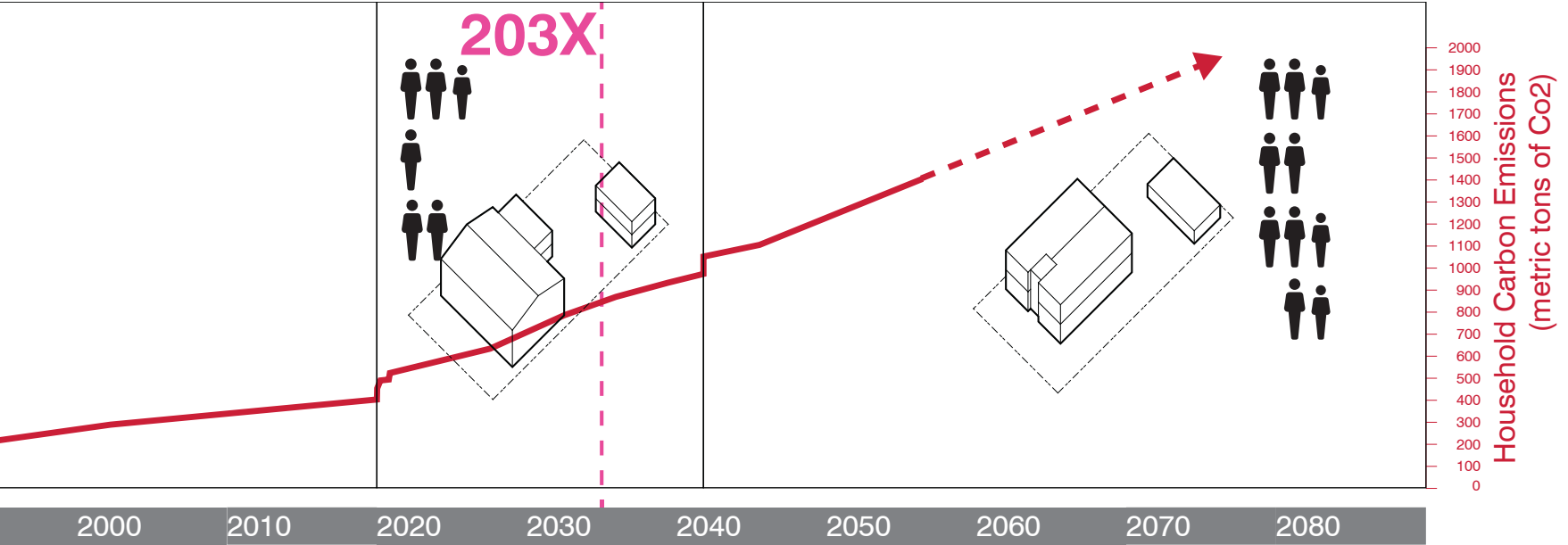


FIGURE 3.10 - The current trajectory of carbon emissions over time.



# Chapter 4: Tomorrow

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## **Design for 203X**

Just as 194X influenced the post-war housing boom of the post-1945 era, a new visionary period called 203X must imagine what is needed to transform our environments for the sustainable transition. A new vision is important because much of the world today still sees the typical American suburb as an aspirational model for a good quality of life, but it is actually a dead end. A new vision is needed.

**FIGURE 4.1** - Conceptual axonometric drawing of a suburb transformed.



# Not Yet A Confluence of Innovations

Looking towards the future, advances in technology seem unprecedented and innumerable. However, unlike the post-war era, architecture and construction do not appear to be benefiting from a convergence of innovations. The key to the success of the post-war model was the synergy of so many new ideas from multiple fields, especially in social, cultural, and economic aspects. In order to have the same impact, sustainable designers must now search for a new confluence of innovations or, “Design for 203X.” The following is a proposal for five key points of “Design for 203X”.

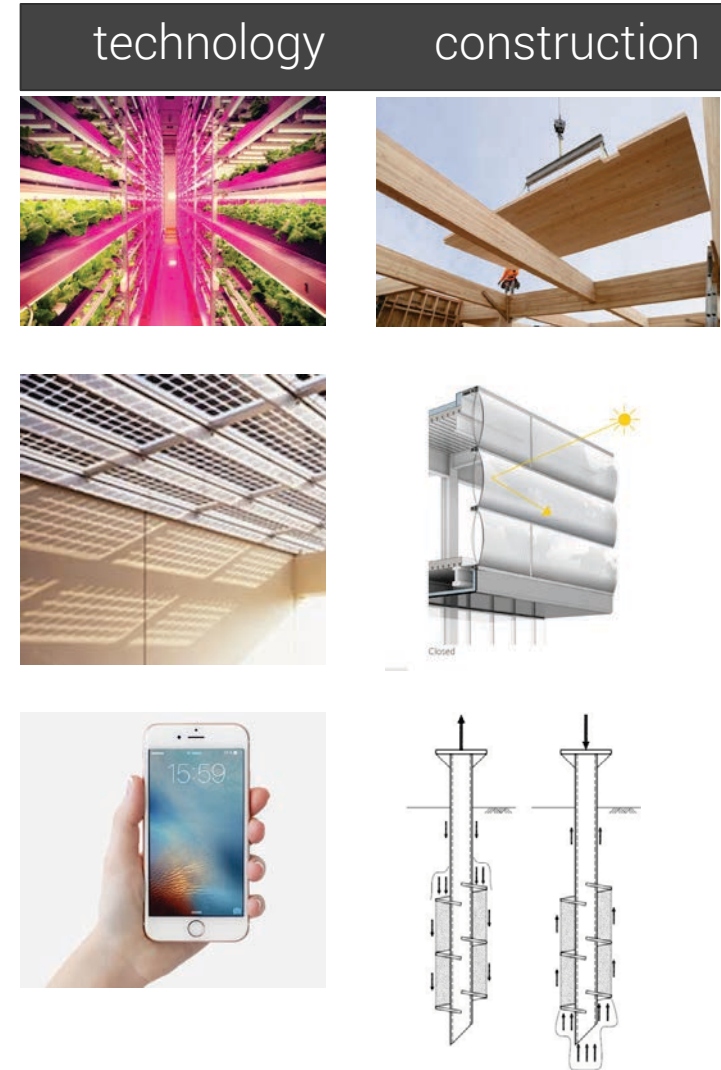


FIGURE 4.2 - Current innovations in construction and technology.

finance

social

infrastructure

architecture

?

?

?

?

**DESIGN  
FOR 203X**

# Point 1 - Alternative Ownership Models

Land currently primarily functions as a monetary vehicle owned and operated for the speculative profit of private finance corporations.<sup>1</sup> At the same time, no one who is struggling with poverty and inequity has the luxury to consider sustainability goals. In general, the financial machine of the modern real estate sector has increased the commodified value of urban land well beyond the reach of the average citizen. To address the resultant inequity and land scarcity in the typical city, alternative models of ownership need to be considered. One model that is well aligned with this need is that of community land trusts (CLT), which separate the value of land and the value of buildings through non-profit leasing agreements in order to develop the homes and

structures for community benefit without speculative appreciation. The CLT organization owns the land while residents own their houses. The houses are kept affordable through agreed-upon covenants which dictate a modest increase in value over the years to keep the houses affordable and attainable while generating wealth for someone who would otherwise be a renter. A scaling up of this type of idea is an important way to develop social values in the built environment. CLTs require a democratic structure of interested buyers of affordable housing, local officials, socially-minded developers, and designers. They work together to develop the land for community benefit once land is purchased.<sup>2</sup>

FIGURE 4.3 - Community land trust structure and concept.

CLTs are typically governed by:



The CLT's geographic focus allows it to not only provide affordable housing, but to play an important role in stabilizing neighborhoods.



As it diversifies its portfolio, the CLT can also own land in trust for permanently affordable rental housing or community-focused commercial developments.

## RESIDENT CONTROL OF BUILDINGS

SINGLE-FAMILY HOME



LIMITED EQUITY HOUSING COOPERATIVE [LEHC]



CONDOMINIUM



MULTIFAMILY RENTAL



99 YEAR GROUND LEASE

## COMMUNITY OWNERSHIP OF LAND

# Point 1 - A Community-Driven Development Model

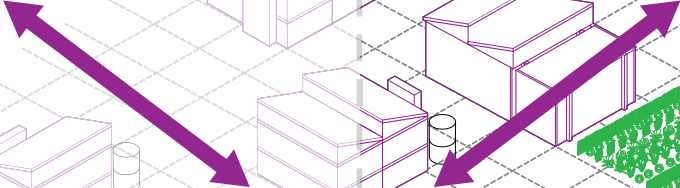
A key component of the appeal of community land trusts (CLTs) is the possibility for community-driven development. In a CLT, land is developed for residents, by residents. Once established, the investments, efforts, and decisions of each CLT member is made for the benefit of the entire community. There is great potential in combining this democratic landownership and development structure with emerging social media, communication technologies, and the advent of ubiquitous data collection. Both the individual user and

the community's direct needs could become a stronger driver of good design. Through a more connected and fluid process, development can accommodate a responsive feedback loop both before, and after, a structure is built.<sup>3</sup> The goal is to maximize connecting with, and listening to, the end users. The future owners/residents would be able to imagine, comment, and evaluate possibilities proposed by architects. They would then be able to work together to design, finance, and build more responsive and regenerative solutions.

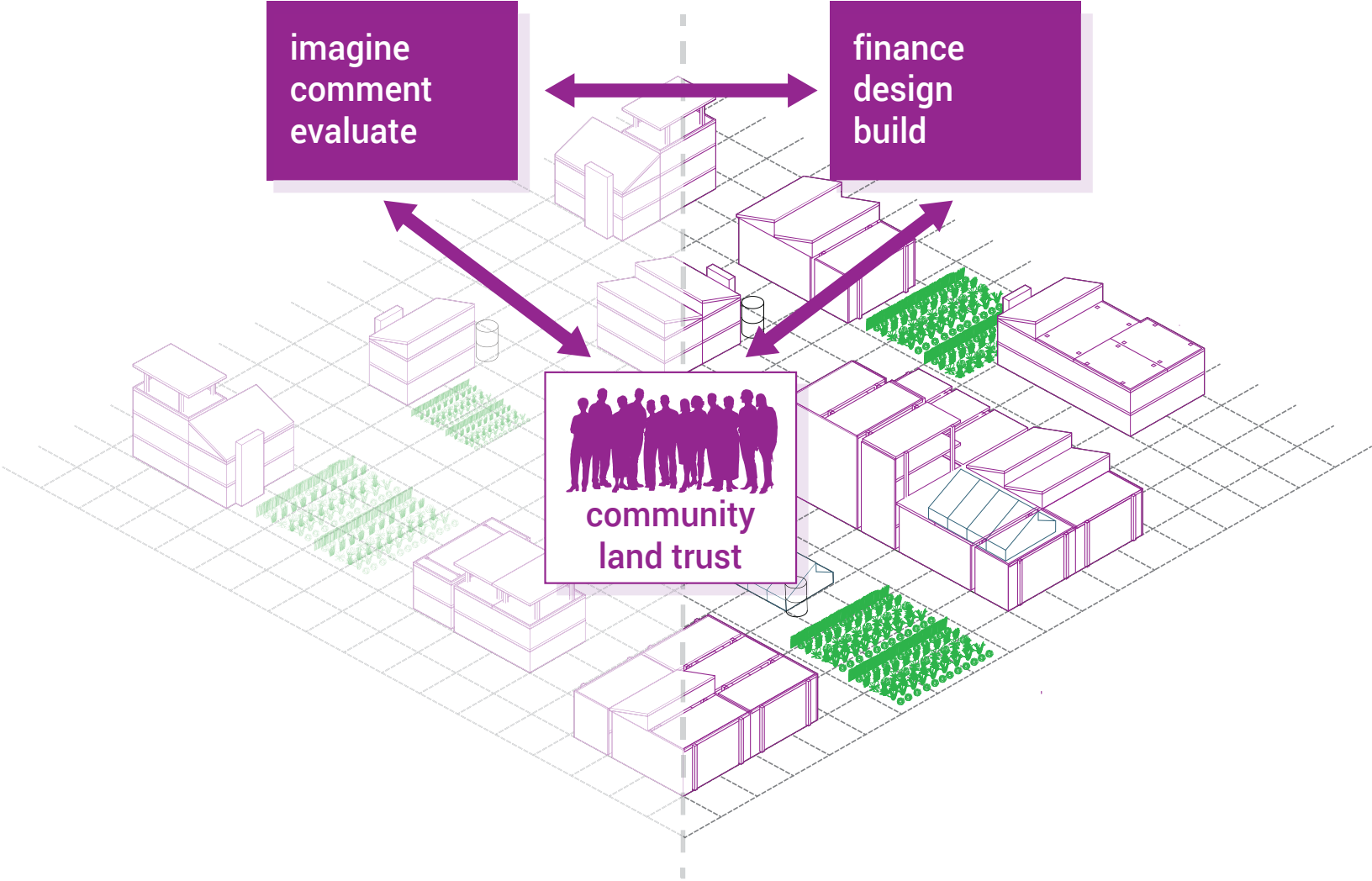
FIGURE 4.4 - Conceptual drawing of a community-driven development model.

imagine  
comment  
evaluate

finance  
design  
build



  
community  
land trust



## Point 1 - The Role of the Architect

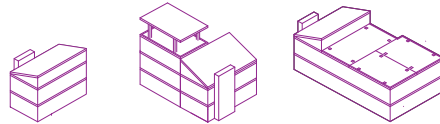
In designing for 203X, architects and designers must reclaim the role of innovating for the sake of better living, rather than only artistic achievement. Architects could be continuous facilitators between the residents' needs, dreams and built realities, while ensuring sustainability and equity. Instead of being dogmatic about abstract design principles, architects could unlock the "right to the city"<sup>4</sup> and an open dialogue between life and architecture for all communities, placing the social value of human habitat above speculative commodification in the real estate market.

Instead of being removed from the mass market by the barriers of developer profit margins and architects' own incomprehension of the everyday issues of average persons, architects as community co-developers would be able to integrate new design thinking where it is needed most: the vast majority of existing residential buildings. This role applies the creative and technical energies of the architect directly to the real issues of domestic life and how to adapt new development to be more sustainable.

FIGURE 4.5 - Conceptual flow of the cooperative development process

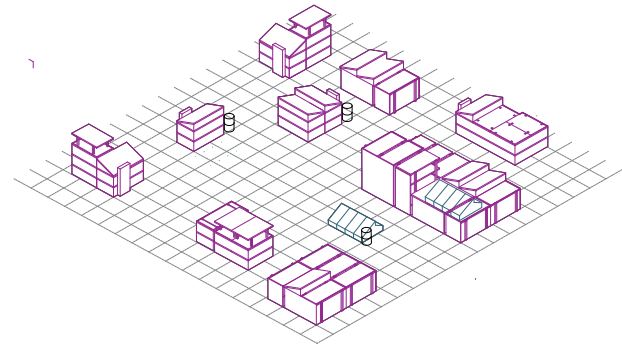


**community  
land trust  
members**



**architects**

# DESIGN FOR 203X



the architect designs directly to the needs of the community, resulting in strong input and large cost savings not possible with traditional development models.

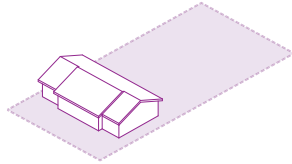
## Point 2 - Economic Models for Social Impact

Community land trusts and other limited equity organizations are generally reliant on external funding for start-up, one of the reasons for their slow uptake. This funding comes from membership fees, grants, investors, philanthropy and loans.<sup>5</sup> Therefore, CLTs will need to find paths to economic sustainability; they might develop additional affordable housing on purchased land as well as any other non-housing values that can be produced from land such as food, water, and energy. From a social perspective, the highest and best use of land is not to increase property value, rent, or mortgage cash flow, but to increase value for living.

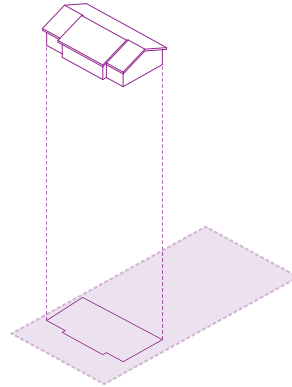
FIGURE 4.6 - Economic breakdown of the CLT development model.



community  
land trust

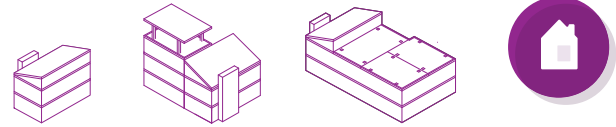


existing  
property  
owners



separation of  
land value from  
house value

## DESIGN FOR 203X



additional housing units



community land values



new community  
land trust  
members

# Point 2 - Community Land Trusts for Social Impact

A community land trust can be considered a multi-dimensional entity, with differing sets of members. A simple balance sheet analysis of the assets and liabilities for each of party may reveal some opportunities. One potential driver is that many existing (often older) homeowners have a large amount of illiquid equity, debt, or a home that no longer fits their stage of life. These homeowners could sell the land underneath their homes to a CLT for development. Additional units could be added as accessory dwelling units, converted garages or floors, or additions. They then join the CLT in return for liquid cash and a guaranteed unit of housing. They may either remain in the existing dwelling unit, live in a newly developed unit, or sell their housing share at value to someone else.

## ASSETS

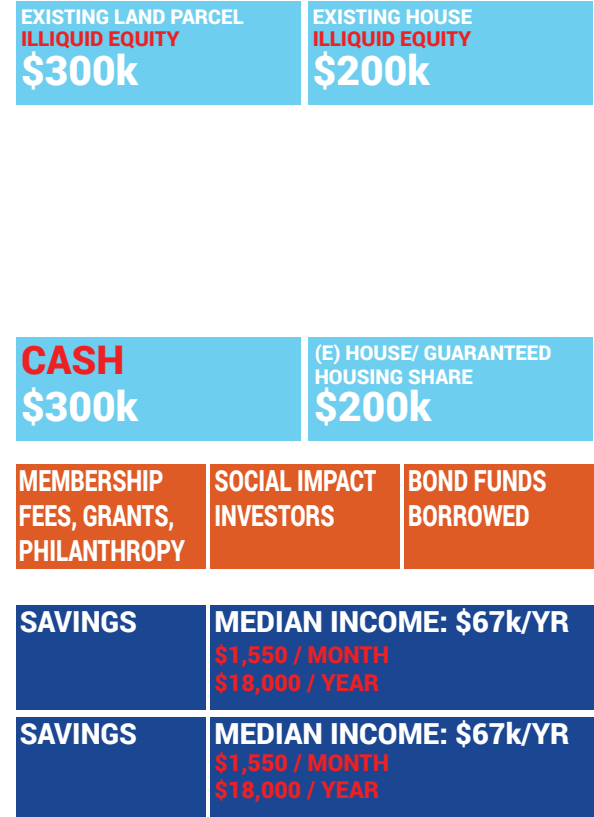


FIGURE 4.7 - Balance sheet analysis of CLT stakeholders.

# LIABILITIES

(E) OWNER

(E) MORTGAGE DEBT

\$0 - ???  
+interest

PROPERTY TAXES

~\$5000-6000  
a year?

PROPERTY TAXES

~\$5000-6000  
a year?

SALE OF LAND  
UNDER (E) HOME  
TO CLT203X

(E) OWNER

(E) MORTGAGE DEBT

\$0 - ???  
+interest

COMMUNITY  
LAND TRUST

DEBT

\$300k

BOND REPAYMENT  
30-50 YR, 2.5% INT  
\$1000 / MONTH

1/2 PROPERTY  
TAXES  
\$250 / MONTH

(N) OWNER 1

(N) UNIT  
DEVELOPMENT  
\$110k

30-YR MORTGAGE  
STRUCTURE ONLY  
\$550 / MONTH

BOND REPAYMENT  
\$500 / MONTH

MEMBERSHIP FEES  
\$200 / MONTH

1/2 PROPERTY TAXES  
\$250 / MONTH

(N) OWNER 2

(N) UNIT  
DEVELOPMENT  
\$110k

30-YR MORTGAGE  
STRUCTURE ONLY  
\$550 / MONTH

BOND REPAYMENT  
\$500 / MONTH

MEMBERSHIP FEES  
\$200 / MONTH

1/2 PROPERTY TAXES  
\$250 / MONTH

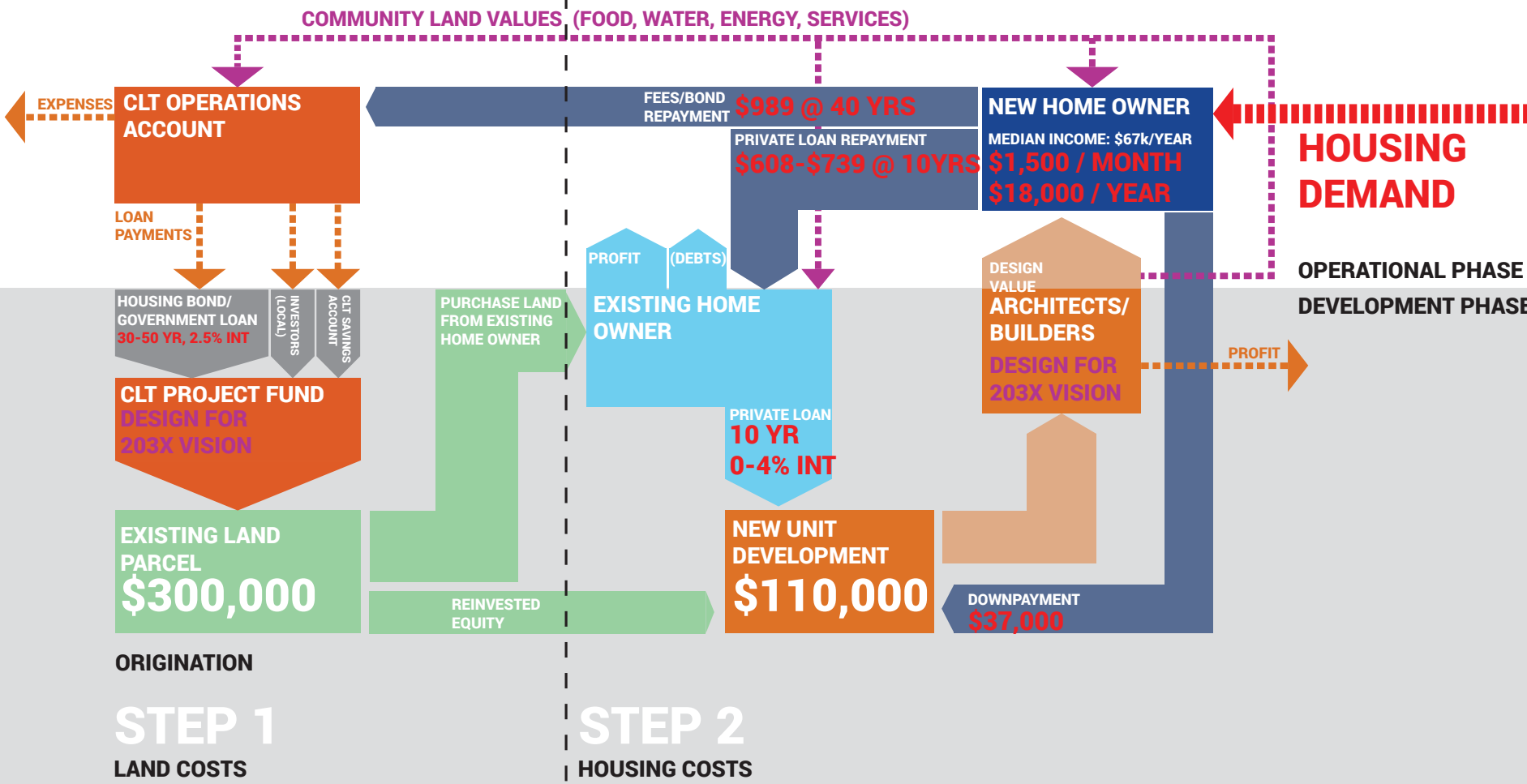
## Point 2 - Financial Models for Social Impact

Another possible key to scaling up this model is the creation of a housing bond with a long-term maturity to help the CLT pay for the land over time. The Toronto Community Housing Corporation raised \$450 million dollars in 30-year bond issues in 2007 and 2010. Long-term bonds are an efficient and flexible means of raising capital, allowing refinancing and credit-worthiness based on the finances of an entire organization rather than a single property.<sup>6</sup> Unlike a mortgage, only a low interest payment is due monthly, until the maturity date, when the full amount is due. The separation of housing and land costs allows the home to be more affordable and funds can be more easily secured traditionally by new residents to develop new units. Through this process, the land can be removed from the real estate market, and instead provides social capital and impact for the community. The process can be continually driven because affordable housing demand does not go away.

FIGURE 4.8 - Economic flows in CLT for social impact.

# STEP 4

# STEP 3

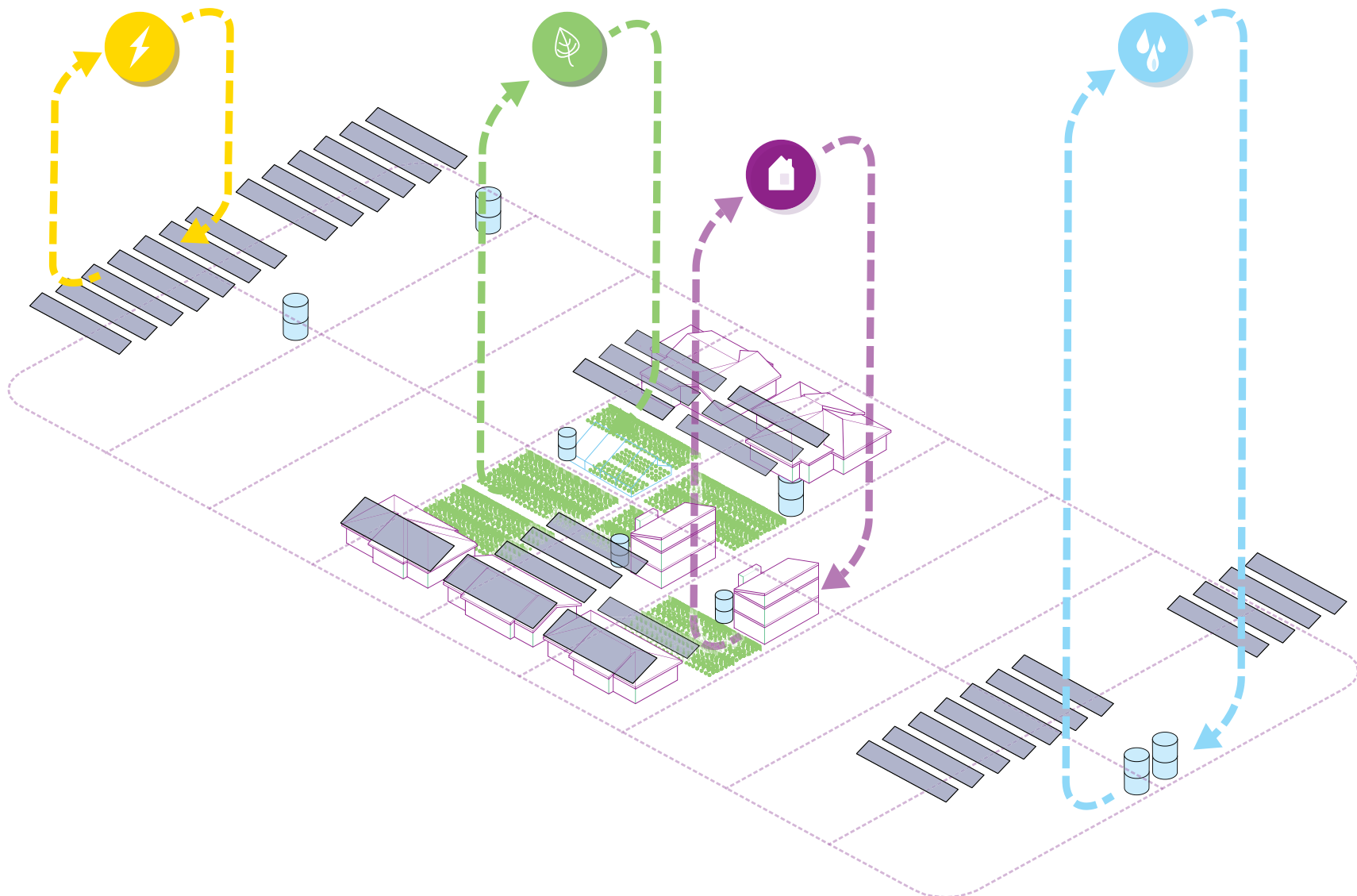


## Point 2 - Community Land Values

As a cooperative form of development, CLTs are able to develop addition housing units in conjunction with non-housing values from land, such as micro-food production, rainwater harvesting, and renewable energy. These products of the land could also be used directly by residents or sold to utilities or neighbors to the benefit of trust members. Good design in the form of a sustainable home is most beneficial and long-lived through an owner-operator, which ideally is the community.

In this way, sustainable design and CLTs could work very well together in the long term. The value created by design thinking is also long-term, extending far past the typical capital development cycle through the entire lifecycle of a structure.

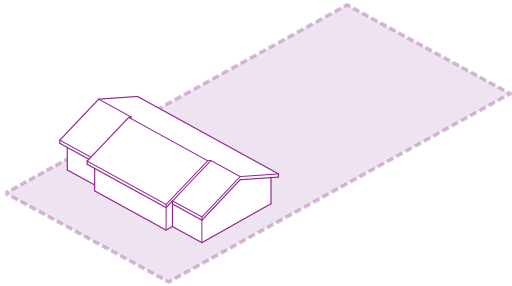
FIGURE 4.9 - Concept drawing of non-housing land values.



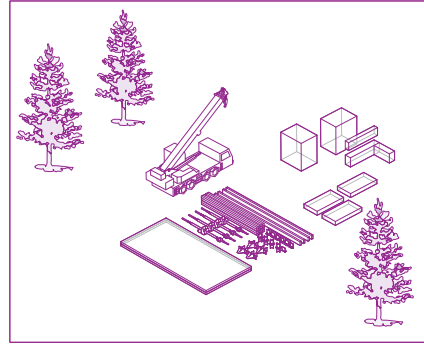
## Point 3 – Dynamic & Evolutionary Architecture

Structures designed for 203X cannot simply be incremental improvements over current models. Due to inefficiencies in the waste stream and to the externalities of the current supply chain of raw materials, the construction of architecture is linear, following a path of take, make, use, dispose, and pollute. According to the U.S. Environmental Protection Agency, construction and demolition waste is estimated as twice the amount of municipal solid waste created annually in the United States, and 90% of this waste is thought to originate from demolition.<sup>7</sup> To end the wasteful cycle of building, demolishing, and rebuilding structures, a dynamic and evolutionary architecture that can respond to change is needed. Change is inevitable, and in current development models, any change produces massive amounts of wasted material, labor, time, and capital, causing harm to the environment and a creating a major barrier for community-first design.

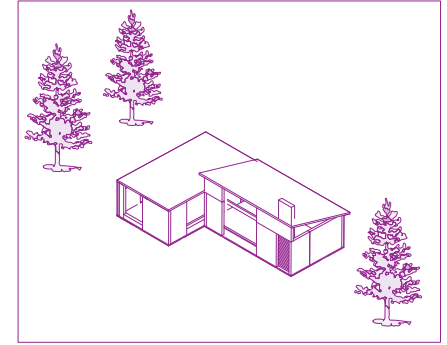
**MAKE** → **USE** → **DISPOSE**



**today**

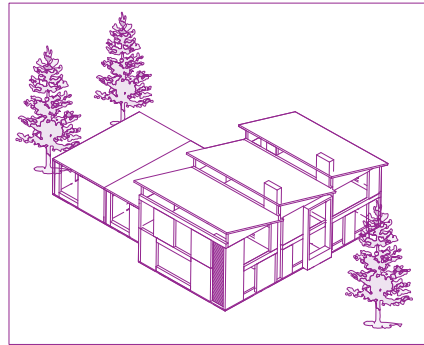


**MAKE**

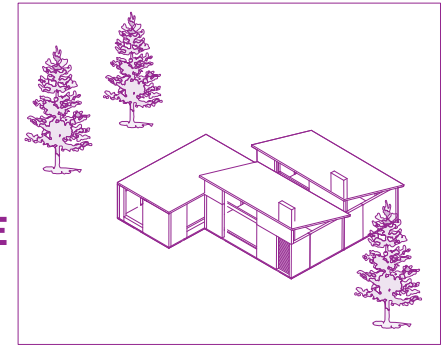


**USE**

**REMAKE** ↑



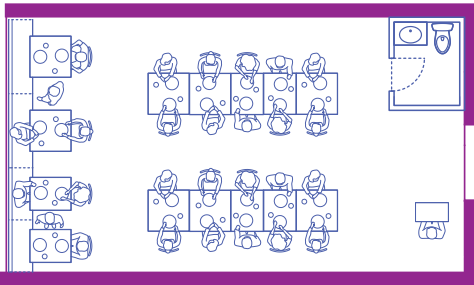
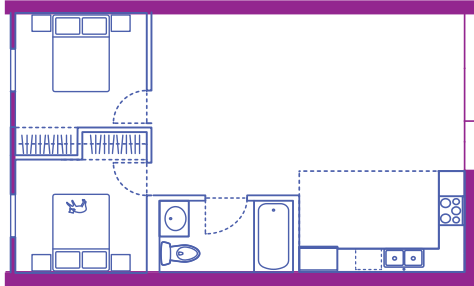
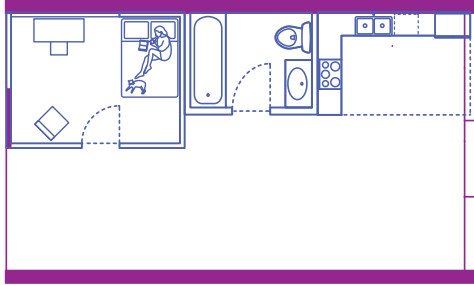
**REUSE**



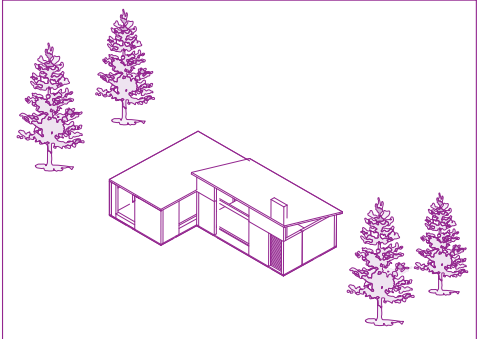
**tomorrow**

## Point 3 – Flexibility in Architecture

Overall, there are two ways in which architecture can be dynamic and evolutionary. It is important to distinguish between adaptability and flexibility in order to understand the design challenge. Architecture can be adaptable, meaning accommodating changes in usage and function, or it can be flexible, meaning accommodating change in capacity, scope, or structure and form.<sup>8</sup> A dynamic and evolutionary architecture must accommodate both. While most architecture already accommodates some sort of change (especially in commercial developments, which cycle through interior layouts, fittings, and fixtures in the tenant improvement process), very few projects have ever attempted to accommodate both types of lifecycle change simultaneously.



**adaptable**



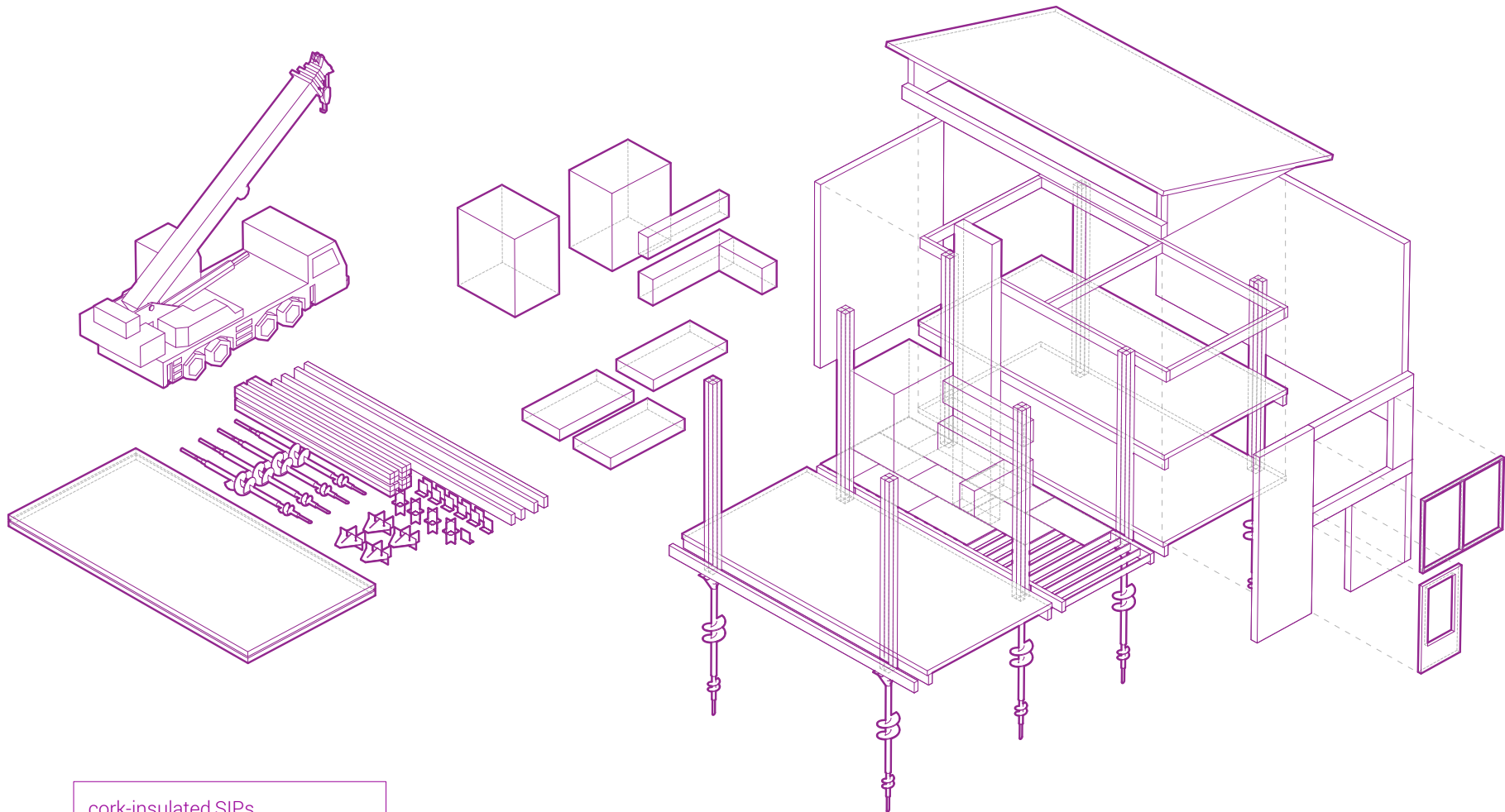
**flexible**

## Point 3 – A Kit of Parts

The professionalization of architecture and the increasing magnitude of prerequisite capital in the built environment present significant challenges to innovating construction means and methods. However, architects have begun to revisit modular and prefabricated design because of recent economic pressures and a renewed concern for building responsibly. A dynamic architecture will need to use a “kit of parts” system to standardize the construction process to make it more efficient through the reduction of labor. The parts and pieces of such a “kit” must be designed to meet the challenges of a dynamic

and evolutionary architecture in the face of climate change, meaning a focus on reducing embodied carbon in materials. This can be achieved through the reuse of existing materials and the use of low-carbon, recyclable substitutes for high-carbon products like concrete. For example, a kit of parts might consist of reversible steel foundations that are not made of concrete, prefabricated building structure and services, and advanced structural systems like engineered mass timber and steel. Such a system would be designed to reduce and sequester embodied carbon.

FIGURE 4.12 - A hypothetical kit of parts system.



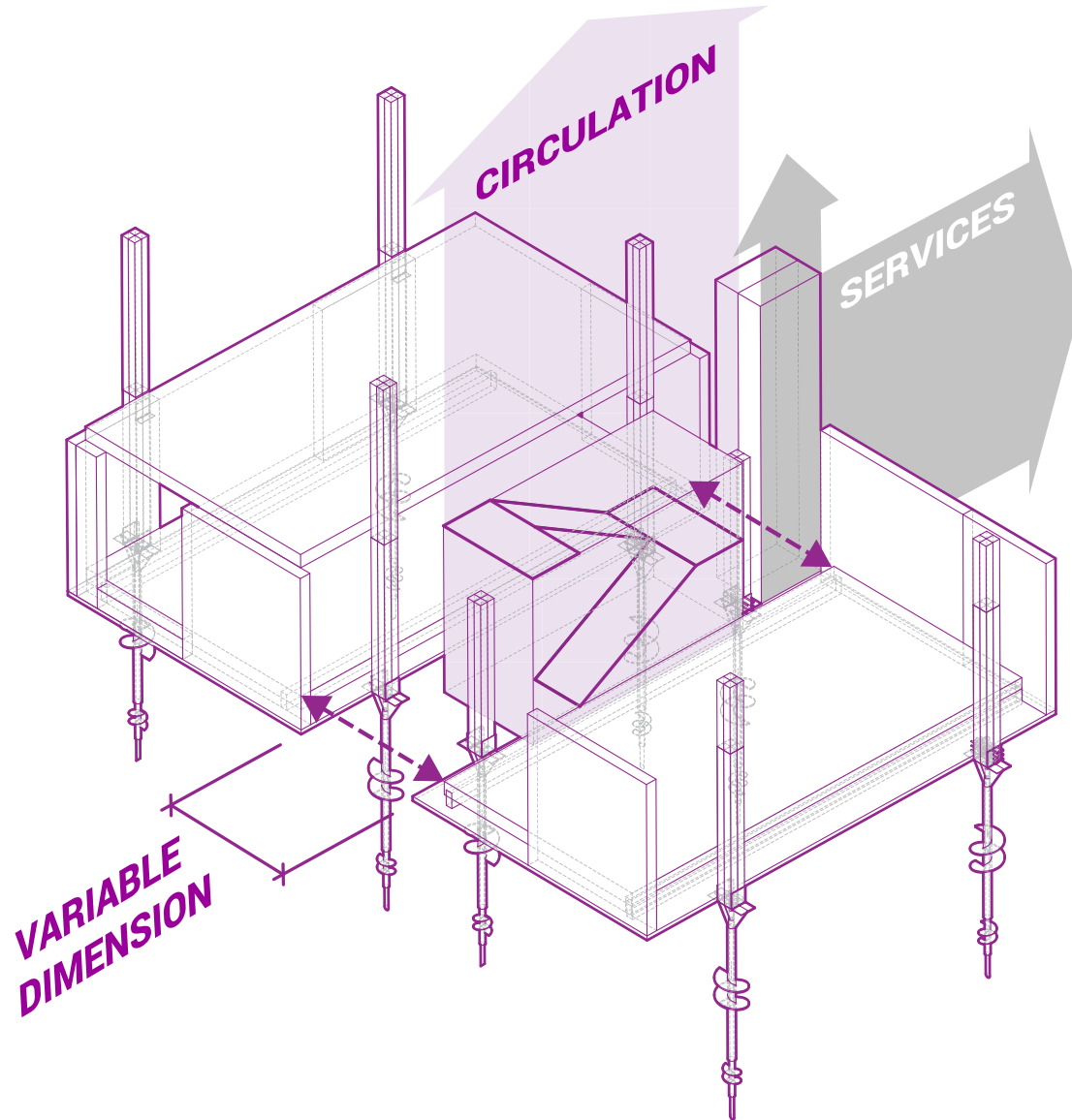
cork-insulated SIPs  
prefabricated services  
modular windows  
modular roof assembly panel  
remountable interior partitions

**kit of parts**

## Point 3 – “Shim Space” for Flexibility

Modularity is not a new idea in architecture, but flexible and modular architecture will need to become less rigid in order to accommodate a range of site conditions and dimensions. These conditions and dimensions become much more varied when considering an architecture that will change with time. One key way to achieve this is to allow for variable dimensioned space, called “shim space,” between discrete (standardized) structural modules to adapt to both sites and future conditions. The shim spaces between structural modules can also be used to accommodate vertical and horizontal services such as mechanical equipment, window openings, door openings, and circulation. This approach may be doubly effective because service cores will need to be accessible both internally and externally without demolition in order to be sustainably extendable and upgradeable.

FIGURE 4.13 - Using variable space for accommodating site, systems, and function.



creates flexibility for  
reconfigurable spatial  
dimensions, vertical  
circulation, services

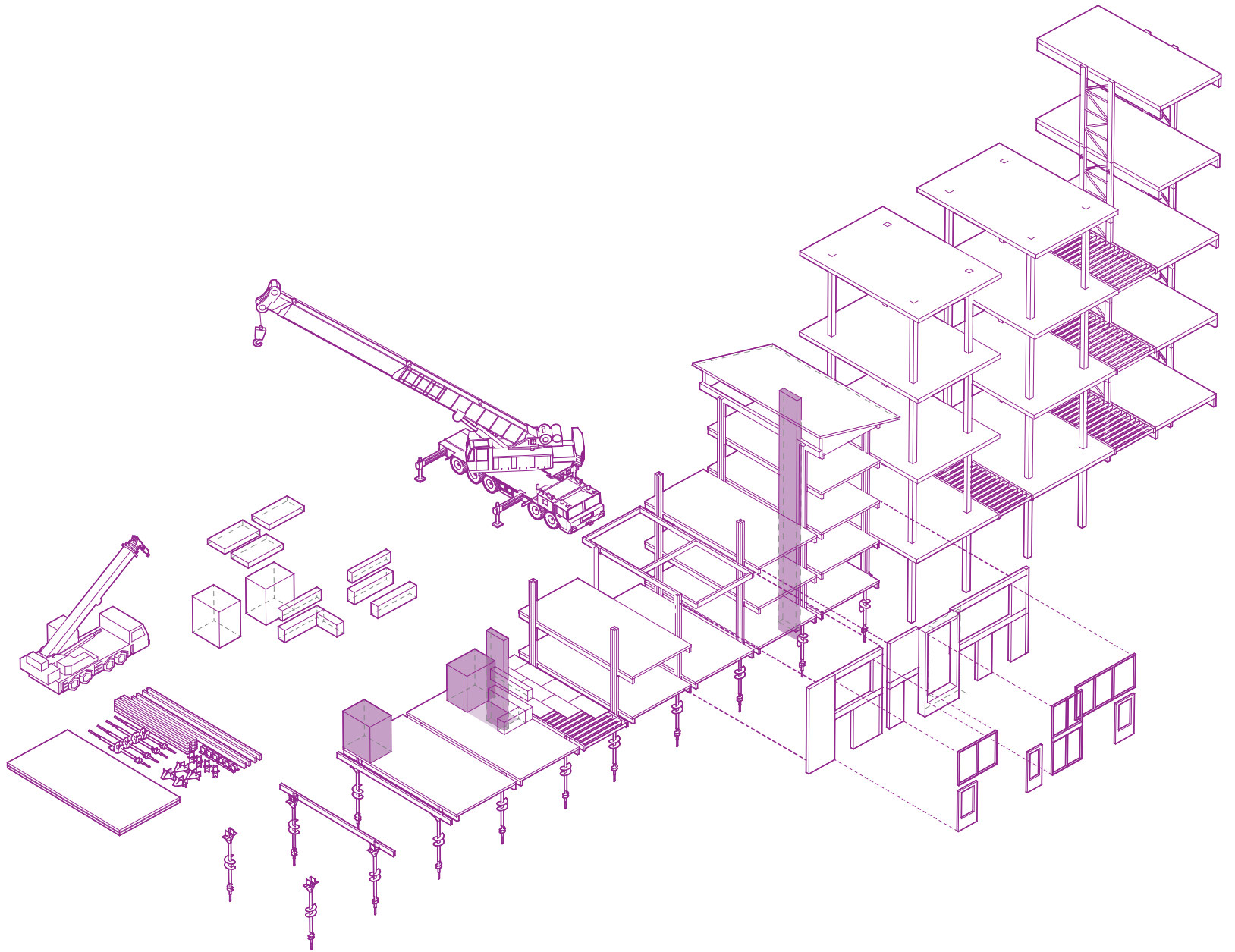
**"shim" space**

## Point 3 – Means & Methods for Flexibility

A dynamic and evolutionary architecture will require architects, engineers, builders, and manufacturers to experiment with new technology, materials and methods. In the past, other considerations were prioritized such as ease and convenience of construction as in the post-war paradigm of light-wood frame houses in the United States. Currently, most building codes classify construction types primarily based on size, height, fire resistance, and material. In designing for 203X, the longevity and durability of buildings and their materials becomes a crucial priority. Buildings must be designed as “material banks” that store materials rather than waste them.

They must be designed for both adaptation, flexibility, and disassembly at the end of life. Therefore, a new set of values, priorities, and considerations must define the construction systems and building codes of 203X. Durable and long-span structures that can be used as discrete structural modules for over 100 years will be better than cheap and short-span systems such as stick-framing. However, all of these systems must also be compatible with each other while preserving the ability to customize and accept change throughout the lifecycle. The following are examples of directions for three possible systems.

FIGURE 4.14 - Concept drawing of integrated construction systems for 203X.



## Point 3 – System 1 Heavy Timber Bypass

One system might consist of heavy timber elements assembled in a bypass fashion. This system would prioritize the carbon-sequestering benefits of massive timber elements. Assembly with bypass mechanical joints would allow the system to be easily expanded or disassembled in the future.

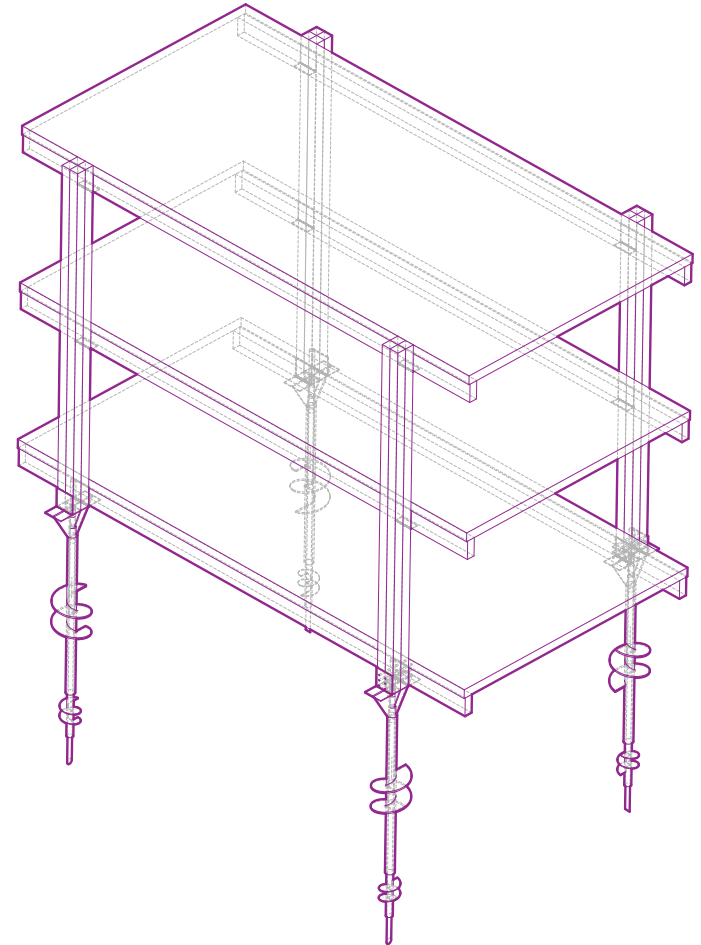
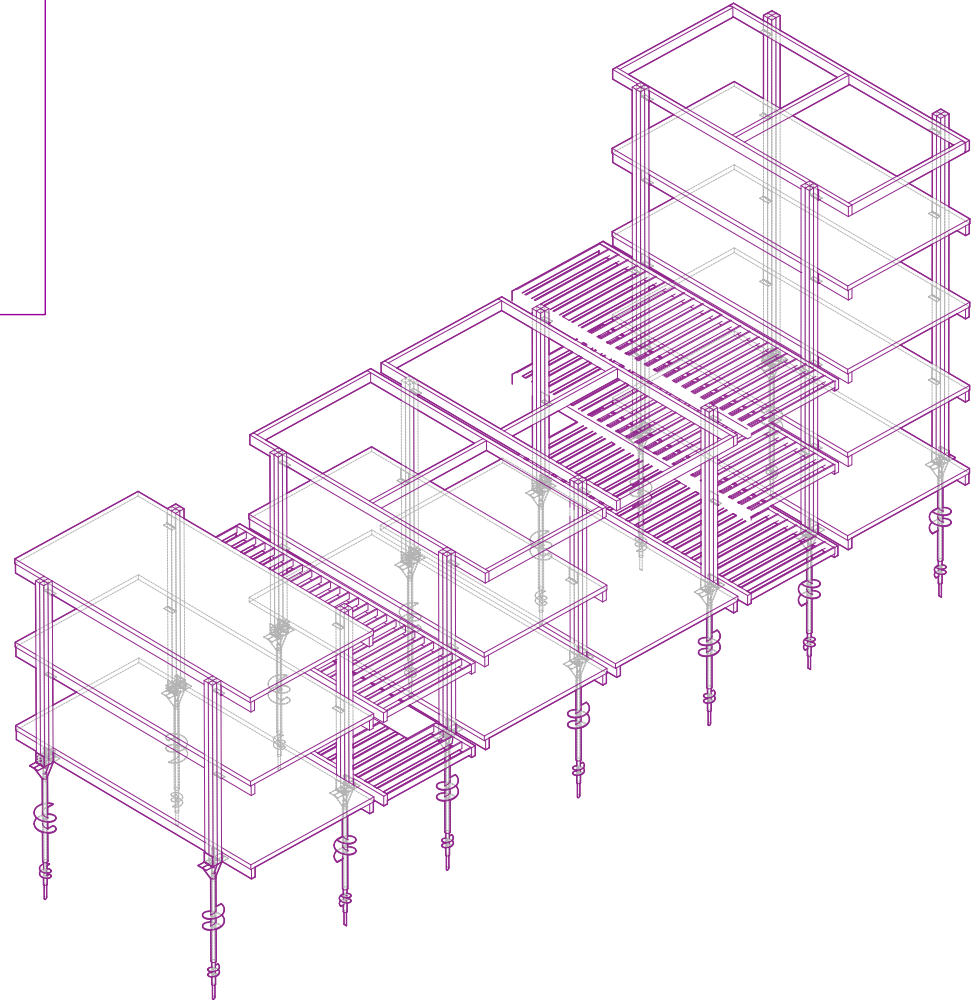


FIGURE 4.15 - Example construction system 1:  
heavy timber bypass.

## MATERIALS

floors	dowel-laminated floor panels
horizontals	glue-laminated beams
joints	steel connectors
verticals	screw-laminated columns
foundation	steel screw piles



## Point 3 – System 2 Steel-Jointed CLT

Another system might use cross-laminated timber joined with steel connectors, taking advantage of cross-laminated timber's carbon storage, long span, and two-way span capabilities. These capabilities would allow structural columns to be located in-board of diaphragm panels, allowing both greater flexibility for both interior and exterior wall layouts.

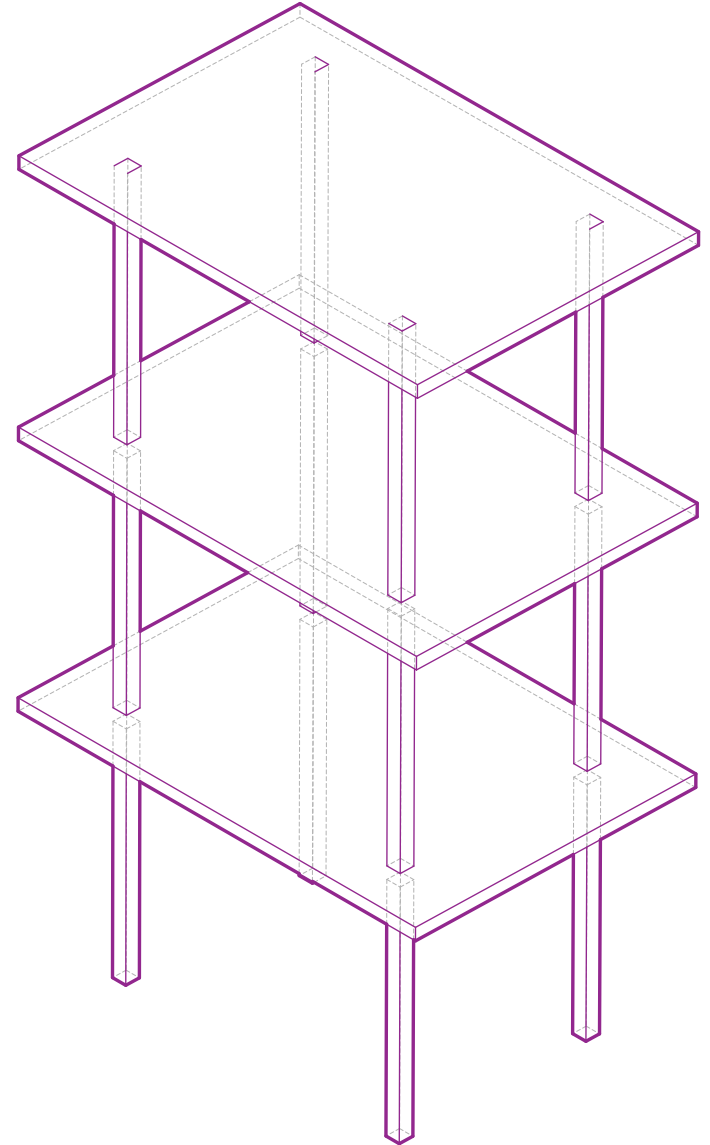
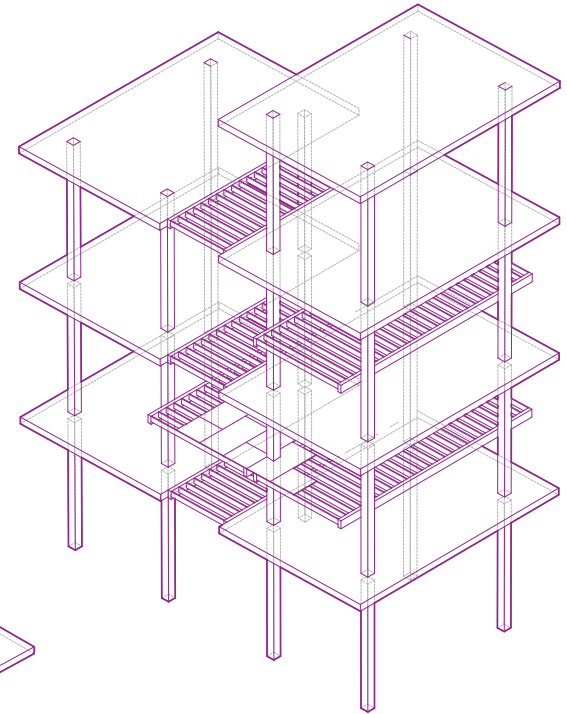
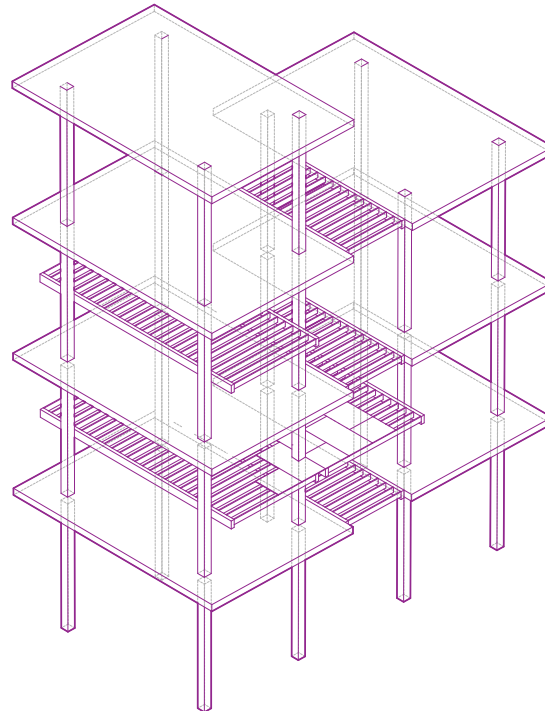


FIGURE 4.16 - Example construction system 2:  
steel-jointed cross-laminated timber.

## MATERIALS

floors	cross-laminated floor panels
horizontals	glue-laminated columns
joints	steel connectors
verticals	glue-laminated columns
foundation	steel screw piles



## Point 3 – System 3 Wood-Steel Hybrid

This system might use a hybrid structural frame of timber and steel in order to increase prefabrication and maximum heights. This system could enable greater variation in floor-to-ceiling height, as the steel elements have greater strength and, for example, might allow attachment to floors at regular intervals.

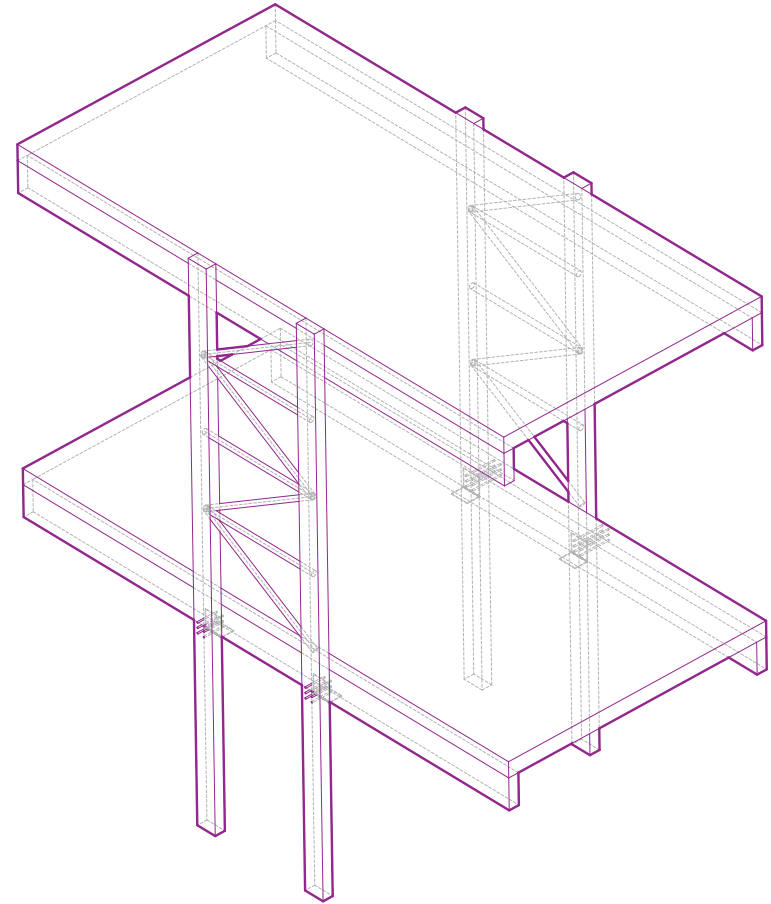
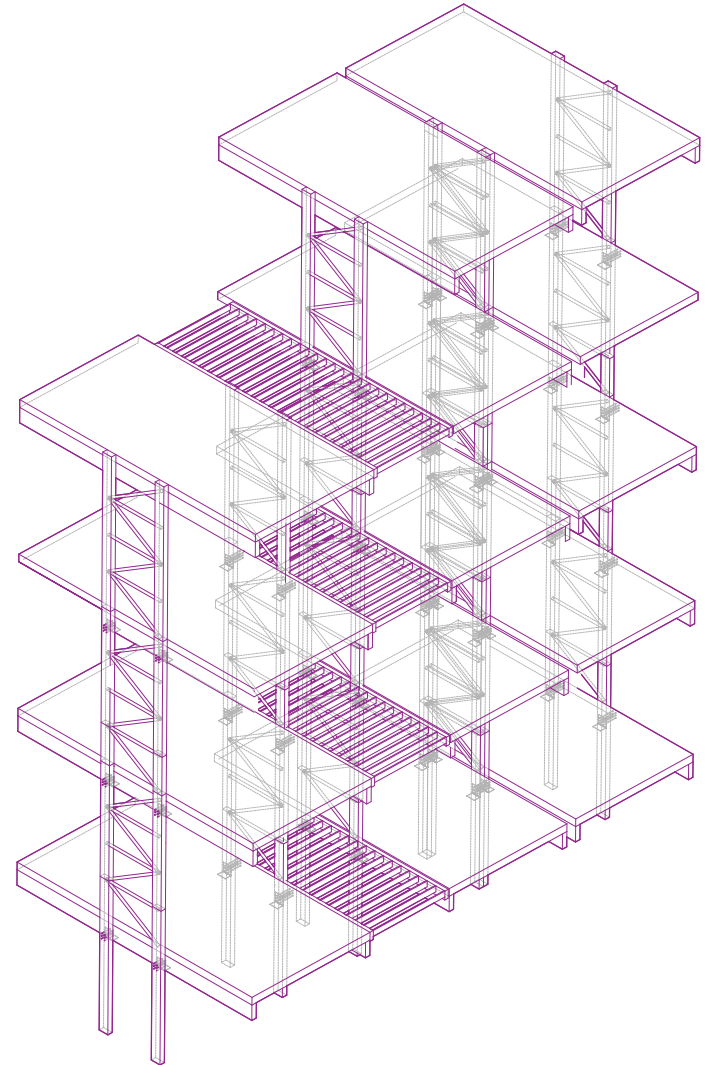
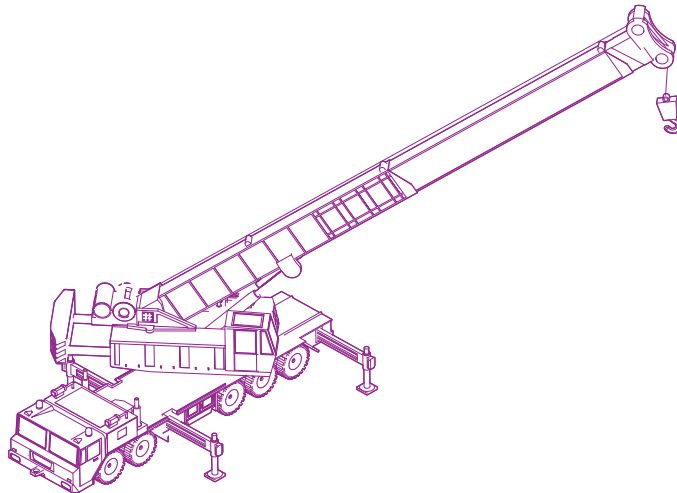


FIGURE 4.17 - Example construction system 3: wood-steel hybrid.

## MATERIALS

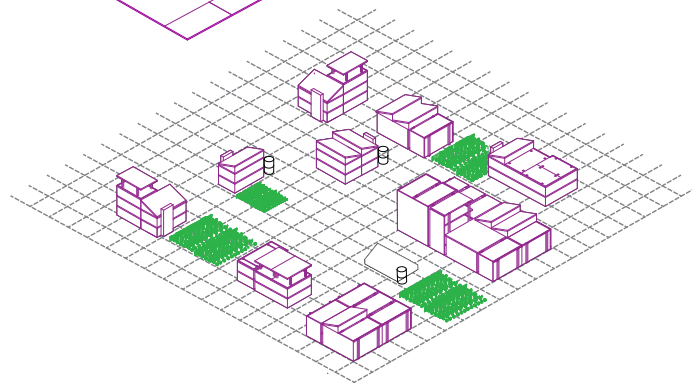
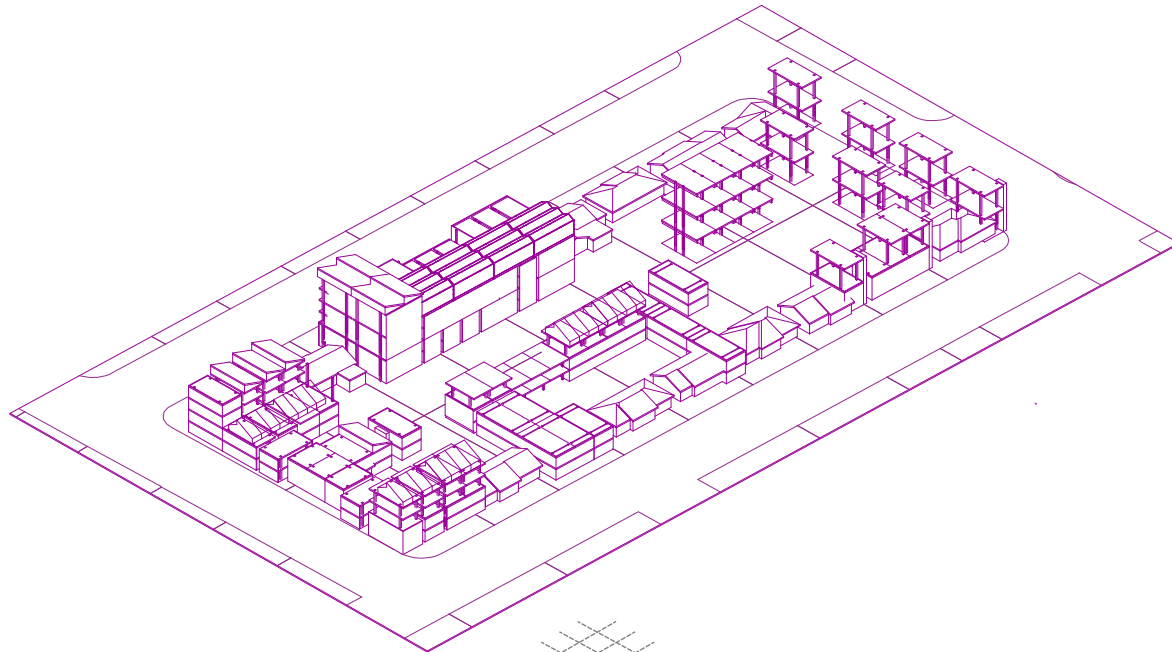
floors	dowel-laminated floor panels
horizontals	steel i-beams
joints	steel connectors
verticals	steel truss members
foundation	steel screw piles



## Point 4 – A Path From Low to High Capacity

Designing for 203X acknowledges that growth is necessary and that single-family neighborhoods eventually need to absorb some growth in population and change in demographics. To allow greater flexibility in every community, the regulatory environment for planning and construction processes must be rewritten to support maximum social impact from community developed land. Required changes entail ending single unit lot maximums, developing an ownership structure for multi-unit land, allowing the assembly of land

parcels for community benefit, increasing height limits, and developing outcome-based planning methods. In many cities, planning reform has become highly intertwined with political and cultural forces. However, due to the severity of the dual crises in affordability and sustainability, social and physical change is inevitable. Now is the time for architects, planners, and citizens to come together to understand the implications of maintaining the status quo and to envision and choose a better version of the future.



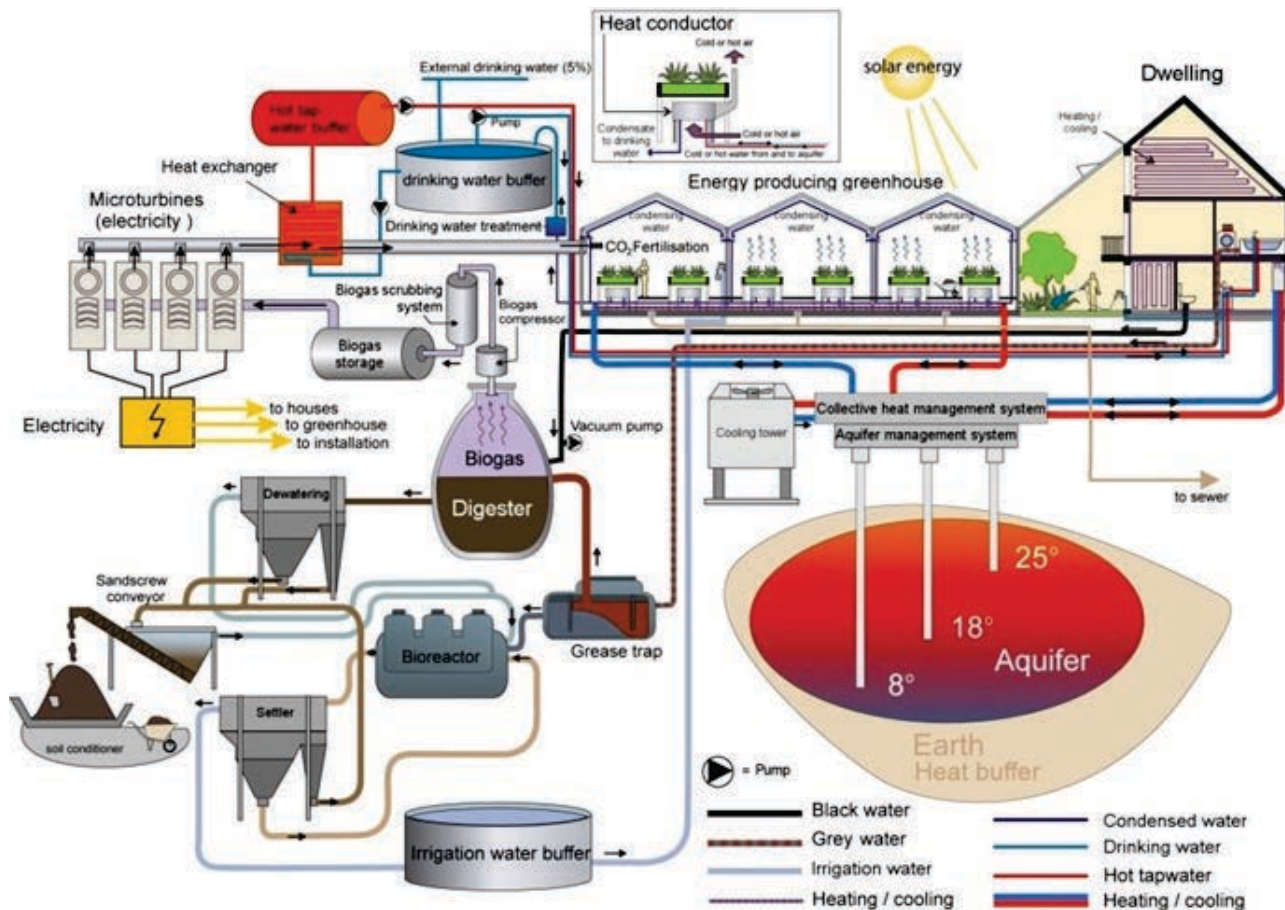
**REGULATORY CHANGES**

- end single-unit lots**
- allow ownership model for multi-unit lots**
- assembly of land parcels for community**
- extend height limits**
- outcome-based planning methods**

## Point 5 - Integrated, Distributed & Upgradable Systems

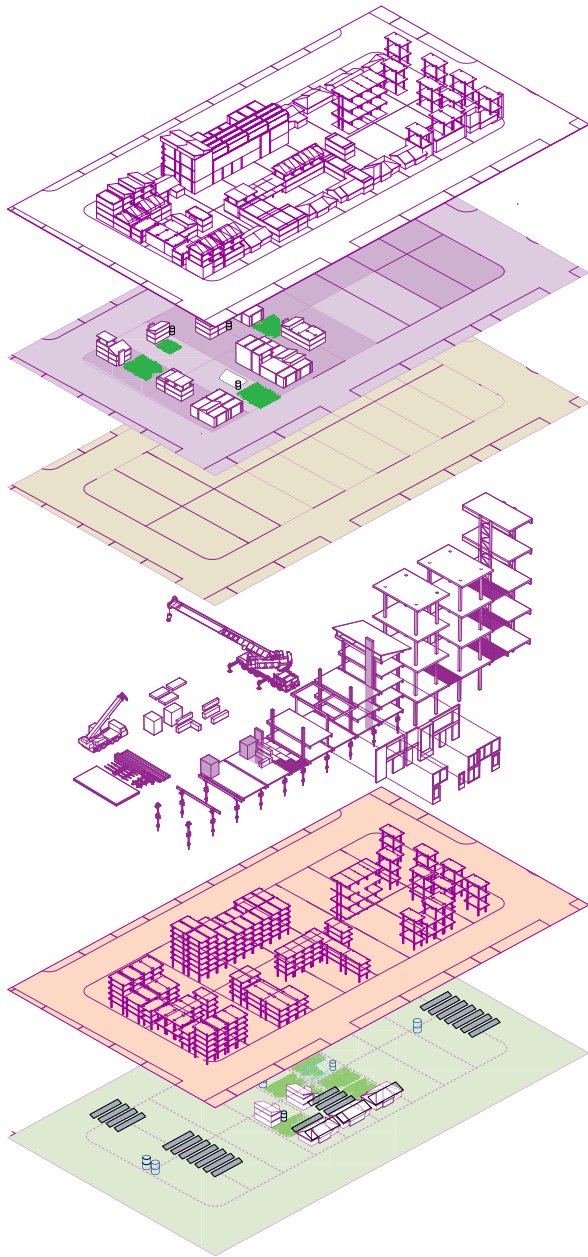
Concurrent with new approaches to residential buildings, the systems that support buildings and everyday life must be re-designed to be more integrated and decentralized to be resilient, extensible, and upgradeable. Services for water, heat, energy, and waste must be both circular and distributed. Many architects have become or will become technical experts in this regard, but further research and design in cooperation with scientists, researchers, and engineers is needed. Innovation is needed to find ways to realize alternative systems that work socially and economically at scale. However, while architects can be quite adept within the limits of building technology, a greater emphasis must be placed on integrating the built with the biological aspects of every site's ecosystem by using the landscape produce food, sequester carbon directly in the soil, process organic waste, and purify water.<sup>9</sup>

FIGURE 4.19 - "Zonnetorpe" or "Greenhouse Village" concept drawing showing integrated systems.



# Design for 203X - A Framework for Living Architecture in the Sustainable Transition

These five points are essential components of an integrated plan for sustainability in the built environment. They are all important because they interact to form a cohesive synergy of innovations similar to the coalescence witnessed in the post-war period.



# Chapter 5: Designing for 203X

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## **Sketch Proposals**

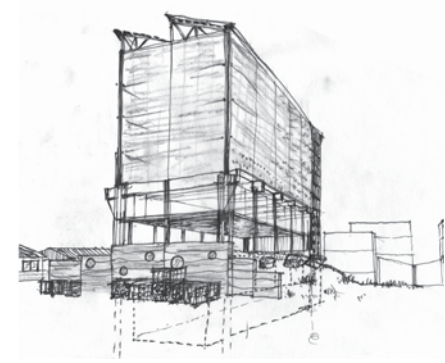
To imagine and explore these ideas, the following are a few sketch proposals for 203X, examples of what could be developed with the integration of the innovative approaches presented in Chapter 4.



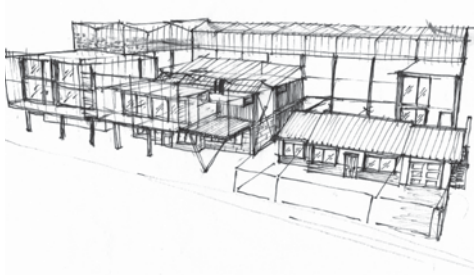
**1 - The Patchwork House**



**2 - The Green Rowhouses**



**3 - The Vertical Farmhouses**



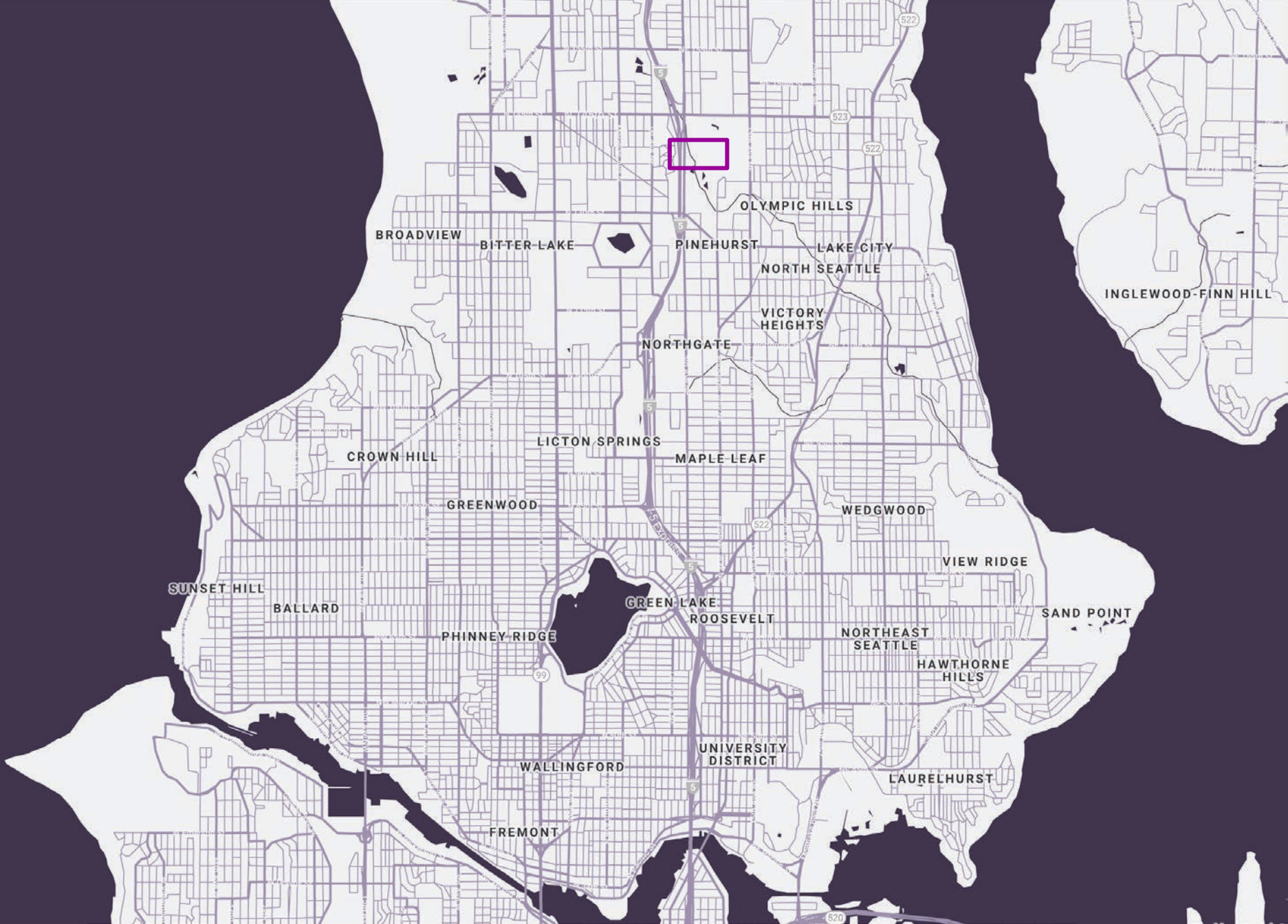
**4 - The Bookshelf House**



**5 - The Cottage Assembly**

# Study Area – Olympic Hills Neighborhood, Seattle

The hypothetical design area is located in the target neighborhood of Olympic Hills in North Seattle, a suburban area at the northern edge of Seattle characterized by post-war single-family dwellings. The target neighborhood is an exemplary post-war suburb, once affordable, but now growing increasingly unaffordable. Before development, the land in the area had been used for agriculture, including orchards and horse stables.



BROADVIEW

BITTER LAKE

PINEHURST

OLYMPIC HILLS

LAKE CITY

NORTH SEATTLE

VICTORY HEIGHTS

NORTHGATE

LICTON SPRINGS

MAPLE LEAF

CROWN HILL

GREENWOOD

WEDGWOOD

VIEW RIDGE

SUNSET HILL

BALLARD

GREEN LAKE

ROOSEVELT

SAND POINT

PHINNEY RIDGE

NORTHEAST SEATTLE

HAWTHORNE HILLS

UNIVERSITY DISTRICT

WALLINGFORD

LAURELHURST

FREMONT

## Focus Area – Olympic Hills Neighborhood, Seattle

This focus area near 15th Avenue NE and NE 135th Street is a grouping of typical, post-war, ranch-style dwellings built in the 1950s located at the western base of Olympic Hills. This area faces a major displacement risk, as the lots are large and the houses are small and old. Due to the current single-family zoning, only much larger single-family homes can be built on each lot. On average, each older house is about 1300square feet while each lot is about 8500 square feet.



# Olympic Hills - Economic and Social Pressures

The land in the area is large and cheap relative to other neighborhoods. In Olympic Hills, the land verges about \$50 per square foot, while in most other areas in Seattle, the cost would be at least \$110 per square foot. Most houses that are sold are demolished so the land can be redeveloped with very large single-family homes (typically about 3000 square feet costing upwards of \$900,000) that are unaffordable and unsustainable.

Currently, only single-family dwellings or accessory structures are allowed and subdivision of these large lots is prohibited. Under the current 2035 growth plan for the City of Seattle, the ordinances governing these lands will remain unchanged.

FIGURE 5.4 - Example houses in the area and associated values.



**1951 - 1310 SF - ~\$110k adjusted**



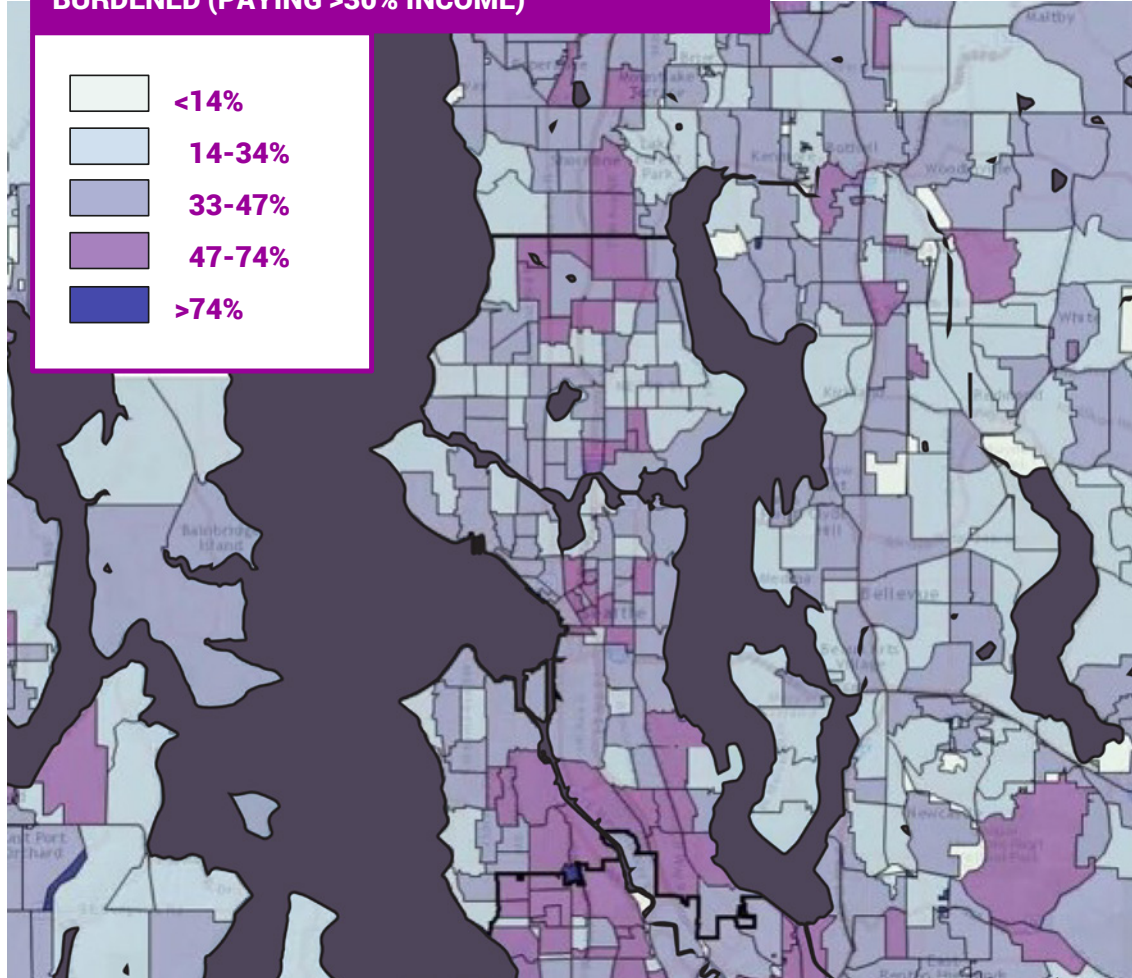
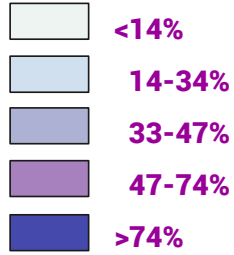
**2015 - 2510 SF - \$973k**

# Olympic Hills - Displacement Risk

Many of the homes in the neighborhood were originally developed as affordable homes for middle-class people. Today, the neighborhood has an annual median income of \$67,000, which is relatively low in Seattle. These single-family homes were often purchased by families whose children have now grown or moved away, leading to a prevalence of aging “empty-nesters” in the area. These socio-economic factors have led to an increased displacement risk as these households are highly cost burdened by housing costs and often feel pressure to sell. According to data from the City of Seattle, the majority of residents in this neighborhood are housing cost-burdened, meaning over 30% of their income is spent on housing costs.

FIGURE 5.5 - Map of cost-burdened households in Seattle.

**PERCENTAGE RESIDENTS WHO ARE HOUSING COST BURDENED (PAYING >30% INCOME)**



# Olympic Hills - Strategic Potential

The social, economic, and cultural factors in the Olympic Hills neighborhood create pressures which drive the area towards gentrification and displacement. However, there is also great strategic potential for this area to experiment with the five points of “Design for 203X” described in Chapter 4. The neighborhood could be transformed through an incremental process starting with existing conditions. This transformation could follow a step-by-step process. As designing for 203X takes hold and more and more land becomes developed for the community, new forms and typologies of larger community-developed buildings could emerge. The following are sketch designs of the possibilities for larger developments.

1) identify CLT site for adding capacity

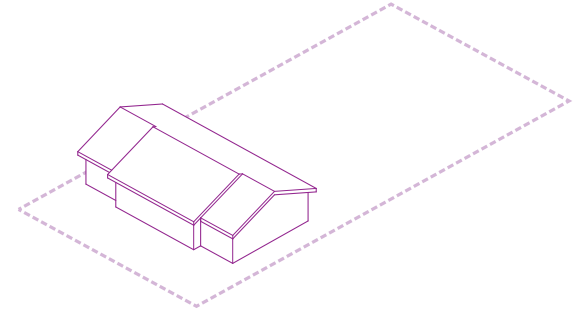
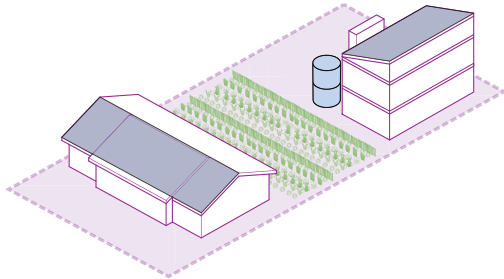
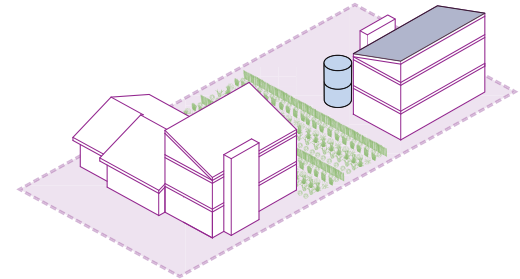


FIGURE 5.6 - Incremental development of an example lot.

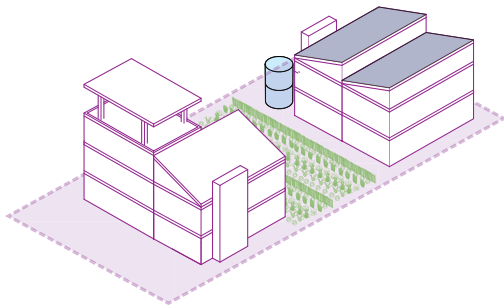
**2) add ADU & resilient features for income**



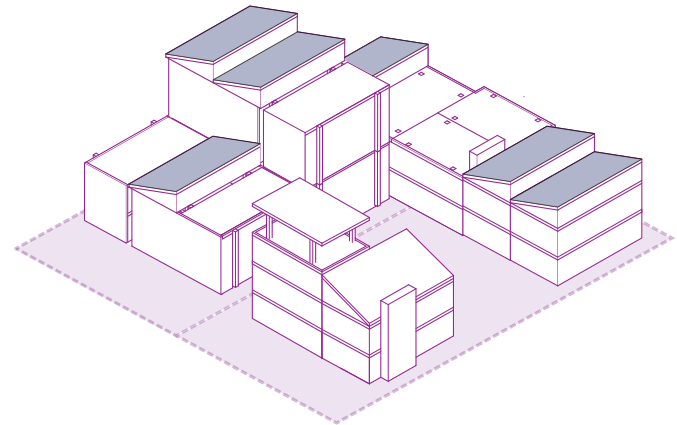
**3) expand & upgrade original structure**



**4) replace original home & add-on to ADU**



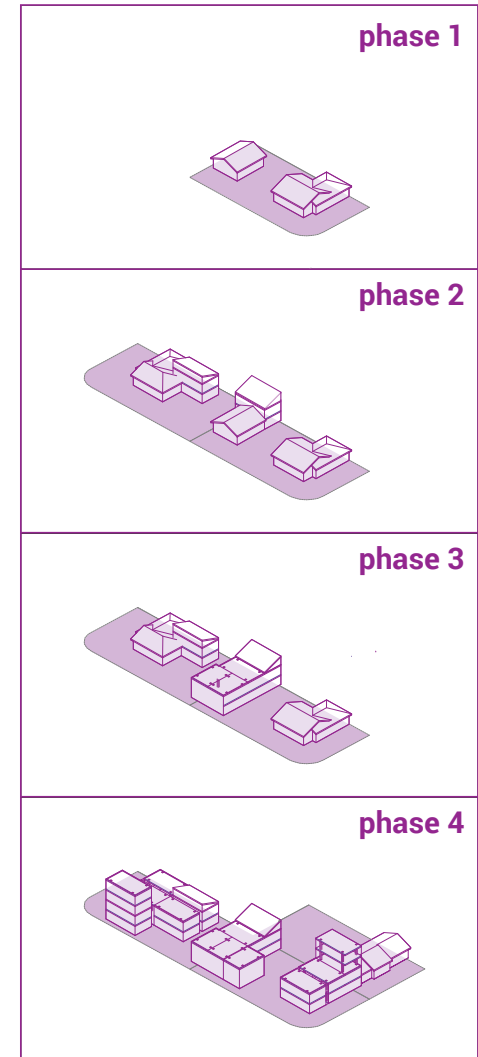
**5) integrate site with larger community developments**



# The Patchwork House



This sketch design shows the growth of a multi-unit co-living building beginning from one single-family lot and developed incrementally in phases. At the start, only a single-family house and a backyard cottage are located on the site. Seeing the original owners' expansions, a neighbor soon joins in and adds new dwelling units to his property as well. As the co-owners add more units, they eventually decide to form a cooperative and link the dwellings together. Starting out with detached accessory dwelling units and then moving on to multiple full-size houses, the later phases then link all the dwellings into one patchwork building that may continue to grow.



phase 5

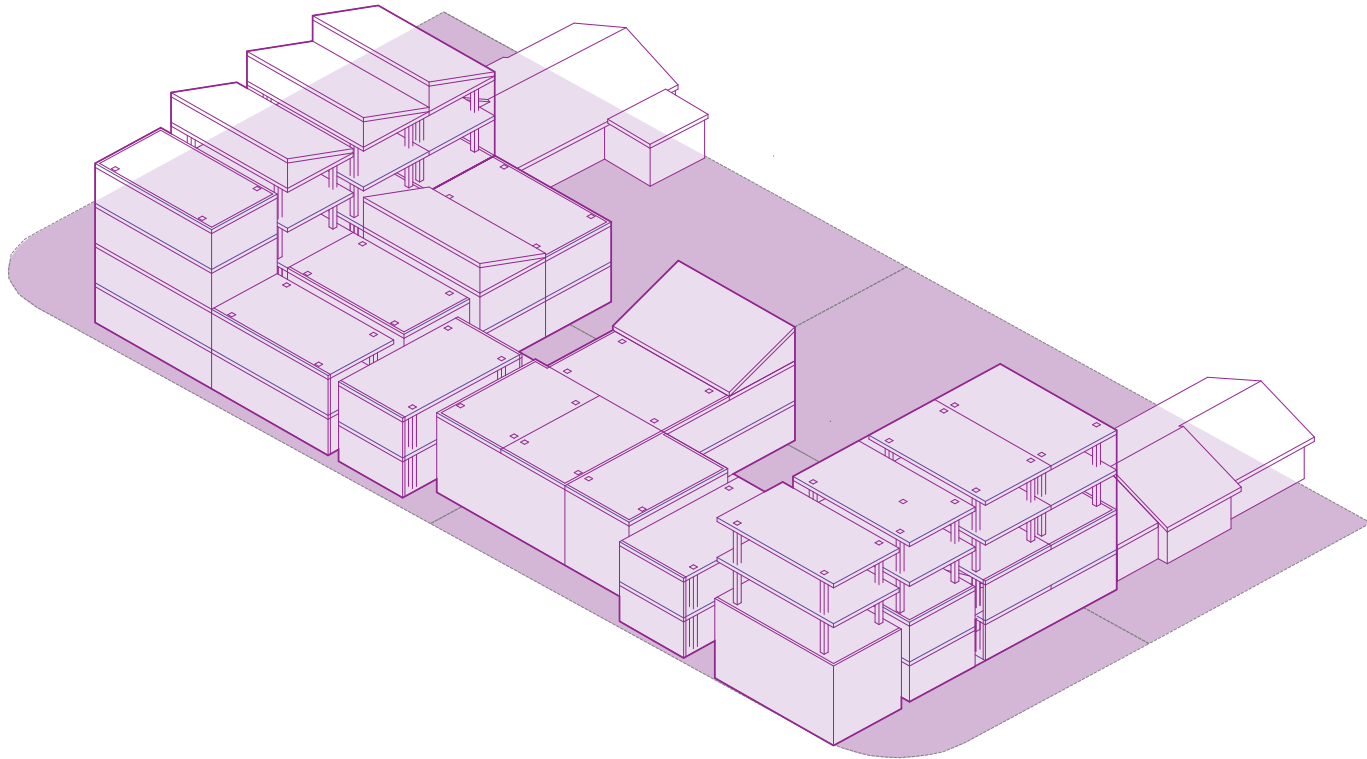
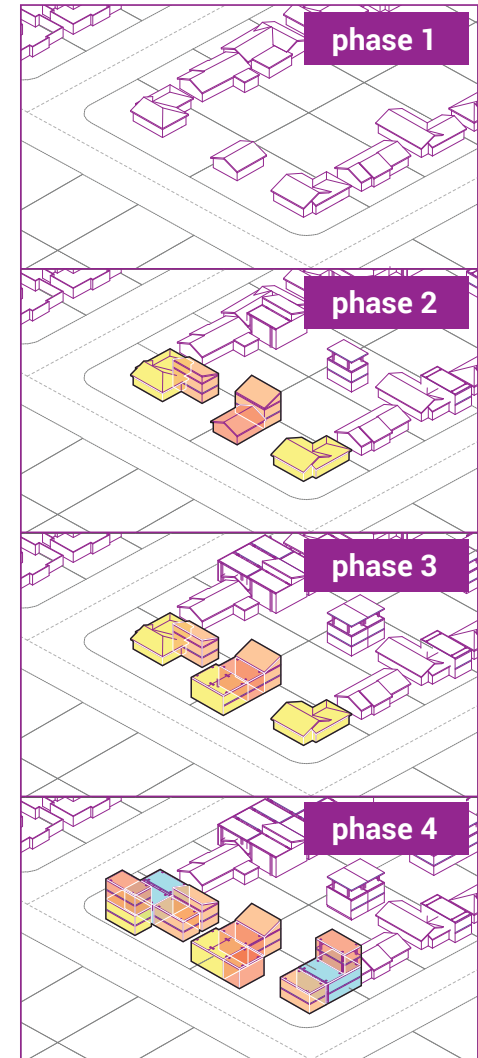


FIGURE 5.7 - incremental development of the Patchwork House.

# The Patchwork House

The Patchwork House consists of a modular structural framework constructed out of the heavy timber bypass construction system. The discrete structural units, “shim spaces,” and distributed yet accessible service cores allow for interior partitions and unit party walls to be reconfigured and are, therefore, both adaptable and flexible. The flexible architecture allows a range of unit types and sizes ranging from studios to four-bedroom apartments. As the members or life situations of each member of the co-living arrangement change, the Patchwork House unit mix and units can change to accommodate the future.



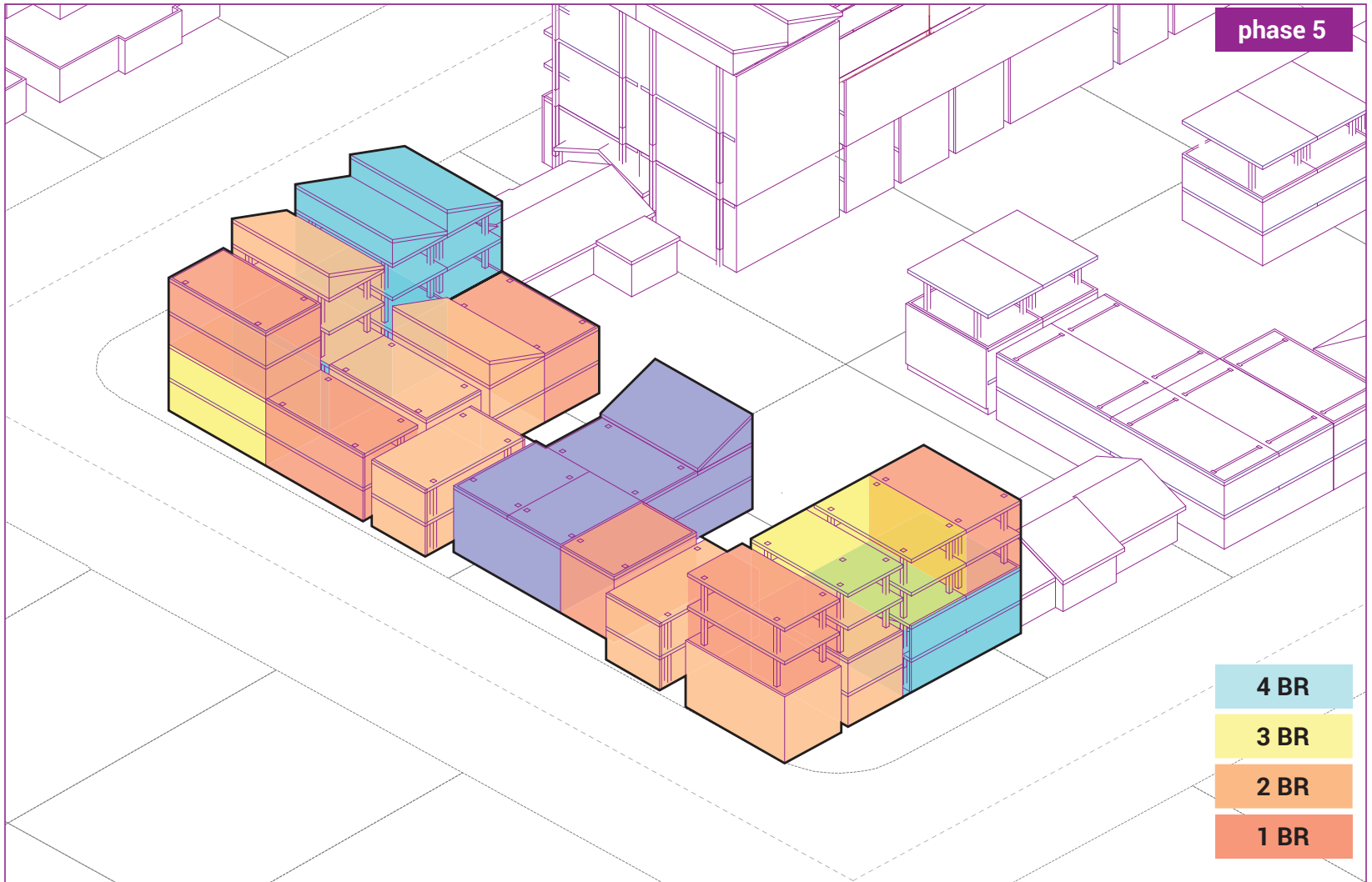


FIGURE 5.8 - Unit mixes by phase in the Patchwork House, adaptable and reconfigurable.

SECTION 5.

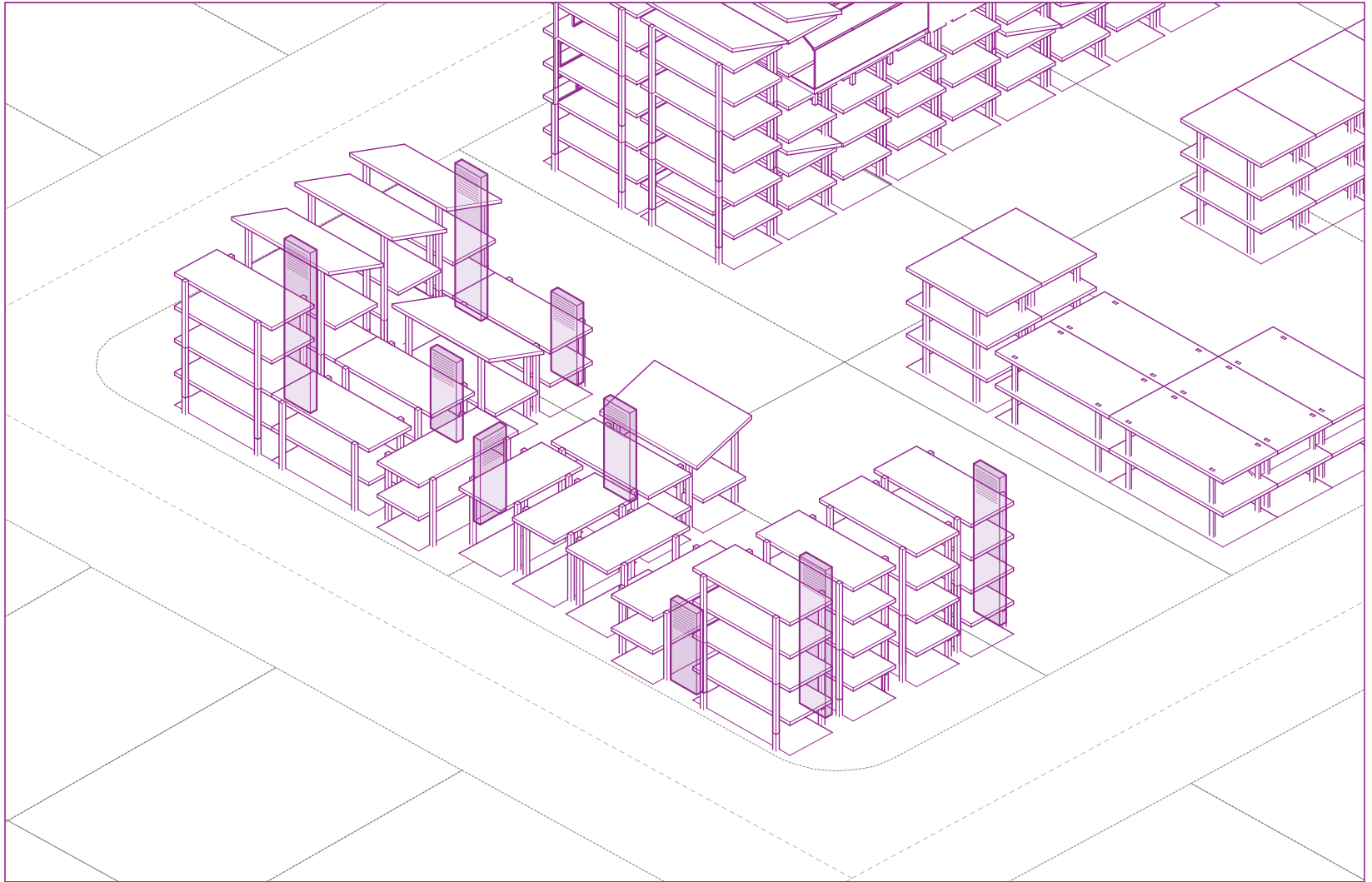


FIGURE 5.9 - Structure and service elements in the Patchwork House.

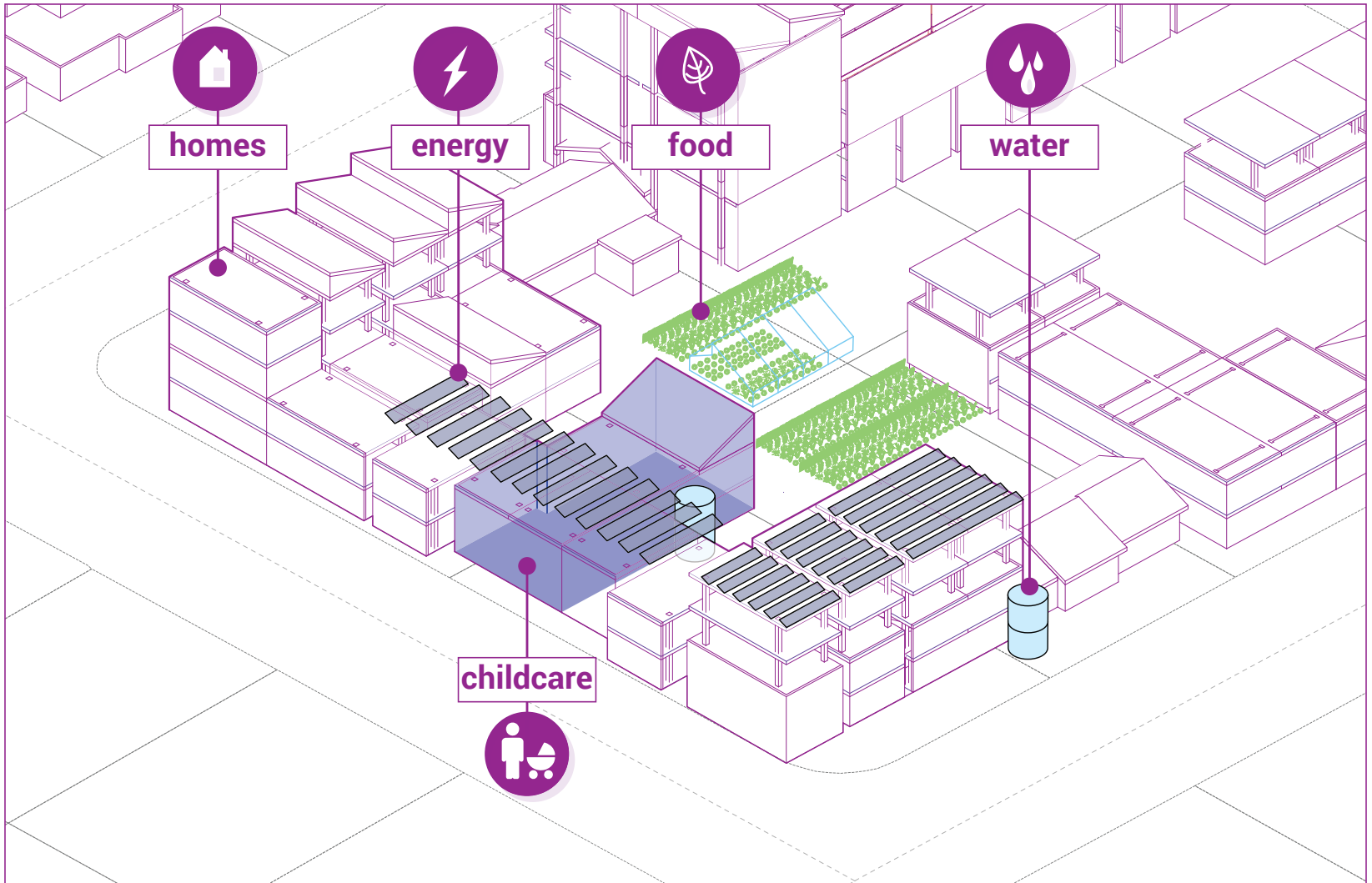


FIGURE 5.10 - Community land values in the Patchwork House.

# The Patchwork House

The visualizations opposite show how a few private lots could eventually transform into a larger cooperative building with more community activation, while maintaining livability and adding new functions such as a childcare or community room facility. The development process is intended to be incremental and continuous, reflecting the passage of time and individuals' progression through the stages of life. In each phase, the additions fit into the neighborhood while pursuing greater affordability and sustainability in their designs.

FIGURE 5.11 - Proposed progressive development of the Patchwork House.



# The Patchwork House

The cooperative is able to harvest food, water, and energy from the land and building. By integrating a working landscape of productive biological and social functions, the previously underutilized backyards of the single-family neighborhood gain a new richness while meeting the challenges of affordable housing and sustainable construction.



FIGURE 5.12 - New relationships between residents and the Patchwork House development.



# The Patchwork House

As units turn over and the building grows into a larger agglomeration of units, the cooperative decides to convert some formerly occupied units of the structure into a community childcare facility. The shared ownership of land through the CLT allows the childcare facility to spill out into a large outdoor play area integrated with neighborhood homes, providing an amenity that conventional single-family development would not offer.

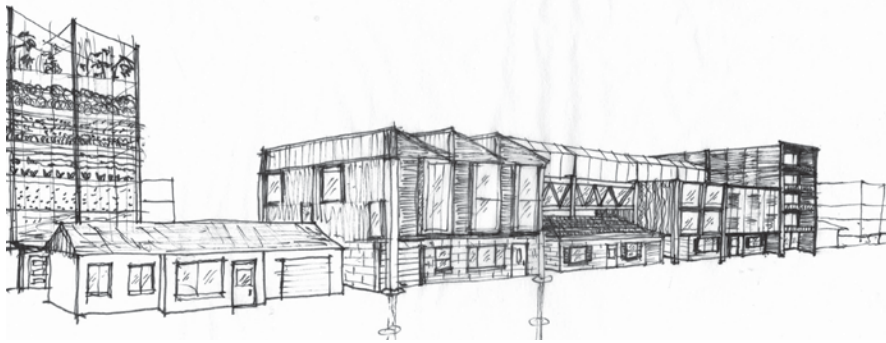
With Design for 203X, the Patchwork House demonstrates how a new model might be able to invite stronger social connections, relationships, and businesses in physical form.



FIGURE 5.13 - Community facilities in the Patchwork House.



# The Green Rowhouses



If more flexible architecture became a reality, residential development could foster new connections between communal space and private space. In this sketch design, the Green Rowhouses imagines the incremental development of individualized family dwellings in the row house typology. Above, at the roof deck, a shared greenhouse enclosure could provide a new type of semi-private or semi-public space that could include food production or a shared winter garden living space, while providing passive solar gains.



FIGURE 5.14 - Exterior view of the Green Rowhouses.



## The Vertical Farmhouses

As design for 203X can adapt and accommodate community needs, the community could experiment with other key ideas in sustainability such as localized food production. This sketch design imagines urban agriculture in a greenhouse enclosed vertical farm built next to a grouping of cottages using the hybrid steel-and-timber construction system. The vertical farm is a testbed for highly productive technologies such as hydroponics and aquaponics in combination with rainwater harvesting and earth-sheltered food storage. Underneath the farm, local food businesses selling and cooking with the onsite produce might thrive as a local gathering place.

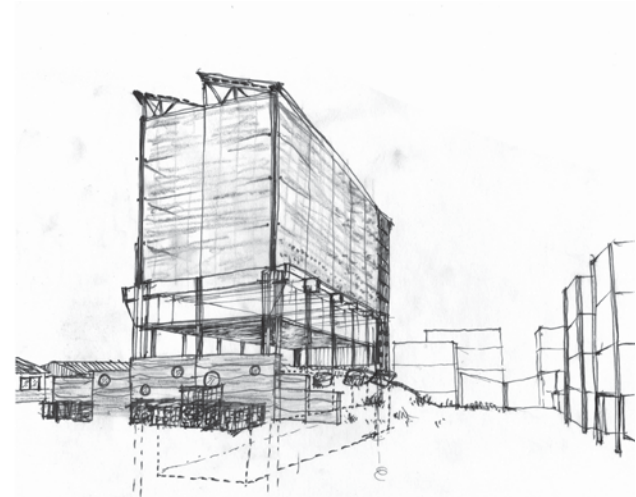


FIGURE 5.15 - A community-developed experiment integrating local food and housing.



## Flexibility, Adaptability, and a New Vernacular?

In these sketch designs, the generosity of space enabled by flexible architecture and shared culture allows residents to make buildings most useful for themselves. These visions of community-led development partnered with design thinking show that imaginative and experimental solutions to real problems are possible with Design for 203X. These are just some of the possibilities; with the pace of societal change (climate change, pandemics, demographic shifts, working from home, etc), many more options are likely possible and desirable. Ultimately, this project aims to address the transformation of a vernacular: the

homogenous and fundamentally wasteful suburban single-family house and neighborhood. Because the current model is so dominant, the principles and proposals for “Design for 203X” are intended to be just as broadly applicable, not just to Seattle, but to other locations as well. As this new pattern spreads, the aggregation of these types of developments will scale up to the community and neighborhood level. Each development can create connections to the others. Rather than singular developments, these interlinked projects can begin to reshape the entire suburban landscape for a future beyond 2030X.

FIGURE 5.16 - Diverse solutions possible through a flexible architecture for 203X.



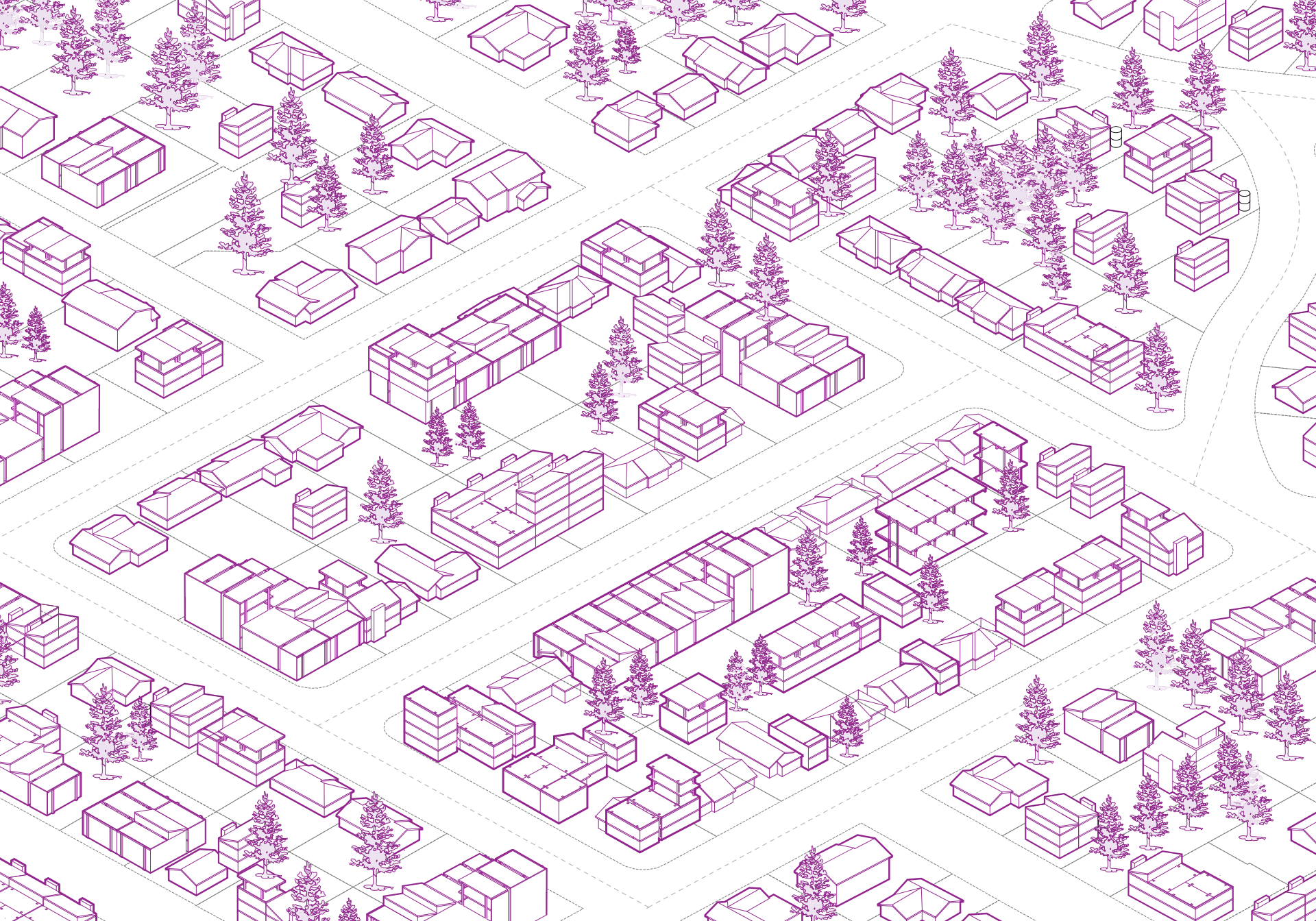
# Chapter 6: Designing for 203X

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## **Conclusion**

FIGURE 6.1 - Conceptual axonometric drawing of a suburb transformed.





## Conclusion - A Necessary Future

To design for a sustainable future, we must transform our relationship to the built environment. We need to find a new convergence of social, economic, and environmental innovations to shape sustainable and equitable communities. Designing with all three key aspects of sustainability at once fosters an imperative to rethink more than just the physical form of architecture. The Design for 203X framework is an argument for a holistic approach to architecture that includes five components aimed at increasing human and environmental well-being. Any one of these is not sufficient because our challenges are too great. We, as designers and citizens, need to reconceive our efforts with innovators in other fields, especially in social and economic aspects to address the challenges of the

present time. Although this thesis did not explore the technicalities of direct implementation, I argue that these ideas are not far off from what must come. This thesis suggests that pursuing sustainability in our human habitats requires more imagination, cooperation, and engagement with the everyday vernacular of human settlement. As architects we must become more engaged and reflect more deeply on the world we create through our actions, and we must move toward a more sustainable and equitable future together. In nature, life benefits from other life. Today, we too often conceive of humans as solely a negative impact that needs to be mitigated. It is our task now to find a way to make human habitats that are regenerative and beneficial to other life by design.

# DESIGN FOR 203X

- 1 - New Ownership Models & Community-Led Development
- 2 - An Economic Model for Social Impact
- 3 - Dynamic & Evolutionary Architectural Systems
- 4 - A Path from Low Capacity to High Capacity
- 5 - Integrated, Distributed, & Upgradeable Systems

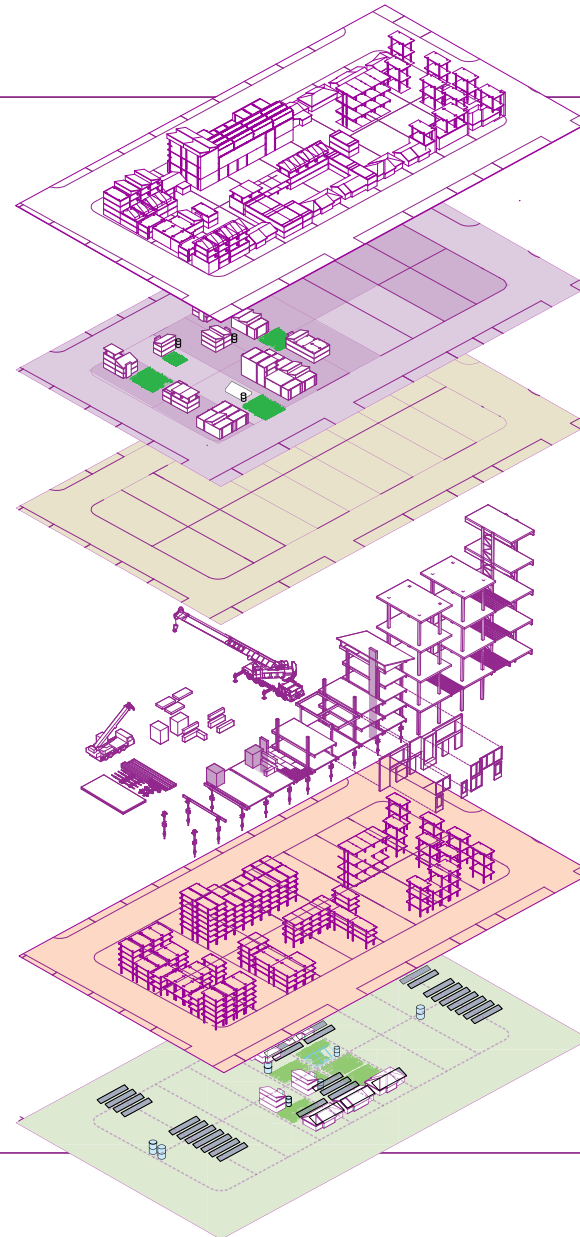


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Source: Modulart.

<https://www.modulart.ch/die-wohnstruktur-im-garten/>

**FIGURE 1.4** - Architects Declare, an international movement for urgent climate action.

Source: Architects Declare.

<https://us.architectsdeclare.com/>

**FIGURE 1.5** - Critical statistics regarding the state of climate change and the building sector.

Source: Architecture 2030.

[https://architecture2030.org/ipcc\\_analysis/](https://architecture2030.org/ipcc_analysis/)

**FIGURE 2.1** - Aerial view of suburban development in Levittown, NY.

Source: Bettman/Getty Images.

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Source: Louis I. Kahn Collection, University of Pennsylvania and the Pennsylvania Historical Museum Commission, Philadelphia.

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Source: Architectural Forum, September, 1942.

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Source: Arts and Architecture Magazine. December 1949.

<https://usmodernist.org/AA/AA-1949-12.pdf>

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Source: TIME Magazine.

<http://100photos.time.com/photos/julius-shulman-case-study-house-22>

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Source: Public Domain.

<https://digitalcollections.nypl.org/items/b2065a93-b245-8366-e040-e00a18066908>

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Source: Fondation Le Corbusier.

<https://afasiaarchzine.com/2014/06/le-corbusier/>

**FIGURE 2.8** - Photograph of the Dymaxion House by Buckminster Fuller, 1946.

Source: Neder, F. (2008) Fuller Houses: R. Buckminster Fuller's Dymaxion Dwellings and Other Domestic Adventures, Lars Muller Publishers, Austin, TX, USA

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Source: Philadelphia Inquirer. (7/20/1958)

<http://levittownbeyond.com/LevittownNJ.html>

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Source: Robert W. Kelley/The LIFE Picture Collection via Getty Images.

<https://www.gettyimages.com/detail/news-photo/street-scene-news-photo/50570777>

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Source: Unsplash. Photo by Bibin Tom.

<https://unsplash.com/photos/4hwyr6dERhU>

**FIGURE 3.1** - Satellite image of a suburban neighborhood today.

Source: King County GIS Center.

[https://gismaps.kingcounty.gov/arcgis/rest/services/BaseMaps/KingCo\\_Aerial\\_2017/MapServer](https://gismaps.kingcounty.gov/arcgis/rest/services/BaseMaps/KingCo_Aerial_2017/MapServer)

**FIGURE 3.2** - Magazine covers showing residential architecture today.

Source: Dwell Magazine.

<https://www.dwell.com/magazine/issues>

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Source: The Seattle Times.

<https://www.seattletimes.com/business/real-estate/city-report-widespread-single-family-zoning-is-damaging-seattle-and-needs-changing/>

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Source: Environ. Sci. Technol. 2014, 48, 2, 895–902

<https://doi.org/10.1021/es4034364>

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Source: UC Berkeley CoolClimate Network, Average Annual Household Carbon Footprint (2013).

<https://coolclimate.org/maps>

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Source: Opticos Design, Inc. 2015.

[https://missingmiddlehousing.com/wp-content/uploads/2019/02/MissingMiddleHousing\\_Diagram01.png](https://missingmiddlehousing.com/wp-content/uploads/2019/02/MissingMiddleHousing_Diagram01.png)

**FIGURE 3.7** - Chart showing estimated carbon savings from through "Missing Middle" housing in single-family zones.

Source: Energy Policy. Vol. 68, May 2014, Pages 534-549

<https://doi-org.offcampus.lib.washington.edu/10.1016/j.enpol.2014.01.024>

**FIGURE 3.8** - Graph showing historical rise in median housing prices in the US.

Source: U.S. Census Bureau and U.S. Department of Housing and Urban Development, Average Sales Price of Houses Sold for the United States [ASPUS], retrieved from FRED, Federal Reserve Bank of St. Louis;

<https://fred.stlouisfed.org/series/ASPUS>, June 23, 2020.

**FIGURE 3.9** - Graph showing global carbon emissions over time by region.

Source: Our World in Data and the Global Carbon Project; Carbon Dioxide Information Analysis Centre (CDIAC)

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**FIGURE 4.18** - Necessary changes for future growth.

**FIGURE 4.19** - “Zonnetorpe” or “Greenhouse Village” concept drawing showing integrated systems.

Source: Zonneterp Design Consortium.

[www.zonneterp.nl/zonneterp.pdf](http://www.zonneterp.nl/zonneterp.pdf)

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**FIGURE 5.1** - Concept sketches for 203X proposals.

**FIGURE 5.2** - Vicinity map of design area.

**FIGURE 5.3** - Satellite image of study area.

Source: King County GIS Center.

[https://gismaps.kingcounty.gov/arcgis/rest/services/BaseMaps/KingCo\\_Aerial\\_2017/MapServer](https://gismaps.kingcounty.gov/arcgis/rest/services/BaseMaps/KingCo_Aerial_2017/MapServer)

**FIGURE 5.4** - Example houses in the area and associated values.

**FIGURE 5.5** - Map of cost-burdened households in Seattle.

Source: US Department of Housing and Urban Development (HUD)/American Community Survey (ACS) Comprehensive Housing Affordability Strategy Data (CHAS)/Consolidated Planning Data (CPD) Maps.

<https://egis.hud.gov/cpdmaps/>

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**FIGURE 5.15** - Exterior view of the Green Rowhouses.

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## Chapter 4

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