



San Diego/  
Tijuana

# SUSTAINABLE AND RESILIENT

The Future of Middle Market Housing in San Diego

Technical Assistance Panel  
September 8–9, 2025

# About

## Urban Land Institute

Urban Land Institute is a global, member-driven organization comprising more than 48,000 real estate and urban development professionals dedicated to advancing the Institute's mission of shaping the future of the built environment for transformative impact in communities worldwide. ULI's interdisciplinary membership represents all aspects of the industry, including developers, property owners, investors, architects, urban planners, public officials, real estate brokers, appraisers, attorneys, engineers, financiers, and academics. Established in 1936, the Institute has a presence in the Americas, Europe, and Asia Pacific regions, with members in 84 countries.

Cover photo: The exposed walls of this kitchen are the structural walls of the building, adding a compelling design element while cutting down on excess materials and processes in the unit's finish. (ULI)

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## ULI Randall Lewis Center for Sustainability in Real Estate

The ULI Randall Lewis Center for Sustainability in Real Estate (the Center) leads the real estate industry in creating places and buildings where people and the environment thrive. In collaboration with ULI members and partners, the Lewis Center drives industry transformation, cultivates leaders and champions, and helps foster solutions for sustainable, resilient, healthy and equitable cities and communities. The Center pursues these goals via cutting-edge research, global convenings, community technical assistance, and other strategies. The Center's main programs are Decarbonization, Urban Resilience, and Healthy Places.

## California-Nevada Technical Assistance Leadership Exchange

The ULI California-Nevada Technical Assistance Leadership Exchange advances innovative solutions to regional land use and climate resilience issues through collaboration between local governments, public sector leaders, and the real estate industry. The program facilitates connections, dialogue, and expert exchange to explore strategies for creating resilient and sustainable communities through land use and real estate interventions.

Seven public agencies in California and Nevada were selected to participate in this program. Working in tandem with their closest ULI District Council, each of these agencies hosted a Technical Assistance Panel focused on a specific and resilience and land use challenge in their communities. The fundamental goal of the effort is to provide concrete ideas and strategies to public sector leaders to advance resilience in the built environment. Through its work, the program will create resources to help all ULI members accelerate resilient land use in their communities.

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ULI San Diego–Tijuana is a community of more than 800 people from diverse professional and personal backgrounds in the bi-national region. As a nonpartisan organization, we have long been recognized as one of America’s most respected and widely quoted sources of objective information on urban planning, growth, and development. Our local program of work includes more than 50 educational forums, mentorship programs, and technical assistance interventions annually. ULI San Diego–Tijuana’s education and outreach is focused on four core areas including: housing affordability, transit, community engagement, and fostering leadership. ULI San Diego - Tijuana is the only bi-national District Council in the global ULI network.

### ULI San Diego–Tijuana Leadership

#### **Sean Slater**

Senior Principal, RDC  
District Council Chair, ULI San Diego–Tijuana

#### **Chris Clark**

Executive Director, ULI San Diego–Tijuana

## Technical Assistance Panel (TAP) Program

In keeping with the ULI mission, Technical Assistance Panels convene ULI members who volunteer their time to aid public agencies and non-profit organizations that have requested expert insight to address their land use challenges.

During this process, a group of diverse professionals representing the full spectrum of land use and real estate disciplines typically spend one to two days visiting and analyzing site-specific conditions in the built environment, identifying pertinent planning and development issues, and formulating realistic and actionable recommendations to move initiatives forward in a fashion consistent with the applicant’s goals and objectives.

Learn more at [sandiego-tijuana.uli.org](http://sandiego-tijuana.uli.org).

### ULI San Diego–Tijuana TAP Committee Leadership

#### **Diego Velasco**

Principal and Founder  
CityThinkers  
TAP Committee Chair, ULI San Diego – Tijuana

#### **Michael Tactay**

Keyser Marston Associates, Inc.  
TAP Committee Vice Chair,  
ULI San Diego – Tijuana



# About

## Technical Assistance Panel

### Panel Co-Chairs

**William Anderson**

Founding Principal, CITECON

Lecturer, Urban Economics + Planning, UCSD

**Andrew Schlesinger, PLA, SITES, AP**

Director of Sustainability, Landscape

Architecture

EDGELAND

### Panel Members

**Laura Aldrete**

President

Urbana Consulting

**Elizabeth Arsenault**

Sustainability & Energy Consultant

IMEG Corp

**Mel Bartow**

Senior Account Manager

Measurabl

**Jake Cattanach**

Principal

POGO DOG DEVELOPMENT CO.

**Monica Contreras**

Project Manager, Climate & Decarbonization

Strategy

JLL

**Christian Dimeling**

Owner / principal

Build Solid, Inc

**Bruce Monighan**

Urban Design Manager

City of Sacramento

**Tony Pauker**

Vice President, Land Acquisition

Brookfield Properties

**Sean Slater**

Senior Principal

RDC

### ULI Project Staff

**Chris Clark**

Executive Director, ULI San Diego–Tijuana

**Tatiana Perez**

Senior Associate, ULI San Diego–Tijuana

**Victoria Oestreich**

Director, Advisory Services Program, Urban

Land Institute

**Kelly Annis**

Report Writer, Branch Communications

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The material presented in this document was prepared by members of the Urban Land Institute's San Diego-Tijuana district council. The report seeks to provide an informed outlook on local real estate and planning topics and as understood by ULI San Diego-Tijuana and our contributing members. The analysis, views and opinions expressed herein are those of the contributors and not necessarily their employers, the Urban Land Institute, or the ULI San Diego-Tijuana district council. The material that follows was developed from a number of sources: interviews, research by individual contributing authors, surveys, and forecasting. While the information contained in this report represents informed analysis of issues in the San Diego - Tijuana region, it should not be used to make business decisions in lieu of professional consultation.

## Executive Summary

San Diego, California, enjoys a climate that is the envy of much of the rest of the country. Daily temperatures are moderate, and cool evenings ensure that any heat from the day is able to dissipate, allowing residents to remain comfortable in homes that are often without mechanical cooling.

As daily temperatures continue to rise nationally, San Diegans are likewise feeling these temperature increases. Concerns around contributing factors, including greenhouse gas emissions (GHG) from the built environment and mobility, have the attention of the City of San Diego (the City) leadership, leading to the 2015 adoption of the city's first [Climate Action Plan](#). Further, the City's Climate Resilient SD plan identifies four primary areas of challenge: extreme heat, extreme rainfall or drought, wildfires, and sea level rise.

Working with the benefit of these adopted plans, the City turned its attention to the role of the built environment in either exacerbating or helping mitigate some of the challenges related to carbon and GHG emissions. Also recognizing that the city has a need for additional housing units, programs have been developed to stimulate more housing production. With the help of the [Complete Communities Housing Solutions](#) program, the Accessory Dwelling Unit (ADU) Home Density Bonus Program, and other housing action and density bonus programs, more housing is on the way.

With the help of the Urban Land Institute San Diego–Tijuana district council (ULI), the City sought to identify how passive cooling strategies, sustainable materials, and climate-adaptive features could be integrated into middle-income housing designs, thereby stimulating additional housing that would be more energy-efficient and climate resilient for the city's residents. Using its trusted Technical Assistance Panel (TAP) program, ULI assembled a panel of design, development, and real estate professionals with the expertise needed to study the challenges and deliver the following actionable recommendations to the City.

### Addressing the Scope

The panel provided the following direction to the City as it considers how to encourage more residential development that will serve a greater population of city residents using more sustainable materials and processes, while also incorporating resilience strategies.

**Use sustainable building materials.** For San Diego, locally available and energy-efficient building materials fall into three primary categories: traditional wood construction, low-carbon concrete, and mass timber. Additionally, stucco, insulated composite concrete block (ICCF), recycled materials, and alternative roofing materials can make a measurable difference in both the embodied carbon and insulation properties supporting energy reductions for buildings.

**Understand the early cost, availability, and scalability challenges.** Stakeholders

## Key Terms

**Adaptation:** The process of adjusting to new (climate) conditions in order to reduce risks to valued assets. [U.S. Climate Resilience Toolkit](#)

**[Climate] Mitigation:** Processes that can reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing them from the atmosphere. [U.S. Climate Resilience Toolkit](#)

**Resilience.** The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption. [U.S. Climate Resilience Toolkit](#)

**Sustainability.** The industry's environmental and social impacts, and the resulting risks and opportunities these impacts present. [Penn State](#)

For more information, see ULI's publication [Greening Buildings for Healthier People](#).

interviewed for this TAP noted a current ten to thirty percent cost premium on materials deemed more sustainable. As these materials become more readily available, gain mainstream acceptance with architects and engineers, and become more familiar to the construction trades, it is anticipated that these premiums will reduce and become cost competitive with conventional materials.

Product scalability for lower embodied carbon (EC) products hinges on the establishment of baselines by the City and the industry's acceptance of the materials, which

can be encouraged through regulations and financial or process incentives.

**Promote sustainability and resilience in missing middle housing production and more efficient building performance.** To promote lower EC materials in missing middle housing, the City is encouraged to leverage the City of San Diego Cooling Solutions Toolkit (currently underway). Additional measures can include promoting or requiring light-colored materials, particularly for roofs and paving. Minimizing paved areas and encouraging softscapes, such as drought tolerant plantings and trees, can help reduce ambient temperatures while also absorbing carbon dioxide and stormwater runoff. The City can and should reward innovation and creativity in new materials and process deliveries, allowing pilot projects to explore and test ideas before encouraging more mainstream deployment.

**Promote passive cooling strategies to support occupant resilience.** The efficacy of passive cooling measures relies on site context, which makes one-size-fits-all policy recommendations challenging. Every effort should be made to allow designers and developers to maximize air flow and maximize fire-smart shade to provide optimum passive cooling opportunities for a home's residents. Building placement and design to improve solar access and capture coastal breezes can also leverage natural sources of heating and cooling.

**Recognize the other benefits that low-EC materials can bring.** The panel noted that both concrete and mass timber perform

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“The nexus of urban heat, wildfire risk and embodied carbon is important.”

–ULI Panelist

well under stress from fire, allowing building occupants anywhere from two to eight hours to evacuate the building.

**Recognize the balance between low-EC and ongoing operational carbon.** While the measurement of operational carbon was outside the scope of this study, the panel did recognize that some building materials with a higher EC value can still provide a high degree of energy efficiency for operations over time. A balance must be struck.

### Key Assumptions

As the panel explored the scope and design challenges posed by the City, the panel identified that it would be working under the following key assumptions:

- The City needs to define the embodied carbon target reduction for proposed use of sustainable materials. The [CALGreen](#) required reduction of ten percent below baseline levels is a good place to start.
- Sustainable building materials typically come with a cost premium. If the City seeks to standardize the use of these

materials for missing middle housing through the Neighborhood Homes for All of Us Program, there will be a gap between cost of new homes and target sales price of new homes.

- The above cost premiums will need to be addressed to support missing middle housing development as a financially viable pursuit in the San Diego market.
- Insurance, operating costs, and lifecycle costs and benefits of lower-EC materials will need to be evaluated further.

**Additional considerations.** In addition to the City setting its carbon reduction goals prior to formalizing regulations or incentives, the panel recommends the City also explore the following tools:

- Use publicly-owned land for a demonstration project.
- Use incentives to promote desired approaches.
- Encourage the combination of low carbon building materials with efforts to promote climate adaptive design.
- Encourage neighborhood passive cooling through new tree yards and other urban easement areas.

### The Panel's Big Ideas

In addition to answering the specific questions posed by the City, the panel identified the following additional opportunities to stimulate sustainable design strategies and resilience in missing middle housing for San Diego.

### **Promote “Sustainable Complete**

**Communities.”** The early cost premiums for lower-EC products will make missing middle projects difficult to pencil. Tax incentives, grants, and land and cost incentives will need to be on the table.

- By piloting a project and a sample process with a developer with a proven track record, the City can deliver a proof-of-concept to the market that can support a shift to these newer approaches.
- The City is encouraged to expand incentives to include sustainability and resilience measures.
- Self-certification should be considered as an approach for developers pursuing a pre-defined typology and following the defined criteria.

### **Leverage a pilot program for materials innovation and statewide manufacturing.**

Using a proof-of-concept approach, the first one to three years of a program of this nature would focus on providing viability, standardizing best practices, establishing a market, and gaining broader awareness of the processes and products.

**Localize production of materials.** Partnering with the State of California, institutions of higher education, and the private sector can support and help drive further research and development and support local materials production in the southwestern United States. Additional efforts that can support local production include: focusing on the supply chain and transportation; supporting workforce development; advocacy; setting

key performance indicators; and moving to a circular economy. The City’s [Neighborhood Homes for All of Us](#) program can also be a powerful tool in catalyzing and supporting the use of local production of key materials.

### **Revise and update permit review processes.**

The following recommendations focus on improving processes for missing middle projects, saving project applicants’ time, and thereby conserving financial resources and supporting project viability.

- Accelerate permit review processes for small-scale or permit-ready projects.
- Provide requirement certainty.
- Streamline complex reviews.
- Incentivize low embodied carbon and passive designs through permitting.
- Create a small-scale simple scope.
- Use State licensed housing inspections.
- Streamline through pre-application review.
- Categorize permitting as “small,” “moderate,” and “complex” to help streamline and scale the process.

### **Incentivize sustainable and resilient features.**

The City is encouraged to use the following process recommendations to incentivize the inclusion of energy-efficient, low carbon, and resilient features in projects.

- Provide expedited permit review for resilient and sustainable buildings.
- Create a climate-responsive application.
- Create an embodied carbon threshold for building certification.

## [Neighborhood Homes for All of Us Program](#)

Small-scale neighborhood homes are townhomes, rowhomes and small-scale multiple-home buildings that are built to the same scale as surrounding traditional single homes that can provide home options for first-time home-buyers, families with children, and middle-income households. These types of homes are often missing due to regulatory barriers such as zoning, that limit the available land on which they can be built. Neighborhood Homes For All of Us will include home design guidelines to provide sample plans, layouts and designs, financing strategies and regulations to allow for the development of these homes in more areas in the City in a manner that will enhance the City’s neighborhoods.

- Determine a minimum percentage goal for EC reduction.
- Include passive thermal and solar design features.
- Test and demonstrate performance for different scales of building types and submarket contexts.

Smaller projects should enjoy less stringent requirements than large projects, which could help speed more missing middle housing production.

**Leverage partnerships for flagship projects.**

In pursuit of a proof-of-concept, the City could use a public-private partnership (P3) to pursue development on public land in exchange for public financing assistance or a reduction of the land cost, which could balance with the potential premiums associated with the lower-EC products. This proof-of-concept project could demonstrate materiality, financial performance, and process viability while delivering much needed housing resources to community.

**Leverage a P3 pilot for climate-resilient infill.** Through land cost adjustments to municipal green bonds for sustainable infrastructure to performance standards,

the City could partner with the private sector to deliver missing middle housing. The goal would be a demonstration of climate-aligned development delivered at scale with risk absorption, advancing CAP goals, and reducing heat vulnerability.

**Conduct an urban tree canopy study.** A tree canopy survey can help the City identify where additional canopy or other shade mechanisms are required to help with neighborhood cooling and support residents' resilience.

**Key Findings**

The City of San Diego has demonstrated strong leadership in its policy pursuits to

date. The work to incentivize affordable housing could serve as a good model and foundation upon which to build similar ordinances and incentives to promote more energy-efficient and climate-resilient building materials and processes, particularly as it relates to development of new missing middle housing. Piloting will show proof of concept and convince developers that these units can brought to market without incurring premium cost for lower embodied carbon materials. Better design ensures that these units will hold value over time to meet climate challenges of tomorrow.





# Introduction and Background

Housing in San Diego is at a premium. Land values have pushed home prices and rental rates to levels not seen before, and the market does not appear to be cooling any time soon. Regulations at the state level, construction materials and labor costs, and high interest rates are adding to the pressure, leaving many would-be homeowners on the sidelines, continuing to rent or considering a move to far-flung areas where housing is more affordable.

Like many cities in the United States, San Diego does not have enough available housing units to meet the current demand. Even with the region's housing boom, during which nearly 10,000 homes were permitted in 2023 alone, the City of San Diego estimates that there is still a deficit of almost 79,000 homes needed in different affordability thresholds to meet the region's

[Regional Housing Needs Assessment \(RHNA\)](#) allocation within the allotted period in order to meet both projected growth and replacement needs.

In particular, City leadership has identified a startling lack of “missing middle” housing in San Diego. According to the National League of Cities, “missing middle housing refers to housing that provides diverse options along the spectrum of affordability,” including townhomes, duplexes, triplexes, fourplexes, and bungalows, as well as cluster homes and cottage courts. Missing middle housing is developed without the assistance of tax credits or other government subsidies and, for the San Diego market, is priced in a manner considered generally affordable to households earning between 80 and 120 percent of the area median income (AMI). (See Exhibits 2 and 3 on page 29.)

## Study Questions from the City

1. What sustainable building materials are available and applicable locally with a low embodied carbon footprint?
2. What is the cost, availability, and scalability of using sustainable building materials in standard construction?
3. With regards to sustainable building materials, what materials and design strategies are best suited for missing middle housing in San Diego that might also enhance heat mitigation, thermal insulation, and heat reflectivity?
4. What passive cooling strategies would be most effective for missing middle housing in San Diego? How can building design, form, layout, etc. be optimized for thermal performance?
5. Are there any conflicts between optimal materials and design for sustainability and resilience?



The panel toured the NIIMA Apartments, a project that demonstrates key materials of interest including mass timber and recycled metal.

## What the Panel Heard

The panel interviewed leaders and staff from the City agencies, developers, industry experts, and professionals working on decarbonization and energy efficiency measures in the region who shared this feedback:

- There is limited public embrace of pre-planned housing designs.
- The Coastal Commission is a factor as is the 30-foot building height limit.
- Developers often views State agencies as frequently overreaching and often believe that the City frequently shifts programmatic goalposts.
- "Only incentives will make the financials of new development work."
- There is a move to make everything run on electricity, but it is unclear that the existing grid has the ability to meet the demands of an all-electric network.
- There is a tension between sustainability measures and missing middle pricing.
- Middle income is generally considered to be 80-120% of AMI.
- Missing middle housing is developed with private funds and is considered market rate housing.
- Resilience is considered enabling infrastructure in Boston, Massachusetts.
- Code adjustments can only become more (not less) stringent as they are determined at the State level.
- By supporting creativity and pilot projects, the City can determine a scalable standard that can be modeled across the market.
- A pilot program or incentives can help spark participation by the private sector.
- The City could lead the way by developing a pilot project and demonstrate innovative ideas on publicly-owned land.
- Showcasing a high-design that delivers on sustainability can help demonstrate the benefits of sustainable projects.
- Education is important to help parties understand the benefits and use of sustainable products and practices.
- The magic lies at the nexus of reduced urban heat, wildfire risk, and embodied carbon.
- Developers seek to use readily available materials with a repeatable process.
- Density should be incentivized without sacrificing quality or location context.
- The market and investors need to see real projects demonstrated and understand their performance metrics.
- Support is needed for workforce training on sustainable products and processes.
- There has been a building boom in the city with more multifamily built in the past three years than in the past three decades.
- Housing should be developed and encouraged where infrastructure is already in place.
- There is a need to better stratify income levels in order to identify where the gaps exist and where the actual need lies.



The City provided the panel with a thorough briefing of its existing sustainability programs.

Elected and professional leadership at the city level is also striving to increase the sustainability (defined as mitigation of emissions) and resilience (defined as adaptation to climate challenges) of housing across San Diego. These leaders understand the value of using more energy-efficient and low carbon building materials and practices across the city’s built environment. San Diego’s [Climate Action Plan](#), first adopted in 2015, seeks to achieve net-zero greenhouse gas emissions by 2035. Additionally, City leadership recognizes the need to support and enhance the resilience of San Diegans in times of stress, with particular attention paid to extreme heat, rainfall, or drought as well as sea level rise and wildfires. [Climate Resilient SD](#), the City’s climate adaptation and resilience plan, provides adaptation strategies that are designed to increase the resilience of the city’s people, assets, economy, and natural resources.

In an effort to explore the opportunities to braid these housing goals together—missing middle housing production, sustainability, and climate resilience—the City turned to the Urban Land Institute San Diego–Tijuana District Council (ULI) for assistance and insights. Using its trusted and objective technical assistance panel (TAP) program, ULI convened a panel of real estate professionals with the expertise needed to answer the City’s questions. With expertise in the areas of real estate development, urban planning, architecture, and sustainability and resilience consulting, the ULI panel studied briefing materials provided by the City, toured

projects and neighborhoods that were striving to meet the City’s goals, and interviewed stakeholders who had experience in the areas of inquiry or who are working on similar development pursuits. Following this information gathering session, the panel turned its attention to the specific questions posed by the City and delivered a series of answers that can help guide elected and staff leadership as they consider how to encourage more missing middle development that will also advance the City’s climate goals.

In addition to answering the City’s five key questions, the panel delivered four “big ideas” that the City can also use to guide and incentivize additional residential development of the types it would like to see in San Diego. These ideas leverage existing City resources, plan for future materials needs, include updates to the City’s permitting processes, and encourage the City to lead by example through flagship developments that can demonstrate applicability.



The panel also toured the Le Parc development, which uses key materials of interest, including concrete masonry unit construction techniques that simplify cost and number of materials. The project also demonstrates passive cooling strategies.



# Addressing the Scope

To address the scope and design challenges posed by the City, the panel first identified and agreed upon a set of key assumptions. These assumptions allowed the panel to more fully explore potential recommendations while recognizing a set of important unknowns.

**Target reduction remains unknown.** The City needs to define its embodied carbon target reduction. In the interim, the panel pointed to the [CALGreen](#) required reduction of ten percent below baseline levels as a good foundation upon which to build.

**Recognize the funding gap.** At present, sustainable building materials typically come with a ten to thirty percent cost premium above traditional materials. If the City seeks to standardize sustainable materials for missing middle housing through the Neighborhood Homes for All of Us Program, there will be a gap between cost of new homes and target sales price of new homes. This could result in a gap in total development costs between three to ten percent.

**Impacts of cost premiums.** The panel began to develop potential solutions for addressing the funding gap which are reflected in the “Big Ideas” section of this report. The actual impact of cost premiums remains unknown and will require further study in order to identify viable solutions that will make delivering missing middle housing a profitable venture for San Diego developers.

**Impacts of insurance, operating, and lifecycle costs.** Developers will also need to consider and plan for the potential insurance impacts of adjusted building materials.

The ongoing operating lifecycle costs and benefits of lower-EC materials is also an important factor and one that will require additional exploration.

With these assumptions in hand, the panel considered the City’s questions and how the TAP recommendations can help advance the City’s housing, sustainability, and resilience goals. Although the questions centered primarily on sustainability pursuits, the tension between sustainability and resilience efforts and supporting and encouraging the development of missing middle housing was ever-present. Striking a balance between the three, the panel provided the following direction to the City as it considers how to encourage more of the types of residential development that will serve a greater population of city residents well into a future where average temperatures are anticipated to be increasingly warmer.

## Sustainable Building Materials

*Question #1: What sustainable building materials are available and applicable locally with a low embodied carbon footprint?*

For San Diego, locally available sustainable building materials fall into three primary categories. While these materials are generally made with less embodied carbon (EC) than traditional materials, it will be important to specify the specific reduction targets the City seeks.

- **Wood.** Wood, or traditional lumber, including both manufactured composite products and natural growth materials,

remains a highly sustainable and renewable building resource.

- **Low-carbon concrete.** Locally produced low-carbon concrete is available as poured in place (PIP) concrete and concrete masonry unit (CMU) blocks to San Diego builders with an additional lead time. Locally-made concrete blocks are produced and supplied at levels that are categorized as “good,” “better,” and “best” at carbon reduction. Producers are incorporating supplementary cementitious materials (SCMs) like fly ash or slag within concrete to lower the embodied carbon. These blocks provide a number of key benefits, including retention of warmth in the winter and cooling in the summer. The blocks that are produced with a ten percent carbon reduction typically have a zero to minimal cost premium. The blocks are fire-resistant, and their use can reduce the need for other building and finish materials such as interior framing, drywall, painting, etc. Designers and builders can use product specific environmental product declarations (EPDs) from material suppliers to inform supplier selection and optimize design by making sure materials and systems do more than one job whenever possible.
- **Mass timber.** Mass timber has entered the market, and while much of the supply still comes from the Pacific Northwest and Canada, there are manufacturers working to bring the material and production to California. Mass timber’s

tight porosity makes it fire resistant with products able to withstand fire for various rated durations of time.

In addition to these core building materials, the panel noted the following additional materials as worthy of consideration, each of which provides sustainability improvements over traditional building materials. More mainstream use of some of these building materials may create opportunities for the building trades to expand their skillsets and develop additional service lines.

- **Stucco.** Stucco, which is used across the region, can be produced with a higher fly-ash content to create a carbon-absorbing product.
- **Insulated composite concrete block (ICCF).** ICCF, which features a mixture of Styrofoam and concrete and functions like concrete block, is fire and insect-retardant, has an insulation factor of R28, and performs well in earthquakes. Much like other low-carbon concrete, ICCF reduces the additional steps needed to create a finished wall, saving time and money.
- **Recycled materials.** Recycled building materials (wood, steel, glass, etc.) can also be factored into a new building project, creating a circular economy and longer lifecycle for products produced at higher costs or with higher embodied carbon.
- **Roofing materials.** Alternate roofing materials that feature lower embodied carbon can be found in the local market. In some instances, traditional roofing

*Environmental product declarations (EPDs) are standardized, third-party-verified documents that report the environmental impacts of a product based on a product life cycle assessment (LCA) and set quantity reporting for high-impact materials.*



Innovations in building technology are saving energy and doing so in increasingly more efficient spaces.

materials, such as clay tile, can be the more sustainable choice over more common asphalt shingles, but is a more expensive material.

## Cost, Availability, and Scalability

*Question #2: What is the cost, availability, and scalability of using sustainable building materials in standard construction?*

**Potential cost premiums.** Across the industry, manufacturers and installers are innovating in order to find, design, and create new building products and processes that will shorten the time to build, reduce costs, and create a more sustainable and resilient structure. As these materials find market acceptance, prices tend to stabilize and align with more common materials.

- Stakeholders interviewed for this TAP noted a ten to thirty percent cost premium on more sustainable materials at present. These costs are anticipated to eventually lower with scale and with broader industry usage. For example, one builder noted an eight to ten percent premium on total building costs when using mass timber.
- Developers can also anticipate an additional one-percent premium for design services in these early days. As architects begin to embrace new products and gain proficiency, it is anticipated that this premium will fade.
- It is also important to consider approaches for working with trade

groups and labor unions to help share information and training on using these newer products and processes. As the industry gains familiarity, labor premiums can likewise begin to regulate as more and more tradespeople gain the knowledge and experience to work with these newer materials, technologies, and approaches.

**Product availabilities.** In most instances, stakeholders noted that the lower EC materials are generally available, although some materials require more significant pre-order or lead time. In the case of the lower-EC concrete, a developer interviewed during the TAP noted that the product came with a longer lead time and had a thirty percent cost premium. Other stakeholders noted that the potential materials costs and the associated embodied carbon rise with the distance the materials are shipped, which reinforces the need to produce more of these new building materials in the San Diego area.

**Product scalability across developments.** The ability to use these lower EC products hinges on two key factors. First, the products and processes must achieve proof-of-concept status, which will lead to the industry readily accepting their use across applications. Secondly, the ability to scale lower-EC materials also hinges on the exact baseline targets defined by the City. Without the regulatory requirements or financial incentives to change, few developers will choose this new path, which, in the early days, can be expected to come with higher prices and a limited range of installers. In some jurisdictions, early EC reporting requests

information regarding EPDs. By introducing a voluntary reporting program as part of initial Phase 1 rollout for projects that seek EPDs, the City can help drive market acceptance of these lower embodied carbon products.

Over time, it is anticipated that broader adoption of lower EC materials and economies of scale will begin to equalize materials costs, reducing or even eliminating current premiums. The potential for longer-term cost efficiencies through lower life-cycle operating costs is also of particular note and may be worth deeper exploration by the City.

### Use in Missing Middle Housing

*Question #3: With regard to sustainable building materials, what materials and design strategies are best suited for missing middle housing in San Diego that might also enhance heat mitigation, thermal insulation, and heat reflectivity?*

To begin to promote the use of lower EC materials in missing middle housing developments, the City is encouraged to leverage the work it has underway in developing the City of San Diego Cooling Solutions Toolkit. Additionally, the panel pointed to the following building strategies for enhancing resilience that can be used across product types and apply to missing middle housing.

- **Color matters.** Using light colored building and roofing materials can help reduce building heat absorption and retention.
- **Materials can assist.** Maximizing softscape materials such as plants,



Outdoor spaces provide welcome opportunities to expand living spaces when doors and windows are opened wide.

grasses, and trees can help reduce ambient temperatures while also absorbing CO2 and stormwater runoff. Similarly, minimizing hardscape—such as paved sidewalks, driveways, and parking areas—and reducing the impermeable areas that tend to absorb and retain heat can make measurable differences in ambient temperatures.

- **Consider roof slope and material.** The slope of the roof will help determine how much solar energy is reflected or absorbed into a building. Similarly, the solar reflectance index (SRI) found in roofing materials can help developers understand which material can best aid in reflecting the solar energy landing on the roof. Using [LEED guidance](#) on the minimum SRI values by roof slope can help guide material selections to aid in structure cooling.
  - » A low-sloped roof with a less than 2:12 ratio should achieve an initial SRI of 82 at installation, with a three-year aged SRI of 64.



This common stairwell features more ventilation mechanisms as well as opportunities to create privacy with the curtains.

- » A steep-sloped roof with a pitch greater than 2:12 should achieve an initial SRI of 39, with a three-year aged SRI of 32.
- **Use reflective road paving material.** Using materials that help reject solar heat can assist with keeping the surface temperatures from increasing uncomfortably. The [SITES rating system](#) requires that paving material have an initial solar reflectance (SR) score of 0.33 and a 0.28 score after three years.

The acceptance of new building materials and practices is a systemic challenge that will require a more expansive approach across building types, including commercial, industrial, retail, and residential buildings. This new approach should reward innovation and creativity, embrace opportunities for efficiency and education, and recognize that individual comfort and overall resilience can be greatly enhanced through innovations in the built environment. New design approaches that allow building materials to shine through, rather than the current practice of burying the bones of the building behind other materials, can create environments that work more efficiently, cool more effectively, and use less material along the way. More information on materials resources, and specifically the 2025 CLF North American Material Baselines can be found on the [Carbon Leadership Forum](#).

## Passive Cooling Strategies

*Question #4: What passive cooling strategies would be most effective for missing middle*

*housing in San Diego? How can building design, form, layout, etc., be optimized for thermal performance?*

In order to maximize the opportunity to use passive cooling measures in buildings, including missing middle housing, context matters. The position of the structure on the lot and in relation to where the sun is and travels and how the air and wind flow are critical and context sensitive. A building's orientation on a site can also help protect against heat gain from the sun and maximize air flow, using building orientation to cool the structure and keep occupants comfortable.

**Maximize air flow.** Building orientation, courtyard design (using the Venturi effect to increase air flow), and window placement and operation are site-specific and should be factored into each building uniquely. This approach, which seeks to maximize air flow for each housing unit, also takes the building's context in relation to neighboring properties into consideration and may result in some adjustments to density on a building site. Greater densities can lead to reduced opportunities for air flow for particular units. Ensuring that each unit has access to effective air flow may require more direct exposure and lower/fewer neighboring building walls that may impede cooling breezes.

**Maximize shade.** Overhangs, awnings, and other shading across buildings can reduce the ability of the sun to penetrate the interior spaces and help keep building temperatures in check.

## Potential Conflicts

*Question #5: Are there any conflicts between optimal materials and design for sustainability and resilience?*

Heat and fire were the two key threats that the panel found most impactful and concerning for the San Diego market. When considering approaches needed for a thirty percent reduction of EC in a building, the panel pointed to the use of low-EC concrete and mass timber. Neither material is one-hundred percent fire-resistant, but both are designed to perform well under the stress of fire, allowing building occupants anywhere from two to eight hours to evacuate the building.

It is also important to consider the ongoing operational carbon in building development. In some instances, a building material that has a higher EC value may have a low operational carbon footprint. There is an evaluation to be performed when selecting building materials and a balance to strike in determining the ongoing operational impacts.

Although sea-level rise is also a concern for San Diego, it is less of a concern for missing middle housing development. The panel recognized this factor and understands that typical considerations for developing with sea-level rise in mind typically involve elevation and stabilization considerations.

## Additional Considerations

After answering the questions posed by the City, the panel identified the following additional factors that will likely come

into play as the City considers how it can encourage more missing middle housing that is also sustainable and resilient.

**Demonstrate viability on publicly-owned land.** The City is encouraged to explore opportunities to use publicly-owned land as flagship development sites, showcasing lower EC building materials and processes. With public land, the City can provide incentives as the land owner, potentially applying financial incentives, public funding sources, or writing down land costs to absorb some of the market risk. Other replicable private development opportunities could be used to demonstrate proof-of-concept to the private market. These pilot developments could also explore the potential impacts of prevailing wage on projects with and without EC approaches.

**Use incentives to promote desired approaches.** Financial incentives and process incentives (streamlining permitting processes, for example) can be used to spur developers to embrace contextual design elements that can assist with natural cooling functions (reducing sun and increasing wind exposure).

**Incentivize low-combustion landscaping materials.** Fire remains an important hazard consideration in the region. Incentivizing the use of low-combustion landscaping materials and plants can help reduce the risk of fires spreading.

**Encourage neighborhood passive cooling.** In addition to the passive cooling measures the



Low-combustion plant material can help soften the edge of the pavement and sidewalks while also providing mechanisms for managing more of the carbon in the environment.

City can promote in the built environment, tree yards and other urban easement areas can also play important roles in helping keep neighborhoods cool and shaded. Again, the City can play a leading role here, demonstrating on public land the types of trees and planting materials it would like to see embraced by the private sector.



# Big Ideas

Through the information gathered during the TAP process and with the benefit of their professional experience, the panel recognized additional opportunities the City can leverage to further encourage the development of more sustainable and resilient missing middle housing. These insights include potential regulatory approaches, development incentives, and actions that can demonstrate the viability of new building materials, processes, and technologies. This last recommendation, which uses pilot projects to develop proof of concept(s), can help build the foundational case for these new approaches, which can then be further encouraged through the use of incentives. Ordinance-based approaches can still play a role, yet the panel recommends leading with and leaning on a pilot and incentives approach first.

## Promote “Sustainable Complete Communities”

The real estate market in San Diego will require incentives to help fund the gap that developers will face when pursuing missing middle developments that feature lower-EC products and processes. Margins are already incredibly tight on conventional projects; layering on top the premiums of lower embodied carbon approaches in these early days will tip most projects beyond the point of financial viability, leaving plans for any new missing middle housing on the drafting room table. Tax incentives, cost incentives such as grants to cover material cost premiums, and land cost incentives should all be considered

on the path toward stimulating lower-EC housing production.

### Use Pilot Projects

The panel outlined a potential process for developing early demonstration projects that can support the delivery of proof-of-concept projects that developers and financial partners will need to validate their shift to different paths.

- 1. Choose a champion.** Although it may not be practical to incentivize all modes of development at the outset, selecting a prototypical project type and honing in on a champion of that type can be helpful in early days. For San Diego, small-scale infill housing developers may be well-positioned to pursue the type of development the City seeks and deploy it more broadly.
- 2. Work with developers.** Developing sustainably and with resilience is becoming increasingly important as the City pursues its stated livability goals. With additional support, developers working in this space can more readily deliver housing for both renters and buyers. The City can help ease the creation of for-rent and for-sale housing by working with developers to make the approval process for sustainable and resilient homes more efficient.
- 3. Specifically identify existing developers with a sustainability track record.** There are developers today who have a demonstrated track record of using new

## Complete Communities

Complete Communities is an initiative to set San Diego on a path to shape a future that works for all of everyone with a focus on four key areas: housing, mobility, parks and infrastructure.

Complete Communities includes planning strategies that work together to create incentives to build homes near transit, provide more mobility choices and enhance opportunities for places to walk, bike, relax and play. These efforts ensure that all residents have access to the resources and opportunities necessary to improve the quality of their lives.

Thoughtful and inclusive planning initiatives and programs aim to create a healthy environment and thriving communities that will serve to enhance the quality of life for all residents, regardless of their background and identity.

[SanDiego.gov](https://www.sandiego.gov)



design and sustainable building practices successfully. These developers are out on the thin branches, testing new ideas with incredibly thin margins and need additional support in order to scale their work and demonstrate to the market that these practices work are replicable, scalable, and increasingly cost-efficient. The City is encouraged to work with

developers using mass timber in projects, those leveraging passive heating and cooling approaches, or those using non-combustible materials in their projects.

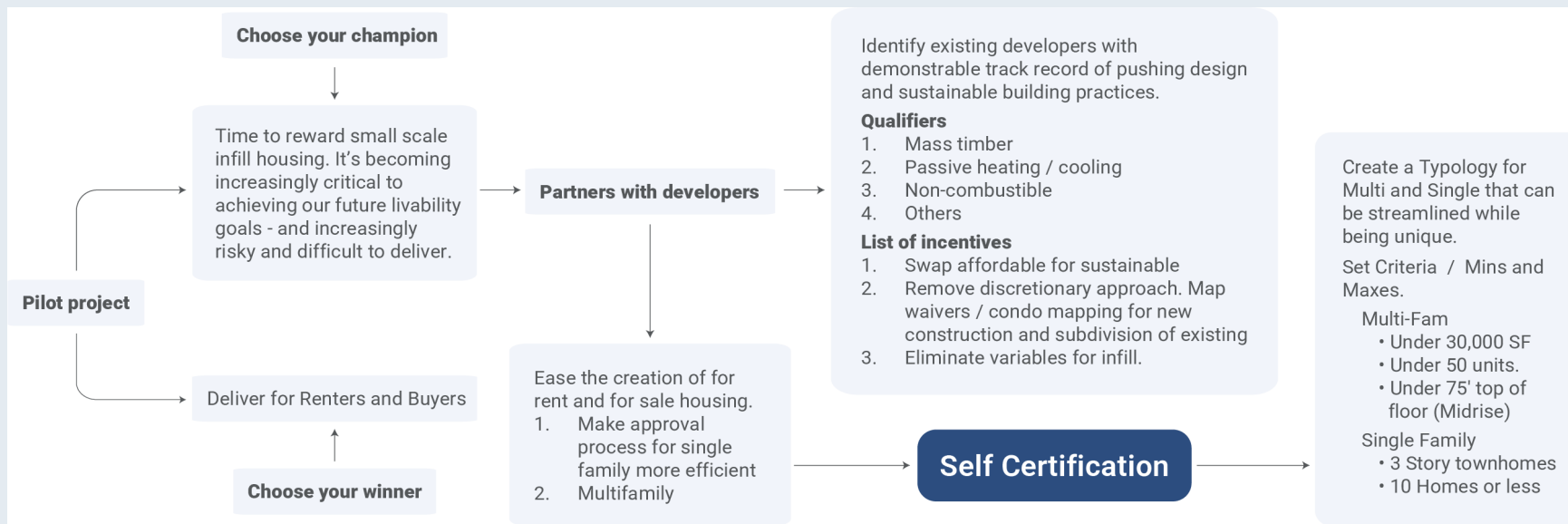
**4. Identify and deploy incentives.** The City has done an impressive job of incentivizing the development of affordable housing in San Diego. Using that same model, the City is encouraged

to consider expanding the available incentives to include those that promote sustainability. Other incentives could include the removal of the discretionary approach, the addition of map waivers and condo mapping for new construction, and subdivision of existing parcels.

Infill development also comes with a wide range of challenging variables. The City

## Sample Housing Review Process

This flowchart incorporates building material considerations into the City's review process, weaving these important City housing goals together. Although a process like this will require additional study for permit applicability, the flowchart is intended to show how materiality can be built into a process that supports infill housing.



### Cons

#### For Sale

1. Inclusionary housing is expensive
2. Discretionary process
3. Produced few (deliveries)
4. Insurance OCIP /WRAP

#### For Rent (Multi)

1. Less efficient capital
2. More regulation
3. A lot more risk / regulation

### Pros

#### For Sale

1. Efficient Capital

#### For Rent (Multi)

1. More efficient / ministerial
2. Produces more units
3. More flexible unit sizes



### Plan Self-Certification Program

The Self-Certification Program eliminates plan review by allowing a registered professional to take responsibility for and certify a project's compliance with building code, standards and ordinances. Depending on the scope of the project, permits can be issued within one to five business days. The expanded program includes tenant improvements on small commercial projects, residential minor grading on a lot without a house, residential driveway permits onto County roads, residential landscape plans, and private roads serving 4 or less homes.

Self-certification applications and classes are available as of 1-1-2021 for tenant improvements and residential minor grading. The other permit types will be available soon.

can promote infill project development by identifying and reforming variables under its control. Some variables that some may consider a constraint have another public policy purpose that should be considered. This include historic districts and designations, infrastructure capacity, stormwater management, habitat preservation, view corridors, and more. Reforming these variables can support improved resilience while also achieving other public policy objectives.

**5. Permit self-certification.** Self-certification can be a powerful tool in the pursuit of a more streamlined and cost-efficient development approach. The City could provide self-certification for developers pursuing a pre-defined typology and following a set of defined criteria, such as the ones outlined below:

a. Create a typology for multi- and single-family buildings that can be streamlined while still remaining unique.

b. Set criteria, including potential minimum and maximum building sizes.

Multifamily developments:

- Under 30,000 square feet (SF)
- Under 50 units
- Under 75 feet to the top of the building (mid-rise)

Single-family developments:

- Three-story townhomes
- 10 homes or fewer

As the City considers its approach to stimulating sustainable and resilient housing, the panel noted the following potential challenges.

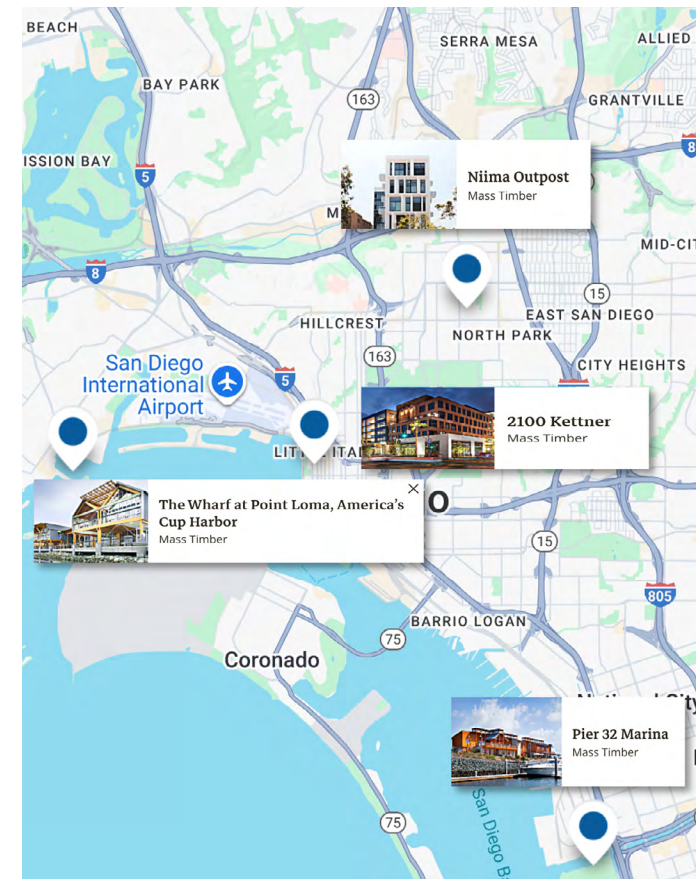
- For-sale housing challenges may include the costs associated with inclusionary housing requirements, the uncertainty of the discretionary process, the insurance requirements for owner controlled insurance and a wrap-up insurance program, and the potential limited scope of deliverables achieved through the process.
- Rental housing, typically multifamily projects, tends to be a less efficient capital deployment. The range of regulations that impact multifamily development can also create more risk for projects, slowing project delivery and potentially tightening already-narrow profit margins.

The benefits of this potential incentives approach are also important to consider.

- For-sale developers and investors can leverage the incentives to create a more efficient use of capital resources.
- Multifamily developers can also leverage a more efficient and ministerial development path, reducing typical uncertainty and risk scenarios. An incentives-based approach also has the potential to produce more units for the community and provide the market with a broader range of options in unit sizes.

## Leverage a Pilot Program for Materials Innovation and Statewide Manufacturing

The City's use of a pilot program to drive sustainable and resilient housing production has the potential to also encourage further innovation in material production and bring additional manufacturing of related products to California.



Across the region, there are several completed mass timber projects that could provide the proof-of-concept information the panel recommends.

## Proof-of-Concept Stage

1–3 Years

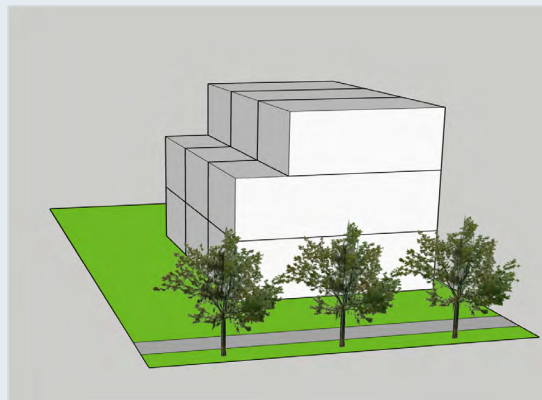
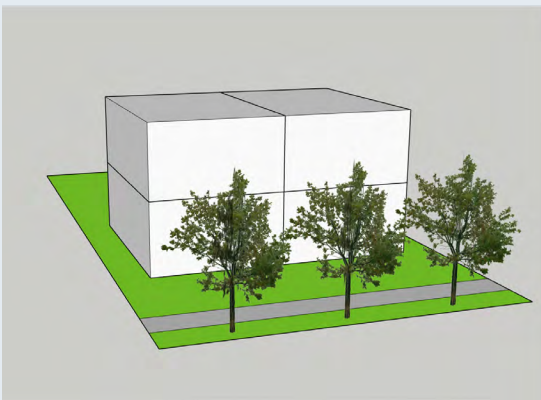
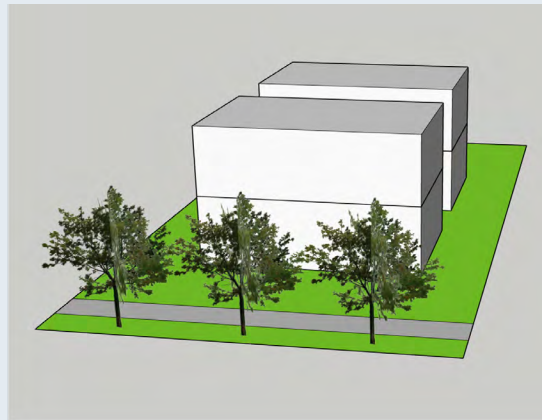
The early years of a program of this nature are about proving viability, establishing a market, and raising awareness of the processes and products more broadly. Identifying and exploring potential value capture is also encouraged and would flow from activities at this stage.

**Run a pilot development program.** By leading with pilot projects that have demonstrated

the use and benefits of mass timber, low-carbon concrete, recycled building materials, and EPDs, the City can establish a proof-of-concept for developments that are delivering an estimated thirty percent reduction in embodied carbon. These projects could then be detailed in case studies, shared across the market, and leveraged and improved by other developers. The initial pilot program could be an exclusive program that connects potential builders and developers with experts, providing them with mentorship

and first-hand experience from successful projects, particularly mass timber and low-EC concrete.

**Market the program, share case studies, and highlight results to raise awareness.** Raising the visibility of these new development approaches and sharing the success stories will be key to gaining broader market acceptance. The celebration of these early projects can also elevate San Diego as a city committed to sustainability and resilience and encourage other developers to embrace



## Case Studies Demonstrate Value

With early information gathering, the City could share the successes of the pioneers in the market who are achieving sizable carbon reductions. An example could feature ten completed projects in 2025-2028 that achieved ten to thirty percent embodied carbon reduction and delivered 200 new units of missing middle housing to the market.

Four sample housing unit typologies could be included in the City's pilot project. These could include a single family home, townhomes, duplexes, and triplexes. Each unit is shown at 1,200 square feet on a typical 5,000 square foot lot.

these new practices and products. This information sharing should also include educational resources for developers that can walk them through the various disclosure tools, such as EPDs, that are readily available to help them meet the goals set by the City.

**Standardize best practices.** A broader objective of this pilot program should also include the standardization of these best practices and incorporation into the City's Neighborhood Homes for All of Us program.

## Localize Production of Materials

### 1–10 Years

The localization of materials production should occur at the same time as the above pilot project work.

**Partnerships will be critical.** Partnering with the State of California, institutions of higher education, and the private sector can help support and drive further research and development of local materials production in the southwestern United States. In addition to supporting the City's climate goals, this work can also support economic development in these industries across the state.

**Focus on transportation and supply chain improvements.** Localizing material production and transportation will bring materials closer to local project sites and reduce transportation-related carbon emissions.

**Support robust workforce development.** It is important to train the workforce on new

“

“Life cycle benefits are greater for sustainable materials, and it would be great to factor this savings into insurance costs, utility costs, maintenance costs over time.”

–ULI Panelist

products and processes to help ensure that the local workforce is ready and able to install and support the construction and maintenance of a more resilient and sustainable built environment.

**Share information.** Information and education are critical—both at the local level with developers and at the state level with legislators. The City is encouraged to coordinate with partners to help deliver transparent information and materials ingredients (disclosure requests/letters) to support third-party verification, additional market acceptance, and broader public understanding.

**Develop key performance indicators (KPIs).** The adage that you cannot improve what you do not measure holds true for carbon emissions. Working with industry and development partners, the City is encouraged to set KPIs for emissions reductions, gather regular reports of

performance, and share information and progress with constituents.

**Create policies that support a circular economy.** In addition to spurring the use of lower-EC materials, the City has a role to play in encouraging materials that can be used more than once. Policies that encourage this type of circular economy can provide the incentive some developers might need to try something new.

**Incorporate local materials production into existing programs.** The City's Neighborhood Homes for All of Us program can also be a powerful tool in supporting the local production of key materials. Following the proof-of-concept stage, perhaps in the next three to ten years, the City can analyze what materials and processes worked well and performed best for missing middle housing and begin to incorporate those items into the Neighborhood Homes program.

## Revise and Update Permit Review Processes

The cost of development financing is highest in the early stages of project planning, where pre-development funding is often associated with high-interest financing. Process uncertainty, which requires time to clear, leads directly to increased development costs, which can kill a deal when it becomes no longer financially viable.

The following recommendations focus on saving project applicants development time, which, in turn, conserves financial resources

and supports overall project viability. With additional project security, the new financial efficiencies can perhaps lead to investments in additional and improved climate-responsive designs. Speed also benefits the City in the deployment of its own personnel resources in the processes.

Although the City may already have programs in place similar to those outlined below, it is worth noting them again and stressing the importance of these types of development incentives, which are within the City's control. The goal is to speed all permit processing where feasible and create a clear path, particularly for projects using lower-EC materials and building processes.

- **Speed processes for small-scale or permit-ready projects.** San Diego's considerable number of infill lots could be more quickly filled with missing middle housing if the City were able to speed the permit review process for off-the-shelf, permit-review-ready projects or simpler small-scale projects.
- **Provide requirement certainty.** The City is encouraged to create a process that provides certainty of requirements for developers so that they can plan for those requirements, budgeting time and resources from Day 1 and well before the first submission of permits.
- **Streamline complex reviews.** Although more complex projects likely require a longer permit review process, there should still be an evaluation to determine

where and how the process might be streamlined, again conserving time and resources for all parties.

- **Incentivize low embodied carbon and passive designs through permitting.** The City is encouraged to provide additional permitting incentives for passive house design features and projects with low-EC materials and processes. Saving time or lowering review thresholds for these lower-EC projects can help offset some of the associated low-EC cost premiums, helping to make the business case for sustainability and resilience.

The panel also outlined the following suggestions for permitting review that may



The mass timber used in this building is left exposed as a design element and adds warmth to the space.

help stimulate additional missing middle housing, in particular.

- **Create a small-scale, simple scope.** A new simple scope process could use an efficient permitting review of simpler zoning and objective design parameters. This would include a plan check for building code compliance, would apply to accessory dwelling units (ADUs), and could include an over-the-counter permit issuance consideration.
- **Use state-licensed housing inspectors.** For manufactured (prefabricated or modular) housing, the City could use an inspection model that deploys a state licensed inspector to conduct the inspection at the factory. This approach could also include an expedited review for utilities and site improvements on certain permits.
- **Streamline through pre-application review.** The City could use pre-application meetings with developers and design teams, bringing all City departments responsible for issuing permits to the table to provide initial comments on project conditions and insights into critical errors where the project could run into problems. This would provide an early read on a project and create a smoother plan check process. This process will hinge on everyone who has review authority participating in the pre-application meeting.

- **Categorize permitting to scale the process.** By categorizing permits into three primary buckets—small-scale, moderate, and complex—the City can create a more efficient system that could potentially review plans more quickly.
  - » Small scale. Easy or simple projects that qualify as over-the-counter permits could speed through a quick permitting process that would be easier and faster to navigate.
  - » Moderate scale. The permit process for moderate-scale work could be categorized in a manner that builds in

conversations with plan reviewers to identify and agree on any necessary document changes. This could lead to an accelerated review of final plans.

- » Complex project processing. For larger, more complex projects, a clear, transparent, and personal review process is needed. After two cycles of review and response, an in-person meeting should be built in to reach agreement on required corrections. This more personal route can help reduce processing time, which can help prevent unexpected delays and keep the project's associated carrying costs in check during permitting.

The panel provided the following compliance examples that could be factored into the process to meaningfully reduce embodied carbon and/or leverage more sustainable design strategies.

- **Create an embodied carbon threshold for building certification.** Requirements for specific credits would be determined at the City's discretion and could include LEED Sustainable Sites Heat Island Reduction credits, for example.
- **Determine a set percentage for EC reduction.** Again, the City should set a baseline and target and is encouraged to consult with municipal peers across the country to best identify targets and gauge potential efficacy.
- **Include passive thermal and solar design features.** The use of passive heating and cooling design and solar installations should be factored into compliance efforts.

### Incentive Sustainable and Resilient Features

There are ways the City can also use the review process to incentivize the inclusion of sustainable and resilient features in projects.

- **Provide expedited permit review.** In much the same way that affordable projects enjoy an expedited review process, faster approval processes should be offered for resilient and sustainable buildings meeting specific thresholds.
- **Create a climate-responsive application.** The City could develop an application to raise the importance of climate-responsive and embodied carbon features. Those projects meeting the application's criteria could then qualify for expedited permitting review.

Although sustainability and resilience features can be built into a project of any size, smaller projects should enjoy slightly more relaxed requirements than large projects. Regulations could be less stringent and costly to support smaller developments, which could help speed more missing middle housing production. Prescriptive measures for materials, for example, or passive cooling design could be variable at a rate determined by the City and applied differently based on project size or scale.



Natural light and air are encouraged to enter all spaces within this apartment's living area.

## Leverage Partnerships for Flagship Projects

Taking the proof-of-concept recommendation further, the City is encouraged to consider a public-private partnership (P3) for climate-resilient development on public land.

Using City-owned land, a P3 could unlock public financing assistance or provide developers with an opportunity to use land at a cost that has been written down by the City. The savings in land cost could help reduce the impact of the potential cost premiums associated with the lower-EC products. This approach helps absorb some of the development risk while providing economic incentives to the partners.

The partnership opportunities of a P3 could be used to reinforce the City's commitment to its climate goals. An institutional partner with an aligned mission, such as a nonprofit or educational institution, could help elevate the work. P3 benefits could also be provided

### Urban Tree Canopy

Across the country, cities are measuring their urban tree canopy to establish a baseline and begin to take steps to increase coverage. The City of San Diego is also encouraged to explore conducting an Urban Tree Canopy Study to help with neighborhood cooling, street design, and property valuation.

in exchange for programming requirements, such as performance requirements, material requirements, or more.

A flagship project, developed through this type of robust partnership, could elevate potential solutions for missing middle housing development that are aligned with the City's climate action plan. It would demonstrate material and process viability while delivering much-needed housing resources to the community. It could also induce additional institutional capital to invest in missing middle and resilient projects and drive broader adoption.

Opportunity areas for a potential P3 development in the region include City-owned land and land held by potential partners such as Midway Rising, San Diego State University West, University of California San Diego main campus and satellite sites, civic center, San Diego Unified School District (schools over 50,000 square feet must already comply with the ten percent embodied reduction required by CalGreen), and the Naval Information Warfare System Command.

## Leverage Public-Private Pilot for Climate-Resilient Infill

Given the numerous opportunities for new infill development across the city, the panel also considered how the City could leverage its potential infill sites for a pilot project.

In one instance, the City would provide the land at a cost that would enable attainable

### Case Study

#### Sugar Pine Village

Sugar Pine Village will be a 248-unit affordable multifamily housing project on state-owned surplus land in South Lake Tahoe. Developed in partnership between Related California and St. Joseph Community Land Trust, the project will be deed-restricted to households making 60% of the Area Median Income (AMI) or below and is the result of Executive Order N-06-19 to utilize excess state-owned land for affordable housing development.

housing price points. The City would provide municipal green bonds for sustainable infrastructure at the site, which might include stormwater capture, a renewable microgrid, and more. Performance standards would be set to lay the groundwork for broader adoption and could include net-zero energy targets, all-electric design, and low-carbon materials.

The role of the private sector in this project would center around the delivery of 100–150 missing middle housing units. This could include townhomes, courtyard housing, or small multiplexes. The units would incorporate passive cooling, shaded walkways, and water-efficient landscaping, as well as other site-specific measures that could increase residents' climate resilience.

The goal of this infill pilot is to show how climate-aligned development can be delivered at scale, with risk absorption, reduced heat vulnerability, and while advancing CAP goals.



# Summary

The City of San Diego has an important role to play in helping drive the adoption of sustainable materials and climate-resilient practices in the region's built environment. While some forward-looking architects and developers are already embracing these practices, the rest of the industry will require encouragement, whether in the form of regulations or incentives, to begin to shift away from traditional practices and embrace these new measures.

At the outset, the City is encouraged to set and define the carbon reduction goals it hopes to achieve with each project. With this baseline established, developers can identify where and how they can adjust their practices to meet these new goals.

Before enacting new regulations to drive lower-EC construction, the City is encouraged to start testing pilot ideas with trusted development partners to arrive at proof-of-concept(s) that can be shared broadly with the market. These proof-of-concept measures can help reassure other developers that the approaches and materials are viable and can help raise the visibility of the practices and materials more broadly with the public, including financial institutions that will be funding new projects and the consumer public who will be buying or leasing these new spaces. It is important to remember, as one panelist noted, "capital chases yield—if it is not profitable, it will not get built."

Moving beyond the proof-of-concept stage, the City is encouraged to first pursue an incentives-based approach to driving material and process adoption. With an incentive-based—including tax credits, tax abatement, fee abatement, and self-certification, for example—developers will be encouraged to select what will work best for their projects and pro formas (while not triggering other unforeseen costs like prevailing wage). This rewarding of desirable actions allows the market to catch up and acclimate to the changes before punitive measures ensue from regulations not followed.

### **The Carbon Sweet Spot: Design Tradeoffs for Embodied and Operational Carbon in New Buildings**

Based on the results of the three project analyses and discussions with leading developers and industry experts, [The Carbon Sweet Spot](#) highlights the critical design decisions that impact the building facade and offers frameworks for considering total carbon emissions over the life of a building investment. Ultimately, it suggests a process by which decision-makers can identify the whole life-cycle carbon "sweet spots" for their buildings.

Similarly, the City is encouraged to foster an innovative development environment where new products and processes can be tested, then be repeated and scaled. This innovation mindset allows for greater flexibility to explore, test, trial, and refine, ultimately delivering materials and processes that will perform well in the San Diego market and climate.

San Diego's temperatures are warming, and its residents will experience more extreme heat events in the coming decades (see [Planning for Extreme Heat in San Diego County](#)). The steps taken today to support more resilient and sustainable buildings, particularly housing, and using passive cooling techniques, are critical to residents' comfort today and the region's habitability tomorrow. The elected and professional staff leadership guiding the City of San Diego understand the importance of this work and the benefits inherent in the practice improvements. With this steady guidance and informed leadership, it is possible that development today can safely, comfortably, and efficiently serve residents today and well into San Diego's future.



# Appendices

## Additional Resources

### Guidebooks

Austin Energy Green Building Ratings – [Guidebooks and reference documents](#)

National Council of Structural Engineers Associations, Sustainable Design Committee – [Performance-Based Concrete Specification Guidance: Concrete Class Table](#)

### Educational opportunities

Carbon Leadership Forum (CLF) – [Embodied Carbon Policy Series](#)

### Informational resources

Architecture 2030 – [Why the Built Environment](#)

US Green Building Council and RMI – [Driving Action on Embodied Carbon in Buildings](#)

### Tools and calculators

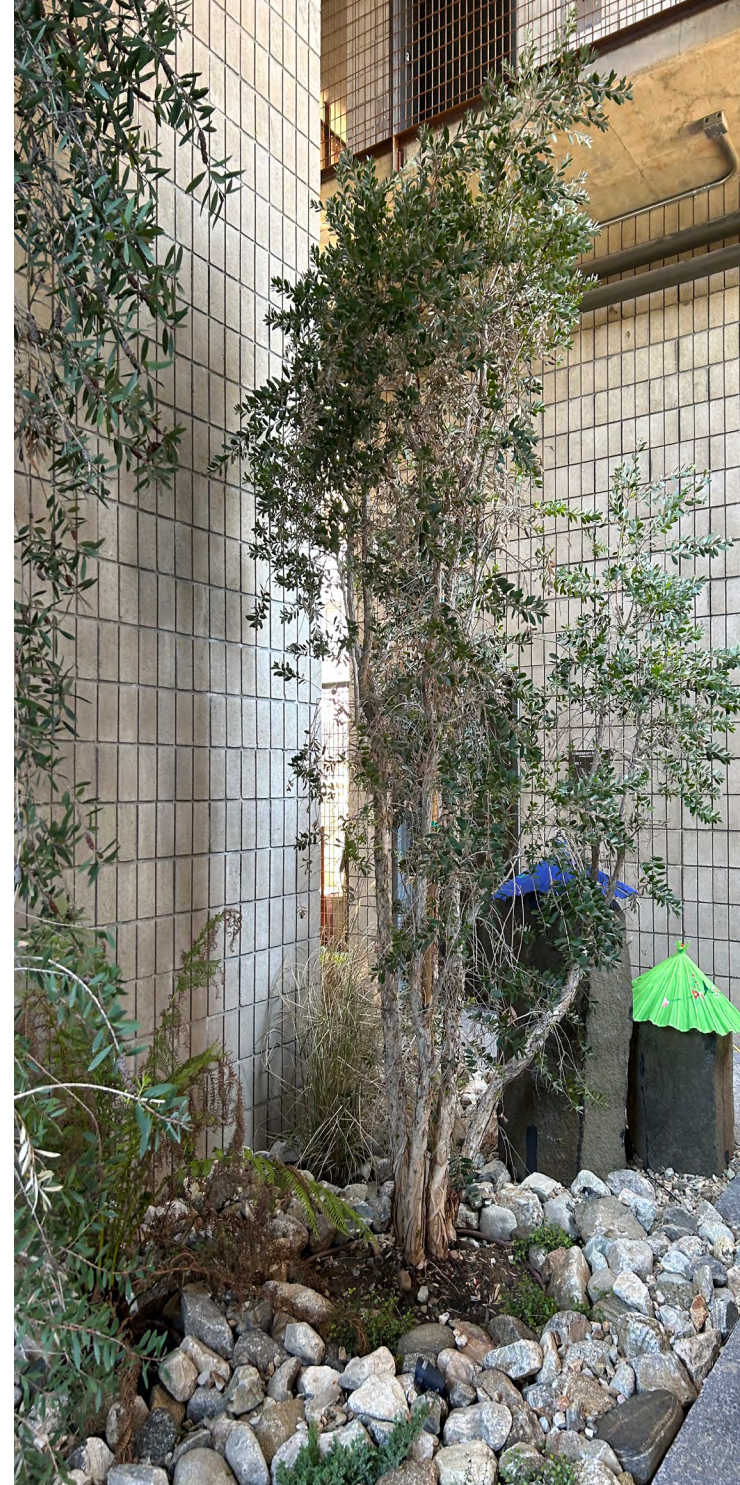
[EC3 Tool](#) is The Embodied Carbon in Construction Calculator (EC3) tool is a free and easy-to-use tool that allows benchmarking, assessment and reductions in embodied carbon, focused on the upfront supply chain emissions of construction materials.

### Passive House Articles and Presentations, Provided by the American Planning Association

[Sustainable & Equitable Living by Default: Planning for Passive House](#), Bronwyn Barry, RA, CPHD, Passive House BB, Passive House Network (WTPD Presentation)

[Planning for Passive Affordable Housing](#), Mike Kapp, Appalachian State University (WTPD Presentation)

[Passive House Multi-Family: Anything BUT a Default Solution for Housing!](#), Ralph Bennett, Architect, FAIA, LEED AP BD+C, Prof. Em. (WTPD Presentation)



## Exhibit 1. Sustainability and Resilience Metrics for Materials of Interest

The table below outlines key materials of interest—including mass timber, low carbon concrete, low carbon concrete CMU block—and the related embodied carbon reduction target vs. the benefits for adaptation to climate risk.

	Carbon Reductions	Construction Type	Housing Type	Resilience & Application Benefits	Approx. Cost Per Sq.Ft. (San Diego 2025)
<b>Traditional Lumber</b>	Baseline carbon sequestration material	Type 1-5 Wraps, Podiums	Single Family Detached, Townhomes	Readily available, workforce is trained in using this material	\$5-\$15 per sq.ft.
<b>Mass Timber</b>	30-50% reductions compared to baseline materials	Wraps, Podiums	Infill Housing, Compete Communities (Floor Assembly Only in San Diego)	Greater upfront cost, fire resistant, can speed up construction time	\$40-45 per sq.ft.
<b>Low Carbon Concrete (PIP)</b>	10-50% reductions compared to baseline concrete	Wraps, Podiums	Infill Housing, Compete Communities	Designer and contractors can specify target carbon reduction as part of concrete specifications.	\$45-\$55 per square foot
<b>Low Carbon Concrete (CMU)</b>	10-30% reductions potential compared to baseline concrete when specified in CMU block	Type 1-5 Wraps, Podiums	Single Family Detached, Townhomes, Infill Housing, Compete Communities	Designer and contractors can specify target carbon reduction as part of concrete specification for CMU block to be produced offsite.	\$+/-32 per square foot
<b>Low Carbon Stucco</b>	10-30% reductions compared to baseline concrete	Type 1-5	Single Family Detached, Townhomes	Option to substitute cement in mix to be low carbon. Workforce is trained in using this material	\$5 - \$12 per square foot
<b>ICCF (Foam Block)</b>	Varies per block, 10-30% reductions	Type 1-5	Single Family Detached, Townhomes	Recycles and repurposes foam supporting waste reductions	+/- \$45-60 per square foot

\* Information based on averages and current market prices. All information to be verified for each project and application moving forward. Information to be used for general purposes only.

## Exhibit 2. AMI For-Sale Home Pricing in 2025 for City of San Diego Unit Typologies (Based on market data from 09-2025)

Annual Incomes for Households within the Area Median Income (AMI) Ranges

AMI	Household Size			
	1 Bedroom/ 2 People	2 Bedrooms/ 3 People	3 Bedrooms/ 4 People	4 Bedrooms/ 5+ People
80%	\$260,000	\$288,000	\$311,000	\$340,000
100%	\$350,000	\$388,000	\$423,000	\$461,000
120%	\$440,000	\$489,000	\$535,000	\$581,000

\*Information based on averages and current market prices. All information to be verified for each project and application moving forward. Information to be used for general purposes only.

## Exhibit 3. Market Rate Costs of Housing Compared to Market Rate with Sustainable Materials Premium Increase Reflected for 2025 for City of San Diego Unit Typologies

Annual Incomes for Households within the Area Median Income (AMI) Ranges

(Units under 1,500 Sq.Ft.)	All Property Types (Avg.)	3-Bedroom Townhomes	Single Family Home
Market Sales Price (09-2025) (Baseline)	\$705,000	\$605,000	\$800,000
Market Sales Price (2025) (Plus 10% premium increase for cost avg. for sustainable design materials, typ.)	+/- \$747,300	+/- \$641,300	\$848,000

\*Information based on averages and current market prices. All information to be verified for each project and application moving forward. Information to be used for general purposes only.

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# About the Panel

## William Anderson

Panel Co-Chair  
Founding Principal,  
CITECON  
Lecturer, Urban  
Economics + Planning,  
UCSD



Bill is a lecturer of economics/planning at UCSD and consults under the dba CITECON. He's held senior positions with global firms ERA, AECOM, and Arup, working in over 30 states and 10 countries over four decades. His government experience includes Director of City Planning & Community Investment/DCOO for the City of San Diego, and chair of the Planning Commission.

Bill has served as national President of the American Planning Association (APA), the California Planning Roundtable, and Vice-Chair of ULI's Urban Revitalization Council. He is a member of Lambda Alpha International land economics honorary society.

Bill co-edited APA's Sustaining Places – the Role of the Comprehensive Plan PAS Report and helped lead ULI's Curtis Infrastructure initiative on 15-Minute Communities.

Bill has held various non-profit board positions with ULI San Diego-Tijuana, C-3, the City Heights Community Development Corporation, and the San Diego Regional Economic Development Corporation. He is a board member of the San Diego Parks Foundation and the San Diego River Park Foundation.

Bill received his B.A. in Economics & Political Science from Claremont McKenna College and master's in City & Regional Planning, with an emphasis on Economic Development, from Harvard University.

## Andrew Schlesinger

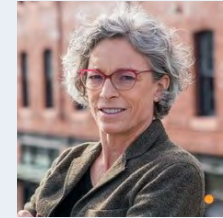
Panel Co-Chair  
Director of Sustainability  
Edgeland



Andrew is an adept landscape architect passionate about crafting sustainable outdoor spaces. With expertise in both landscape architecture and project management, he has led various projects, from residential gardens to expansive public parks. Andrew excels in blending creativity with functionality, prioritizing client satisfaction and environmental enhancement. His work reflects a commitment to addressing climate change through community-driven design solutions.

## Laura Aldrete

President  
Urbana Consulting



Laura E. Aldrete oversees the North American Urban Solutions team, reinforcing Hatch's commitment to enhancing positive urban development and sustainable infrastructure. She has a proven ability to advance organizational vision and strategy, with a deep understanding of public and private sector planning and development.

Laura served as the executive director of Community Planning and Development for the City and County of Denver and deputy mayor under the Hancock administration. She directed city policy for equity and sustainability, quality of design, and public realm enhancements while also streamlining entitlement processes and prioritizing affordable housing permitting and construction. She led an agency with a \$43 million budget, driving a vision of city building and fostering a culture of compassionate accountability. Laura guided over 300 employees through one of the most unprecedented times of uncertainty. Additionally, Laura crafted a development master plan for non-aviation real estate transactions as the Senior VP of Real Estate and Denver International Airport. She has worked at several private consulting firms as well as at the Denver Urban Renewal Authority.

Laura holds a M.A. in Urban Planning and Latin American Studies from the University of California, Los Angeles, and a B.A. in Anthropology from the University of Colorado, Boulder. She is also extensively involved in the Biennial of the Americas and ULI.

**Elizabeth  
Arsenault**  
Sustainability & Energy  
Consultant  
IMEG Corp



Elizabeth is a Sustainability and Energy Consultant at IMEG, specializing in LEED administration. She supports teams in achieving cost-effective sustainability goals and green building certifications across multifamily residential, commercial, public, and transit projects. She leads sustainability kick-off sessions, reviews project specifications and drawings, coordinates with design and construction teams, and documents compliance for certification submission. A strong advocate for human-centered design and climate resilience, she works closely with project teams to integrate sustainable strategies that enhance occupant well-being and environmental performance.

**Melissa Bartow**  
Senior Account  
Manager  
Measurabl



Mel Bartow is an action-oriented leader driving digital transformation at the intersection of real estate, sustainability, and technology. As one of the early employees of Measurabl, the world's most widely adopted sustainability software for real estate, Mel has been instrumental in scaling the platform globally and guiding owners, investors, and operators in advancing their sustainability and carbon strategies.

Since 2016, Mel has had a track record of success in building long-term client relationships and delivering solutions to help organizations unlock value, mitigate risk, and meet stakeholder demands.

A lifelong athlete and former NCAA water polo player, Mel brings resilience, adaptability, and a competitive spirit to her professional life. She has been a proud resident of San Diego for 15 years and is actively involved in the San Diego community. Mel received her Bachelor of Science in Biology from the University of California, San Diego.

**Jake Cattanach**  
Principal  
POGO DOG  
DEVELOPMENT CO.



Jake Cattanach is a Licensed Contractor with a Professional Bachelor's Degree in Architecture from Woodbury University, which affords him a unique full range of knowledge from design and construction drawing detailing to management and execution. Born and raised in New Jersey, Jake grew up on the construction sites of his Father, also a general contractor, where he learned to operate heavy equipment and manage complex construction projects. This formative experience helped Jake learn how to operate a successful construction business from an early age. Jake's professional construction management experience in San Diego started in 2016 while working for FAIA Architect-Developer Jonathan Segal, building, drawing and managing multiple concrete mid-rise projects.

**Monica Contreras**  
Project Manager,  
Climate &  
Decarbonization  
Strategy  
JLL



Monica Contreras is a sustainability consultant on JLL's Climate & Decarbonization Strategy team, where she develops corporate sustainability strategies and portfolio-level decarbonization roadmaps for commercial real estate clients. Prior to JLL, she worked with the Queensland Department of Energy on energy policy and served on Arup's Sustainable Buildings Team in Brisbane, Australia, focusing on green building certifications. Monica holds a Bachelor of Environmental Management from the University of Queensland and is passionate about contributing to the decarbonization of the built environment, helping clients navigate towards net zero while aligning their pathway with the priorities of their real estate portfolios.

**Christian Dimeling**  
Owner / principal  
Build Solid, Inc



Christian Dimeling is a seasoned professional in architecture, urban design, and real estate development with extensive experience spanning over a decade. Currently serving as a co-sponsor and managing partner at Build Solid + LeParc since December 2020, Christian oversees the design and construction of a \$13.6 million multi-family development in San Diego. In addition, Christian holds the position of 5th Year Degree Project Instructor at NewSchool of Architecture & Design. Previously, Christian served as the Owner's Representative at dasMOD LLC, Principal Owner of Flur Architectural Metals, and Urban Designer at AECOM, contributing to a variety of projects in urban development and design. Christian's earlier roles include managing mixed-use developments in Costa Rica and coordinating construction for the Department of Defense in Iraq. Christian holds a Master of Architecture with an emphasis on real estate from Woodbury University and a Bachelor's degree in Urban Planning from San Francisco State University.

**Bruce Monighan**  
Urban Design Manager  
City of Sacramento



In 2025 Bruce celebrates 53 years in architecture and 45 years as a licensed architect. He was the owner and principal of Monighan Design, an architectural design practice since its founding in 1982 and closed in 2019. Bruce has a diverse project experience throughout California, the United States, Asia, and Latin America and held as many as 32 State architectural licenses and is nationally certified through NCARB. He has also held certification by the State of California as a Certified Access Specialist. He is currently in his 15th year on the Design Review Advisory Committee for the County of Sacramento.

In 2014, Bruce joined the City of Sacramento Community Development Department, Planning Division as the Urban Design Manager where he oversees citywide design review and the City Preservation program and is responsible for planning codes related to historic preservation, design policies, design guidelines, provides urban design guidance for the City General Plan and Climate Action and Adaptation Plan.

Bruce has been active in the community and public agencies and has served on Boards and Commissions related to design and planning in the region. He was a member of the Rancho Murrieta Design Review Board, he serves on the Design Review Committee for the County of Sacramento, and served as a member of the SHRA Alkali Flat RAC. Bruce is a California licensed Architect and is National Council Architectural Registration Board Certified.

**Tony Pauker**  
Vice President, Land  
Acquisition  
Brookfield Properties



Tony Pauker is the Vice President of Acquisition for Brookfield Residential Southern California. He leads land acquisition in Los Angeles, Orange, San Diego, Riverside and San Bernardino Counties. He has been involved with a wide variety of housing from development of for sale home, affordable rental and ownership housing, market rate apartments, acquisition rehab, financing and investment. Has served as the chair of ULI San Diego Tijuana in two separate terms totaling four years. In addition to ULI he is active in the BIA and Lambda Alpha Land Use Economics society. He is a licensed California real estate broker and class B general contractor and holds an inactive AICP designation.

**Sean Slater**  
Panel Chair  
Senior Principal  
rdc.



Sean joined RDC's Placemaking Group in 2016 after spending over twenty-two years practicing architecture in Berkeley, Atlanta, and Austin. As Senior Principal and Principal in Charge of the firm's San Diego office, Sean uses his experience in domestic and international retail/mixed-use design, to develop new business endeavors for RDC.

Sean has been honored with ULI's Apgar Award for co-authoring "New Suburbanism: Reinventing Inner-Ring Suburbs," and his article "Crafting Authenticity" graced the cover of *Urban Land's* June/July 2015 print edition. His 2022 *Urban Land* article, "Mall Redevelopment Can Achieve Sustainable, Equitable Diversity in American Suburbs," examines the history of real estate development and solutions to bring equitable solutions to future redevelopment of mall sites across the country.

Sean is a co-founder of Futuro Space, a San Diego-based think tank dedicated to design community collaboration and urban design solutions. Futuro Space has teamed with C3 San Diego to examine the opportunities for civic and cultural life in the heart of San Diego.

A licensed architect in numerous U.S. states including California, Sean is the Chair of ULI's Entertainment Development Council and is the District Chair for ULI San Diego/ Tijuana. He is also active with the International Council of Shopping Centers and the American Institute of Architects.