



LOW-IMPACT
INFILL HOUSING



COMBAT THE CLIMATE CHALLENGE,
THE HOUSING CRISIS &
DISRUPT DEVELOPMENT

As cities, towns and suburbs continue to densify, flexible options to address housing demand is required. With **Low-Impact Infill Housing**, we hope to provide a holistic **policy, financing and design strategy** to give a range of stakeholders awareness of low-impact/NetZero design systems, advocate for policies that disrupt disastrous development and agency to combat the climate challenge through design. From incremental developers to homeowners, non-profits and housing agencies, each has a role to play in addressing in our vision of the **Green New Deal**.

JORDAN DUKE + STEPHEN PARKER – SMITHGROUP DC

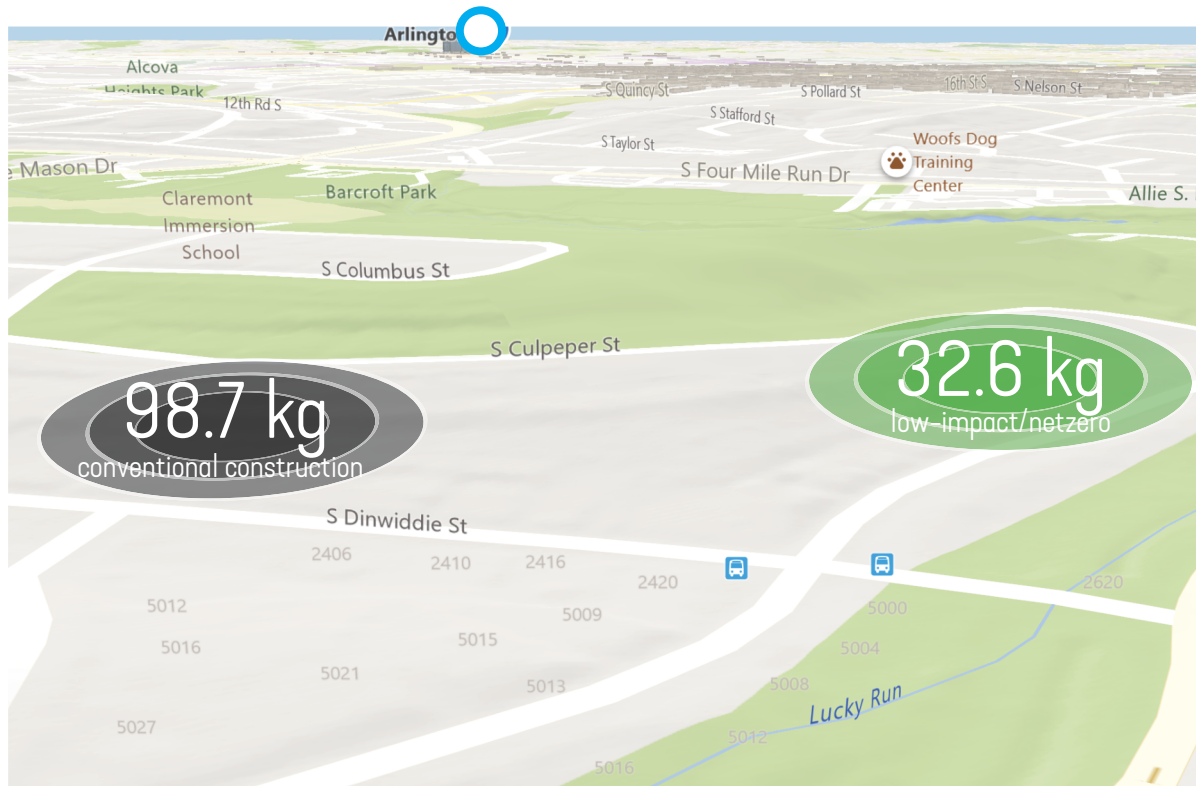


WHY LOW-IMPACT/NETZERO:

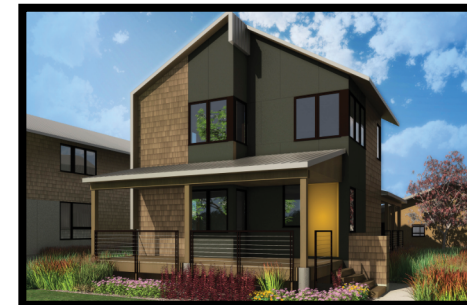
To meet the climate challenge, the Green New Deal should start with Zero. NetZero energy producing homes, Netzero water infrastructure and Netzero waste systems.

CARBON COUNTS:

- 1) Carbon Intensive Development
- 2) Regenerative & Carbon Capturing Development



Permeable pavers, reuse of existing home, decreased EUI & increased density with addition of an two-unit ADU.



Impermeable pavement, demolish of existing home, decreased density while increasing footprint & increased EUI.

LEVERAGE THE GREEN NEW DEAL TO ADDRESS THE HOUSING CRISIS HOLISTICALLY

NetZero or Else::

Designing a space for both now and into the future. The ability for the proposed **accessory dwelling unit** or ADU to disrupt the development disaster of sprawl and addressing the housing crisis. Starting with NetZero design strategies as a baseline in the cornerstone of low-impact infill housing. This is especially true for decreasing the **Energy Unit Intensity** or EUI of existing buildings and new construction to lessen the energy consumption over time.



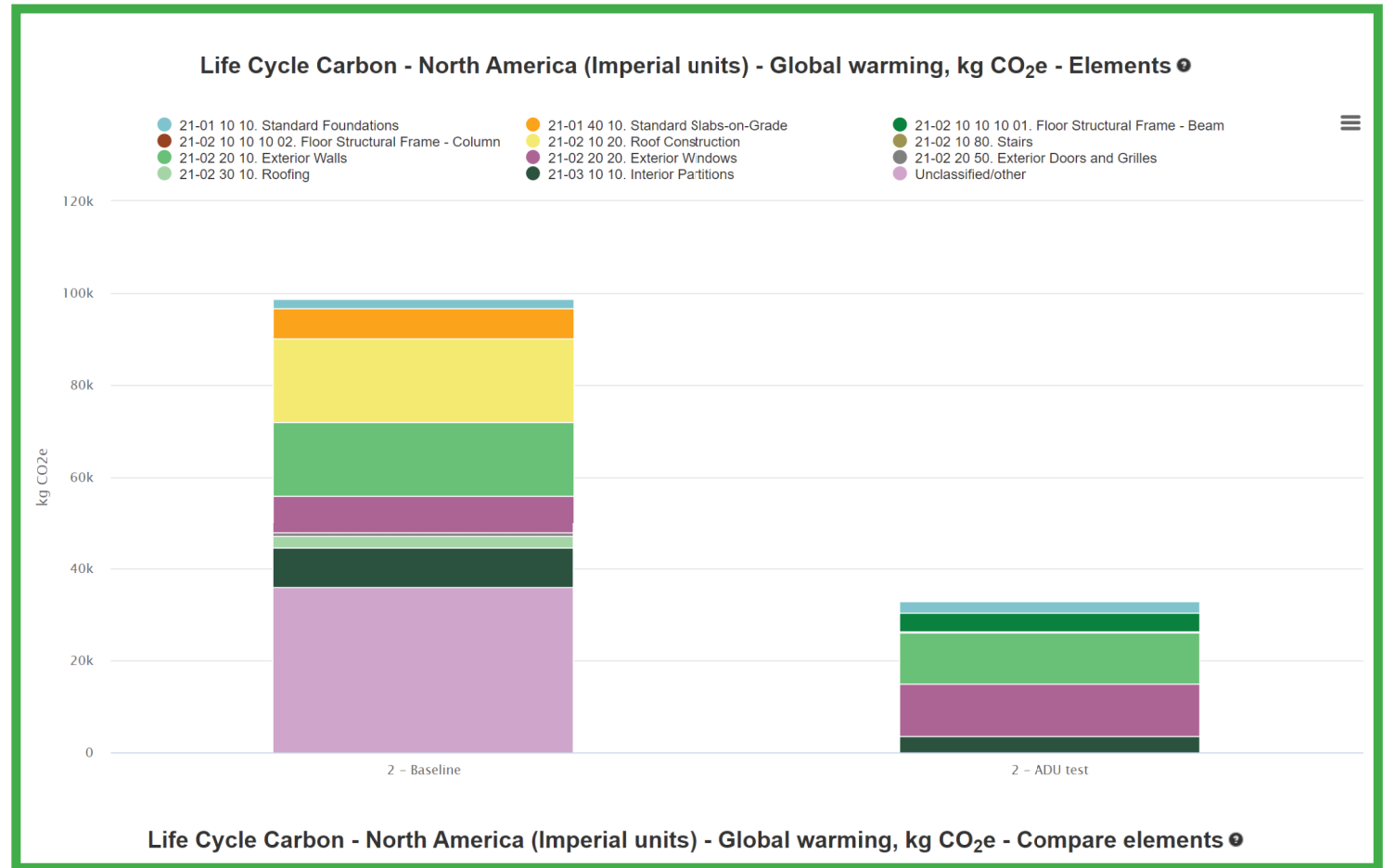


WHAT IS LIFE-CYCLE CARBON:

A building is not simply the energy and water it consumes or the waste it generates but the carbon embodied construction and maintenance.

CALCULATING CARBON:

- 1) Baseline Carbon in Conventional Construction
- 2) Regenerative & Carbon Capturing Development



CONCEPTS TO KNOW: CARBON AND THE GREEN NEW DEAL

Designing with Carbon in Mind:

Iterations of construction methods have evolved with the needs of each era and society's material and technological limitations. The Green New Deal provides an opportunity to jumpstart more innovative and efficient building systems that are low-impact with regard to **embodied carbon and operational energy usage**, raising awareness of these systems is the first step in scaling them to the wider market.





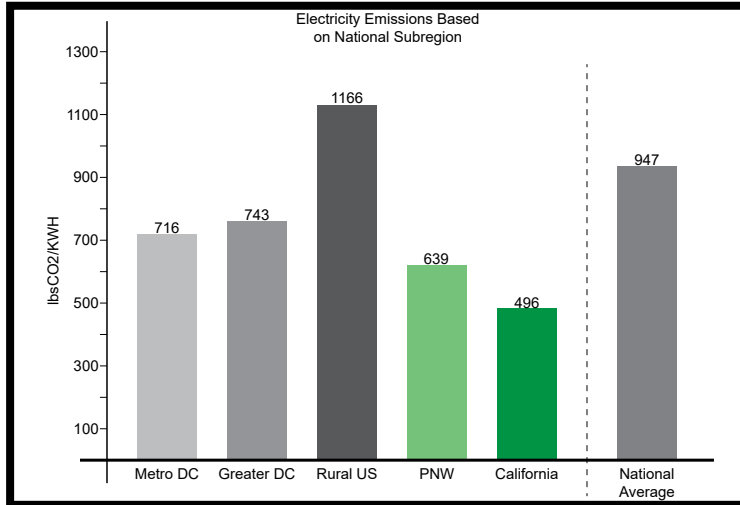
WHY LOCATION MATTERS:

Location is as important to real estate values as it is greenhouse emissions and energy efficiency by region, especially rural and suburban areas vs. urban cores.

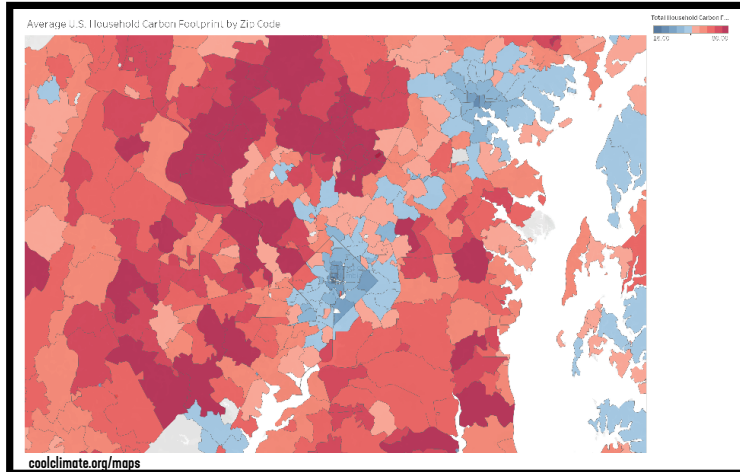
CARBON COUNTS:

- 1) Electric Emissions by region
- 2) Carbon Footprint
- 3) Urban Infill GreenHouse Gases

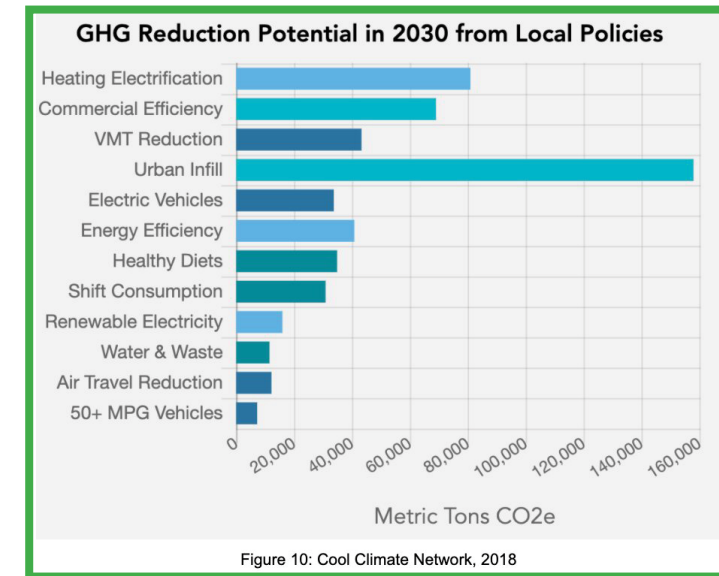
1) Electric Emissions: By Region



2) Carbon Footprint: Rural vs. Urban



3) Impact of Urban Infill on GreenHouse Gases



3) Cool Climate Network found that **urban infill** held the greatest opportunity to reduce GHG (greenhouse gases), making low-impact, infill housing the lowest hanging fruit with the highest return that is accessible to a wide range of stakeholders.

YOUR CHOICE OF WHERE TO BUILD IS AS IMPORTANT AS HOW TO BUILD

Location, Construction & Building Type

As the chart show, different regions have different emission rates, with state-wide policies making California and the Pacific Northwest more efficient than other regions through strategic policy. Rural and suburban regions are far more carbon intensive compared to the relevant efficiency of urban areas given their density and infrastructure efficiency. The Cool Climate Network found that **urban infill** held the greatest opportunity to reduce GHG (greenhouse gases), **making low-impact, infill housing** the lowest hanging fruit with the highest return that is accessible to a wide range of stakeholders.



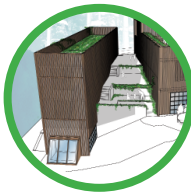
WHAT IS INFILL HOUSING:

It is everything from small interior renovations for an in-law suite to detached guest-house and small multi-unit buildings that fit in their neighborhoods while increasing density .

**CONVERTED
GARAGE**



**DETACHED
GUEST HOUSE**



**INTERIOR
GRANNY
FLAT**



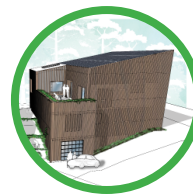
**ATTIC
APARTMENT**



**BASEMENT
CONVERSION**



**ATTACHED
IN-LAW SUITE**



**SMALL
MULTI-UNIT**



**LANEWAY
HOUSE**



ALL HOUSING IS GOOD HOUSING. LOW-IMPACT HOUSING IS BETTER. LOW-IMPACT INFILL HOUSING IS BEST.

Low-Impact, Infill Housing:

It's not simply the need for more homes during a national housing crisis, but taking advantage of the sustainable benefits offered by urban infill helps densify existing communities while building with low-impact, NetZero standards as a baseline. It can look like any other housing and fill odd lots and sites.



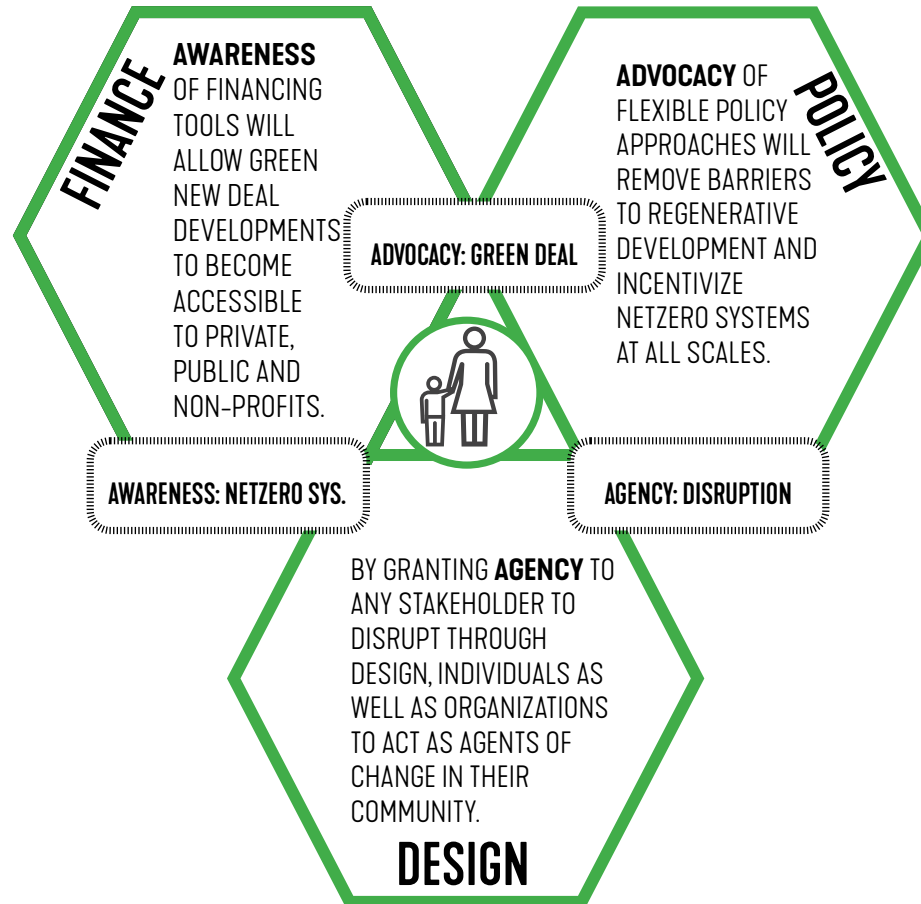


WHAT ARE THE HURDLES:

To combat climate change, the housing crisis and disrupt the development disaster that is sprawl, we must support **Policy, Financing and Design** strategies through **awareness, advocacy and agency**.

SOLUTIONS:

- 1) Policy
- 2) Finance
- 3) Design
- 4) ALL OF THE ABOVE



HOW TO SUPPORT THE GREEN NEW DEAL THROUGH LOW-IMPACT, INFILL HOUSING

Policy, Finance & Design:

It's not simply enough to focus on urban infill to combat the climate challenges we face as a society but we must find low-impact, regenerative approaches to overcome **policies** that impeded density, **financing** that makes urban infill more accessible to all stakeholders and **design** strategies that ensure low-impact construction and building operations.





LOW-IMPACT INFILL HOUSING



DESIGN YOUR OWN DEVELOPMENT!

As the process is confusing and opaque, we designed a how to guide of one family's journey to address their housing needs, balance community interests and leverage policy and financing options to create a more regenerative and sustained approach to infill housing. This idealized scenario is conveyed with "a choose your own adventure" format that helps inform the decisions one can make as an individual and community with a shared goal in mind yet many paths with which to achieve it.



PICK YOUR PERSONA:

You're a growing family who are concerned your home can't accommodate elderly in-laws in the future.

PERSONA OPTIONS:

- 1) Municipal Agency
- 2) Homeowner
- 3) Housing Non-Profit
- 4) Incremental Developer



A municipal agency, such as the affordable housing authority, is interested in incentivizing, building and maintaining a diverse array of housing options.



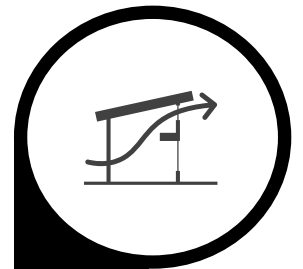
A homeowner with a growing family that has disabled in-laws that will eventually need in-home care.



A non-profit interested in developing affordable housing for a wide range of populations priced out of the local housing market. They've partnered with several financial institutions to offer low cost financing for applicable projects of all scales.



An incremental developer whose invested in their community for decades is interested in doing well by doing good.



How can we expand sustainably for a three-generation home?

YOU'VE SELECTED TO BE A HOMEOWNER OF A GROWING FAMILY!

Persona Options:

You've selected homeowner as your persona and will venture through the policy, financing and design-build process to expand housing options on your property. Your family is concerned that you won't have the space for your disabled in-laws to age gracefully and with dignity as well.





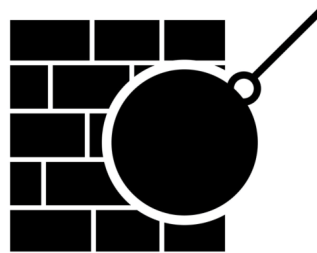
PICK A TYPE OF INFILL HOUSING APPROACH:

You're family is growing and your elderly parents in need of housing.

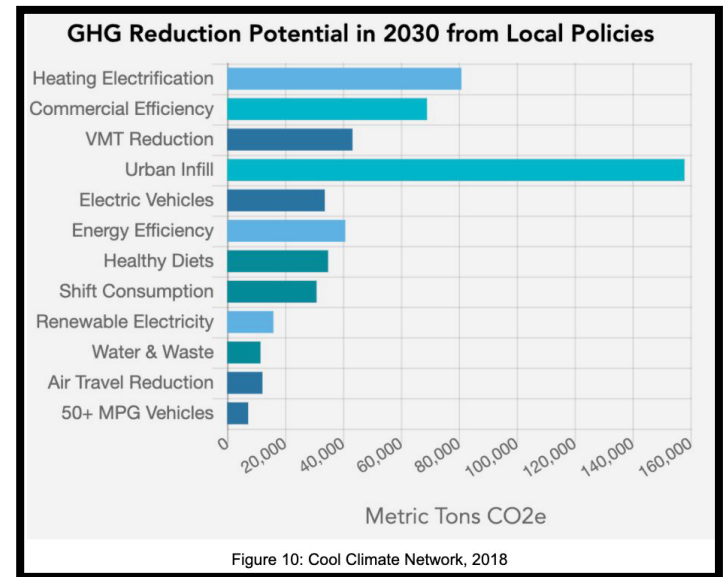
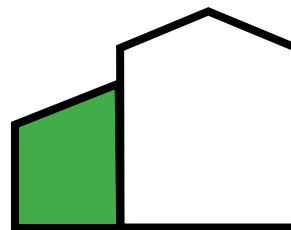
INFILL OPTIONS:

- 1) Demolition & Build New
- 2) Addition or Renovation

1) Demolition of existing buildings voids the benefits the carbon captured from it's construction.



2) Addition or Renovation: Limit the carbon expended during construction of a similar sized building built from scratch.



How can we help reduce emissions while designing for our future?

YOU'VE SELECTED TO DESIGN AND DEVELOP AN ACCESSORY DWELLING UNIT!

Infill Opportunities:

You've selected an addition or detached approach. This is a more sustainable solution by working with your existing structure, gaining the value of the embodied carbon and working in the spirit of the Green New Deal. The amount of green house gases saved from [urban infill](#) takes advantage of existing transportation, infrastructure and commercial networks that make urban centers so resource efficient.



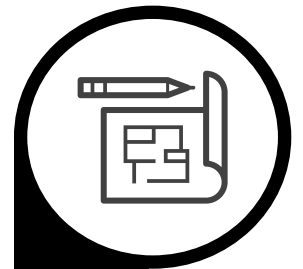
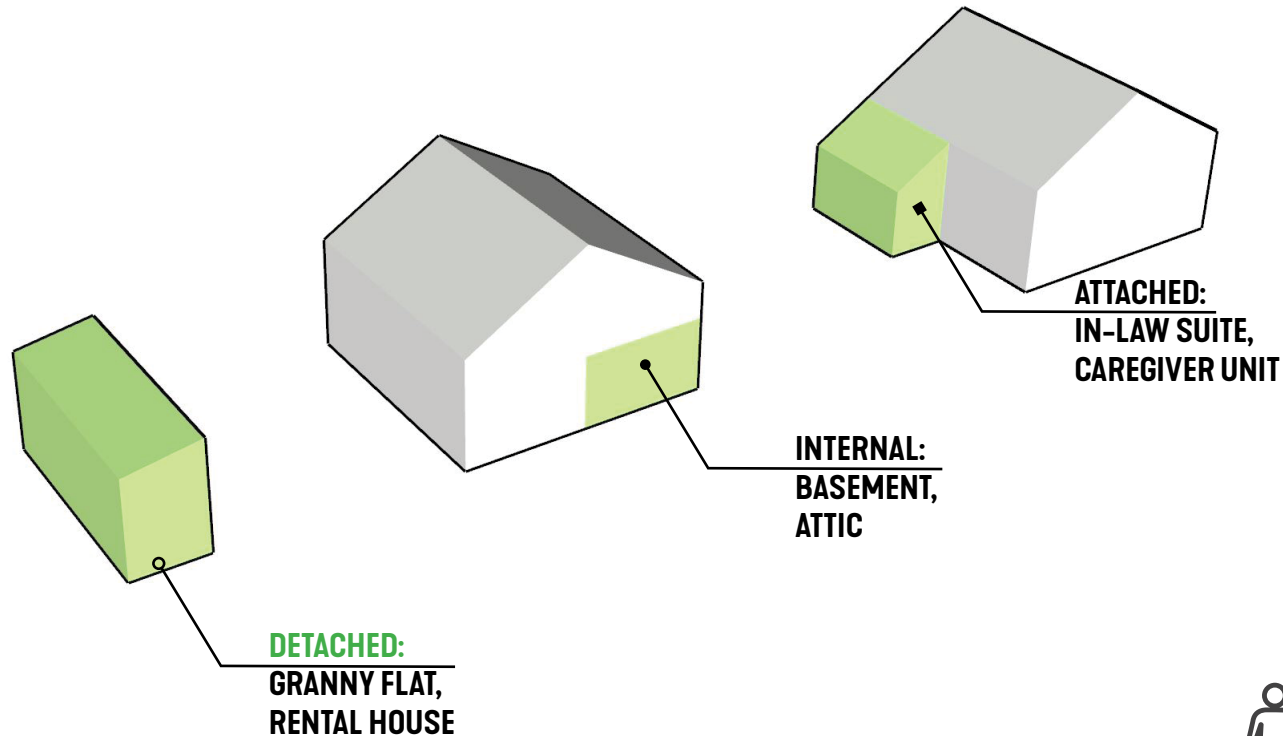


PICK A TYPE OF ADU TO DESIGN AND DEVELOP:

We'd like to preserve the house we have and not have to leave our home.

ADU OPTIONS:

- 1) INTERNAL ACCESSORY DWELLING UNIT
- 2) ATTACHED IN-LAW SUITE OR CAREGIVER
- 3) DETACHED



We're planning to stay in our home as we build, what options do we have?

YOU'VE SELECTED TO DESIGN AND DEVELOP A DETACHED ACCESSORY DWELLING UNIT!

Zoning Incentives:

You've selected to take advantage of a detached unit with a zoning incentive from your local jurisdiction. This will allow you build with a higher density than previously allowed while building within existing zoning setbacks and lot coverage requirements.



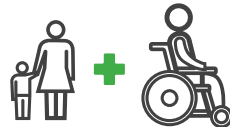


PICK A TYPE OF FINANCING:

We'd like to help those in our community and leverage the least costly financing available.

FINANCING OPTIONS:

- 1) Live in Primary Home & Rent ADU
- 2) Live Primary Home & ADU
- 3) Rent Primary Home & Live in ADU



Non-Profit Finance Program and
Municipal Tax Break Incentive

YOU'VE SELECTED TO
RENT YOUR ADU WITH A
NON-PROFIT THAT PROVIDES
AFFORDABLE HOUSING TO
ELDERLY OR DISABLED
INDIVIDUALS WITH A
CAREGIVER TRAINING
PROGRAM.



HELOC and Construction Loans Available



Affordable Housing Grants and
Non-Profit Finance Program Available



Before the in-laws move in, how can we offset the cost while helping our community?

YOU'VE SELECTED TO FINANCE WITH NON-PROFIT FINANCING!

Financing Forms:

You can select from a number of financing options that incentive community needs, such as senior housing, affordable housing and more. You've chosen a senior housing program that allows you to build an affordable rental unit with a lower interest rate from a local credit union based on the future value of the home. This rent is below market rate but more than offsets the [additional mortgage costs](#) given the lower than average interest rate.



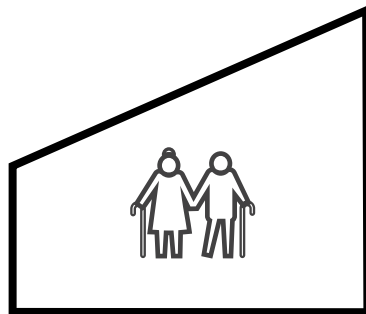


PICK AN ADU SIZE:

We'd like to maximize the density in our neighborhood and create more options for affordable housing.

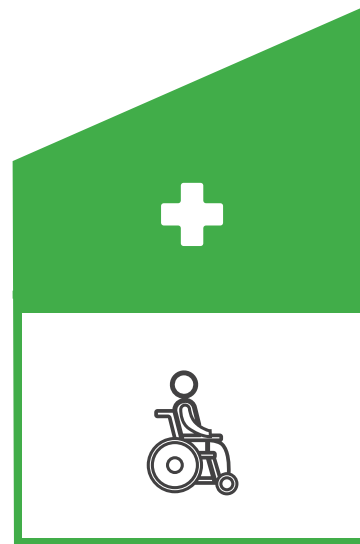
HEIGHT OPTIONS:

- 1) SINGLE STORY STRUCTURE
- 2) TWO STORY STRUCTURE



**SINGLE FLOOR UNIT FOR
AN ELDERLY AFFORDABLE
HOUSING**

OR



**SINGLE FLOOR UNIT FOR
AN ELDERLY AFFORDABLE
HOUSING + CAREGIVER
SUITE**



We'd like flexible options for our growing family, whatever they may be.

YOU'VE SELECTED TO DESIGN AND DEVELOP A TWO STORY ADU!

Program Incentives:

An affordable housing alliance that offers homes to elderly or disabled individuals has partnered with a nearby university to train in-home caregivers through their outpatient residency program. Universal design principles provide a flexible layout for different housing needs that will ensure this space will serve your family now and into the future.





PICK YOUR BUILDING APPROACH:

Self-build? Conventional contractor? Pre-fabricated installation?

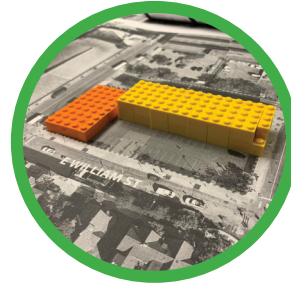
BUILDING OPTIONS:

- 1) CONVENTIONAL CONSTRUCTION BY AN ON-SITE BUILDER
- 2) PREFAB OFF-SITE CONSTRUCTION
- 3) SELF-BUILD



PREFAB FOR THE WIN!

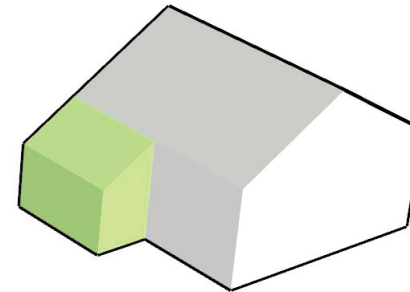
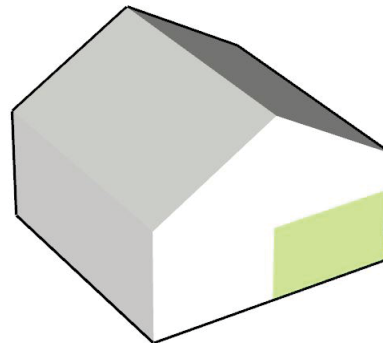
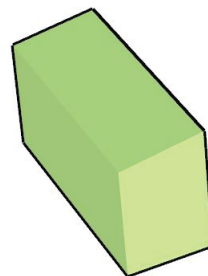
Photo by Heijmans ONE via Inhabitat



**SELF-BUILD,
IT'S AS EASY
AS LEGOS!**



**BOB THE
BUILDER**



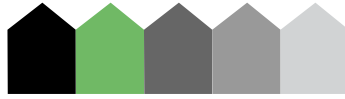
We'd like to feel part of the building process, not just a spectator.

YOU'VE SELECTED THE SELF-BUILD APPROACH!

Building Flexibility:

Having a range of building approaches using a consistent kit of parts sourced from sustainable and regenerative supply chain will help lower the barrier for entry and work with range of stakeholders of varying skill sets, means and priorities. Using smaller [SIPs, 2'x4'](#) module that is less than 35 lbs, makes this work much easier for a layperson.





PICK YOUR SITE APPROACH:

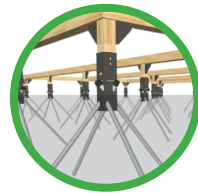
We'd like to maximize our energy production, minimize water usage and lower our utility fees as much as we can.

FOUNDATION OPTIONS:

- 1) FLAT SITE
- 2) SLOPED SITE

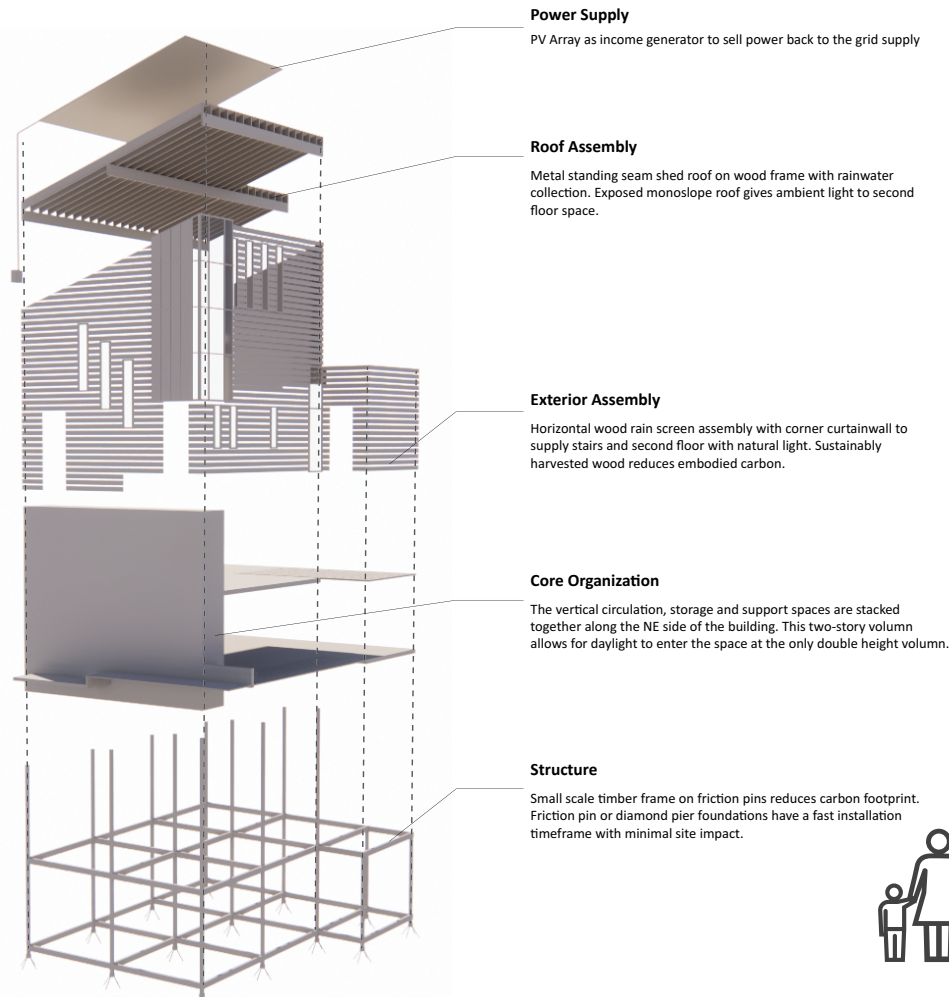


LET'S ROCK A MECHANICAL CONCRETE FOUNDATION!



LET'S STICK WITH A FRICTION PIN FOUNDATION!

Photo by Ground Frame Image by Pin Foundations, Inc.



We have a sloped yard and like to be sensitive to our landscape.

YOU'VE SELECTED A FRICTION PIN FOUNDATION FOR YOUR SLOPED SITE!

SUSTAINABLE ALTERNATIVES:

Think beyond concrete. [Mechanical concrete](#) works just as well on flat, stable sites with proper placement and grading. Sloped sites can use minimal impact foundation systems such as [friction pins](#) that don't require substantial earth moving and preserve water retention in existing landscapes.



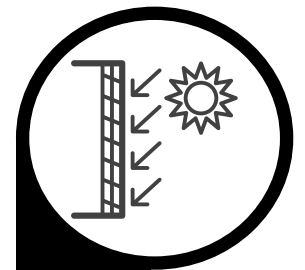
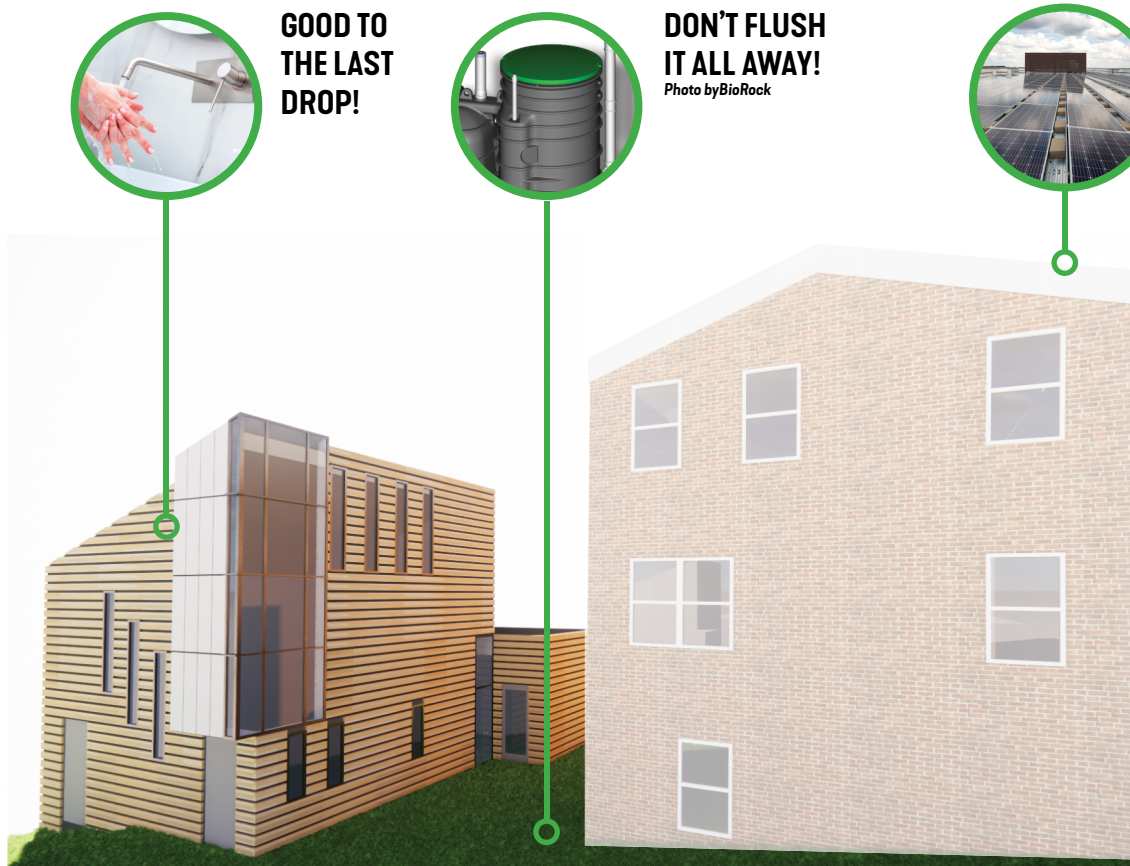


PICK YOUR BUILDING SYSTEMS:

What to prioritize for the Green New Deal... Energy production? Water conversation? Waste treatment?

BUILDING SYSTEM OPTIONS:

- 1) NETZERO WATER
- 2) NETZERO ENERGY
- 3) NETZERO WASTE
- 4) ALL OF THE ABOVE



How can we sustain our family's energy and water need?

YOU'VE SELECTED NETZERO...EVERYTHING!

NETZERO BASELINE:

To achieve the goals of the Green New Deal, we have to start with NetZero and maximize our opportunities to combat climate change. TriSolar panels provide power, domestic hotwater and meet the HVAC needs through [solar panel-integrated hydronic heat pumps](#). Water is recycled onsite with a compact sewage treatment unit and water usage is minimized with [recirculating](#) showers and gray water treatment.

