COLUMBIA UNIVERSITY
MPA in Environmental Science and Policy

SUSTAINABLE WORKFORCE HOUSING

MOONSHOT

The Spruce in West Palm Beach (Image via Merton Capital)

Prepared By:

COLUMBIA UNIVERSITY MOONSHOT CAPSTONE TEAM

Caroline Benedetti (Manager), Astrid Giraud (Deputy Manager)
William Morrissey, Aditya Mistry, Alex Li, Andrew Tseng, Jay Xu, Kimberly Liu, Theo Moers, Gabriel Sandosham, Vincy Wu

CONTRIBUTORS & ACKNOWLEDGEMENTS

CONTRIBUTORS

In the final semester of the Master of Public Administration in Environmental Science and Policy Program (MPA-ESP Program) at Columbia University's School of International and Public Affairs, graduate students undertake a Capstone project for real-world clients. The capstone is an analytical project for nonprofit agencies or a local, state, or federal government organization. It aims to engage students in conducting multidisciplinary policy analysis and providing a public service. Over the course of the semester, the students conduct research and interact with stakeholders and experts to produce a final report and presentation for the client.

The **MOONSHOT** report was prepared at the request of, and in collaboration with, Sean Davis and Duke McLarty. Davis is the founder of Merton Capital Partners, which invests philanthropy in private companies, in partnership with ImpactAssets, a 501(c)(3) donor-advised fund (DAF) that holds over $3 billion in contributions to drive social change.

Duke McLarty is the Executive Director of Groundwork Northwest Arkansas, or NWA, a 501(c)(3). Through advocacy and collaboration with partners, Groundwork NWA creates housing that allows workers to live near their workplace and local amenities in the NWA region.

Over the 2025 spring semester, eleven graduate students in the MPA-ESP Program conducted the research that informs the findings and recommendations in the report. The team was advised by Professor Nancy Degnan.

- Caroline Benedetti, Manager
- Astrid Giraud, Deputy Manager
- Aditya Mistry
- Alex Li
- Andrew Tseng
- Gabriel Sandosham
- Kimberly Liu
- Jay Xu
- Theo Moers
- Vincy Wu
- William Morrissey

ACKNOWLEDGEMENTS

This report relied heavily on engagement from external experts. Thank you to the following individuals and organizations for their insights that guided the development of this report:

- **Jeff Washburne**, Everlong Consulting & Burlington Associates in Community Development, LLC
- **Anne Kuszupa**, Housing Nantucket
- **Armando Fana**, The City of West Palm Beach
- **Sunny Daily**, Community Foundation for Nantucket
- **Stacy Jurado Miller**, Walton Family Foundation
- **Karen Minkle**, Lever for Change
- **Suzanne Cabrera**, Housing Leadership Council of Palm Beach County
- **Mark Reed**, Contact Fund
- **Cady Seabaugh**, McCormack Baron Salazar
- **Scott Short**, RiseBoro Community Partnership
- **Melinda Pollack** & **Divya Khandke**, Blue Meridian Partners
- **Benjamin Preis**, National Housing Crisis Taskforce
- **Gil Kemp**, SEEDS
- **Tim Connors**, PivotNorth Capital
- **Apoorva Pasricha**, Cloud Apartments
- **Jock Gilchrist**, JP Morgan Chase
- **Abigail Suarez**, JP Morgan Chase Neighborhood Development
- **Polly Daugherty**, Paradelo Burgess Design Studio
- **Gillian Pressman**, YIMBY Action
- **JP Julien**, McKinsey & Company

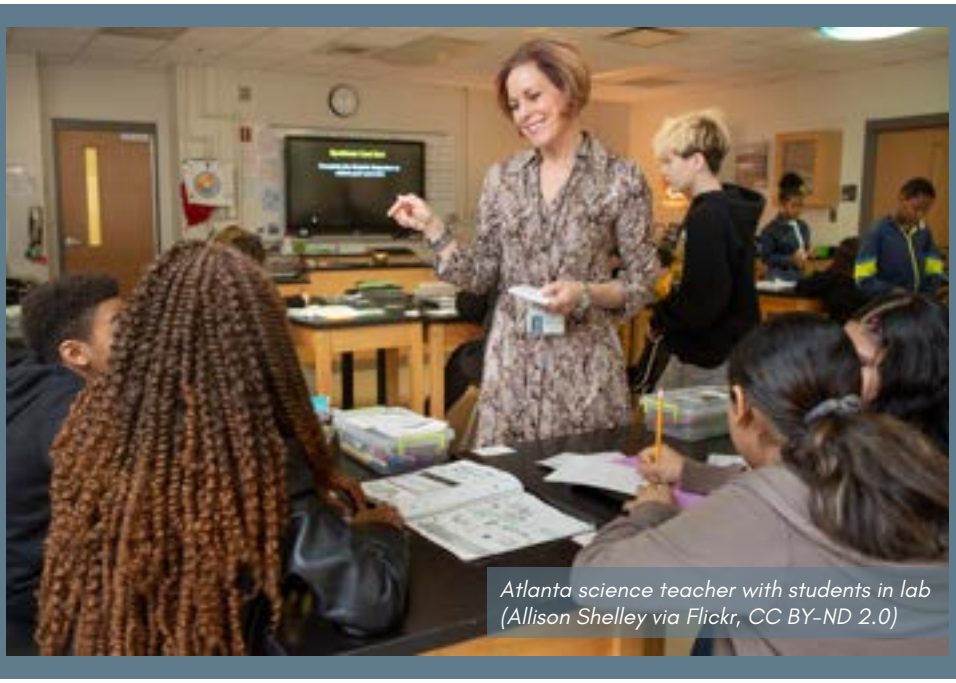
TABLE OF CONTENTS

An elementary school teacher helps a student (Allison Shelley for EDUimages, CC BY-NC 4.0)

THE MOONSHOT
AN EXECUTIVE SUMMARY

The nation's workforce–firefighters, police officers, healthcare workers, and other individuals who form the fabric of their communities–are facing **an acute housing crisis** and **need a solution**.

Government policy and nonprofit housing development initiatives have historically targeted low-income residents, but have not addressed the workforce population that makes between 60% and 120% of the Area Median Income. With high-income residents able to afford their own housing and many low-income individuals benefiting from incentives for Affordable Housing, the U.S. workforce is now the "missing middle." Housing dynamics exacerbate social inequalities, erode community stability, and accelerate the widening of the wealth gap across the country.



Atlanta science teacher with students in lab (Allison Shelley via Flickr, CC BY-ND 2.0)

WHO DOES THE **MOONSHOT** TARGET?

Workforce Housing

Housing for essential workers who make our communities run, like:

60% - 120%
Area Median Income

OUR FIREFIGHTERS

"They come over [to Nantucket Island] and they work a 24-hour shift. Then they go home. If there are two emergency situations, the department can't just call somebody into work."

- Brian Sullivan, Nantucket's Affordable Housing Trust Chair [1]

OUR POLICE

"We have a workforce in [the Community Development Building] that - 80% of them - don't even live here. Ask the police department, they'll tell you. Ask the firemen, they'll tell you they can't live here."

- Bill Burckart, Bentonville City Council Alderman [2]

OUR TEACHERS

"Even though Palm Beach County has done a good job of raising beginning salaries for new teachers, the housing crisis has still made it difficult for young educators to find adequate housing"

- Scott Houchins, a teacher at Palm Beach Central High School [3]

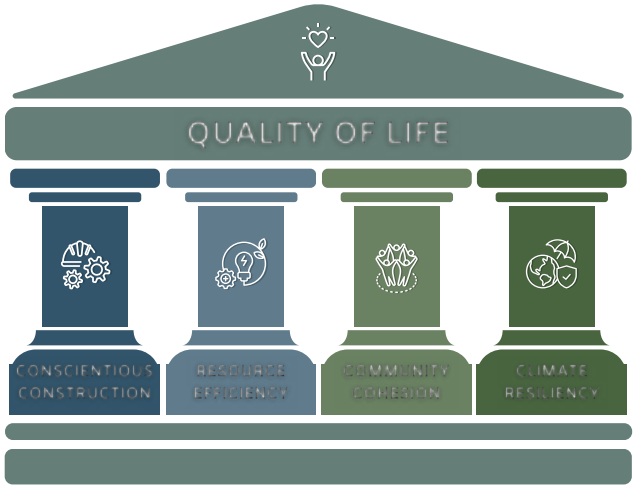
The **MOONSHOT** initiative presents **an opportunity for philanthropists** to address this **critical funding gap**, enabling middle-income workers to reside and thrive in the communities they serve.

The **MOONSHOT** aims to create **one million sustainable workforce housing** units by 2035 by leveraging philanthropic capital as the equity for housing projects. Unlike typical profit-driven real estate investment capital, philanthropy can forego an immediate return on investment. Rents on units can remain steadily lower, ensuring that they are not cost-burdened households (i.e., spend less than 30 percent of income on housing and utility costs).[4]

The MOONSHOT operates through three core principles: Additionality, Permanence, and Sustainability.

1. **Additionality:** Through philanthropic investment, the **MOONSHOT** generates more units than the market or government can currently provide.
2. **Permanence**: For rents to be kept affordable in perpetuity, a nonprofit retains ownership of the building. This model departs from typical affordable housing, which ages out of affordability after 15 to 30 years.[5]
3. **Sustainability:** With a commitment to environmental, social, and economic sustainability principles and practices, philanthropic funds contribute to desirable, long-term benefits for residents, including cost savings.

The **MOONSHOT** initiative incorporates sustainability principles that include social, economic, and environmental considerations to **maximize resident quality of life.**



The **MOONSHOT** integrates four sustainability pillars into its development practices:

- **Conscientious Construction** promotes responsible building practices to reduce environmental and social harm.
- **Resource Efficiency** ensures effective use of energy, water, and other materials.
- **Community Cohesion** strengthens neighborhood ties and local identity.
- **Climate Resilience** prepares buildings to endure climate challenges and disasters.

Together, these pillars **reduce utility and insurance bills** for residents, ensure **community engagement** in the development process, enhance **disaster preparedness** in the face of climate change, and provide benefits like **community cohesion and social mobility.**

THE MOONSHOT
THREE PILOT PROJECTS

To facilitate the launch of the **MOONSHOT**, this report outlines implementation plans for three pilot sustainable workforce rental housing projects.

Through expert interviews, designed to gather insights on current best practices in sustainable workforce housing development, a review of journals, and extensive data analysis, the Columbia **MOONSHOT** team identified various estimates of housing needs across the three pilot locations:

- Northwest Arkansas
- West Palm Beach, Florida
- Nantucket, Massachusetts

California firefighter in full gear (Ernesto Andrade via Flickr, CC BY-ND 2.0)

Housing need estimates vary in their baseline assumptions, often using Area Median Income ranges that include both affordable housing and workforce housing. As a result, it is difficult to isolate the exact workforce housing need within current estimates. To address this, the Columbia team developed a **unique housing need model** that identifies the rental housing demand over a ten-year period for renters between 60% and 120% of the area median income for each locale. The model's assumptions are transparent and can be adjusted for analytic purposes. For more information on these assumptions, please refer the full report.

SUMMARY OF PILOT PROJECTS

West Palm Beach

10,500 Units
Total workforce need

~$1.4 Billion
Total philanthropic need

Northwest Arkansas

12,900 Units
Total workforce need

~$1.2 Billion
Total philanthropic need

Nantucket

150 Units
Total workforce need

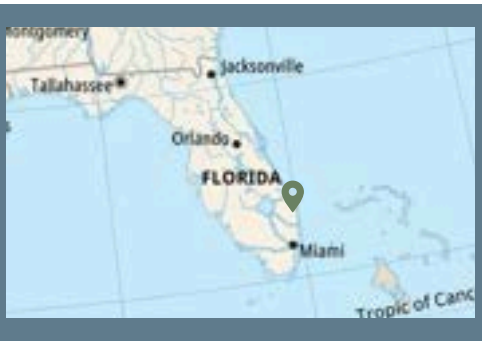
~$61 Million
Total philanthropic need

Building enough units to meet the estimated housing need will address the workforce housing crisis, but it will not meet the need for low-income housing.

WEST PALM BEACH
PILOT PROJECT

UNIQUE CHARACTERISTICS

- Low public transit use and lack of easy access to public services
- Reliance on surface water sources
- Exposure to storm surges and aging stormwater infrastructure
- High population growth
- Recently known as "Wall Street South" due to the large number of New York and Connecticut investment groups relocating there



$64,356	176,801	2% Annually
Area Median Income	Population (2024)	Projected Population Growth

Workforce Housing Income Range: $38,614 to $77,227

300 UNIT PILOT PROJECT

Sustainability Recommendations

Environmental Impact Assessment	Stormwater Management
Community Meetings	Integrating Green Spaces
Hiring Local Contractors	Water Saving Fixtures
Noise Assessment	Heat Pumps
Garage Enhancements	Solar Photovoltaic Systems
Light Pollution Controls	Triple Paned Windows

~$343,000
Typical Cost Per Unit

~$103 Million
Estimated Total Cost

For more details on these sustainability recommendations, their rationale, and estimated costs, please refer to the full report.

Pilot Project Philanthropic Need*: ~$41 Million

**Assuming a debt-to-equity ratio of 60% to 40%.*

MEETING THE WORKFORCE HOUSING NEED

The following housing estimates are only for the workforce housing range shown above, over ten years. They are likely lower than most publicly available estimates, as they do not include the Affordable Housing (low-income) units needed.

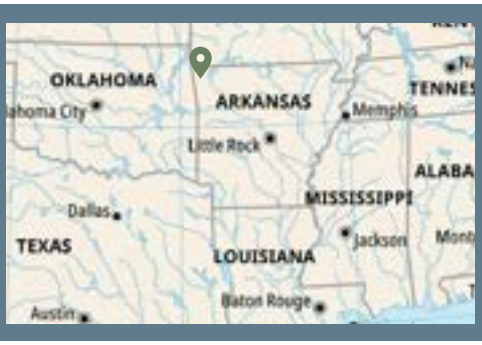
Conservative Estimate	Baseline Estimate	Generous Estimate
8,600 units	10,500 units	12,300 units
High Private Market Construction Rate	*Expected Private Market Construction Rate*	*Low Private Market Construction Rate*

Total Philanthropic Need: ~$1.4 Billion

NORTHWEST ARKANSAS
PILOT PROJECT

UNIQUE CHARACTERISTICS

- High transportation costs for residents and few public transit options
- Aging wastewater systems that are in need of infrastructure upgrades
- Moderate risk of heavy rains and localized flooding
- High population growth
- Current residents highly value access to green space, which is at risk due to urban sprawl



$79,480	590,295	3% Annually
Area Median Income	Population (2024)	Projected Population Growth

Workforce Housing Income Range: $47,688 to $95,376

300 UNIT PILOT PROJECT

Sustainability Recommendations

Environmental Impact Assessment	Water Saving Fixtures
Noise Assessment	Heat Pumps
Community Meetings	Energy Star Appliances
Hiring Local Contractors	Triple Paned Windows
EV Chargers and Garage Isolation	Solar Photovoltaic Rooftops
Integrating Green Space	Light Pollution Controls

~$261,350
Typical Cost Per Unit

~$78 Million
Estimated Total Cost

For more details on these sustainability recommendations, their rationale, and estimated costs, please refer to the full report.

Pilot Project Philanthropic Need*: ~$31 Million

**Assuming a debt-to-equity ratio of 60% to 40%.*

MEETING THE WORKFORCE HOUSING NEED

The following housing estimates are only for the workforce housing range shown above, over ten years. They are likely lower than most publicly available estimates, as they do not include the Affordable Housing (low-income) units needed.

Conservative Estimate	Baseline Estimate	Generous Estimate
5,200 units	12,900 units	19,900 units
High Private Market Construction Rate	*Expected Private Market Construction Rate*	*Low Private Market Construction Rate*

Total Philanthropic Need: ~$1.3 Billion

NANTUCKET
PILOT PROJECT

UNIQUE CHARACTERISTICS

- High risk of sea level rise, coastal erosion, severe storms, and flooding
- 60% of the land is dedicated to conservation
- Highly seasonal population
- Historic preservation rules and local opposition increase costs and limit housing density
- Year-round workforce priced out during peak seasons

$119,750	14,299	1% Annually
Area Median Income	Population (2024)	Projected Population Growth

Workforce Housing Income Range: $71,850 to $143,700

100 UNIT PILOT PROJECT

Sustainability Recommendations

Environmental Impact Assessment	Water Saving Fixtures
Recycled Materials	Heat Pumps
Community Meetings	Energy Star Appliances
Hiring Local Contractors	Triple Paned Windows
Transit-Oriented Development	Strategic Resource System Placement
Integrating Green Space	Emergency Power Systems

~$996,000
Typical Cost Per Unit

~$99.6 Million
Estimated Total Cost

For more details on these sustainability recommendations, their rationale, and estimated costs, please refer to the full report.

Pilot Project Philanthropic Need*: ~$39.8 Million

**Assuming a debt-to-equity ratio of 60% to 40%.*

MEETING THE WORKFORCE HOUSING NEED

The following housing estimates are only for the workforce housing range shown above, over ten years. They are likely lower than most publicly available estimates, as they do not include the Affordable Housing (low-income) units needed.

Conservative Estimate	Baseline Estimate	Generous Estimate
130 units	150 units	180 units
High Private Market Construction Rate	*Expected Private Market Construction Rate*	*Low Private Market Construction Rate*

Total Philanthropic Need: ~$61 Million

INTRODUCTION

"The housing gap across this country is tremendous, and it's only growing. Making a real dent in the crisis will require bold, innovative thinking and a multi-pronged effort that brings together public and private forces."

Paul Sween, Chairman of Dominium (as cited in Wierson, 2024)

The **MOONSHOT** report describes the challenges facing affordable workforce housing in the United States. It also outlines an innovative and ambitious initiative –a housing **MOONSHOT** – specifically designed to address those challenges over the coming decade. Critically, sustainable housing development techniques have been built into **MOONSHOT** to ensure both a higher quality of housing and, as a result, a higher quality of life for residents.

Since the turn of the 21st century, the United States has been grappling with a workforce housing challenge. Median rents across the nation have significantly outpaced household incomes, placing a growing financial strain on middle-income workers. As a result, the essential workers who make communities run–like teachers, healthcare workers, police officers, and firefighters–are increasingly priced out of market rate neighborhoods that are closer to employment, goods and services like schools, hospitals, public libraries, community centers and critical infrastructure like public transportation, electricity and water utilities.

While funding is provided by local, state, and federal government programs and nonprofit housing initiatives for low-income individuals and families, middle-income individuals and families have neither access to nor benefit from housing funded through public sources. With high-income residents able to afford

their own housing and low-income individuals supported in accessing housing, the nation's workforce has become the "missing middle."

These housing dynamics exacerbate social inequalities, erode community stability, and accelerate the widening of the wealth gap across the country.

The housing **MOONSHOT** is an innovative strategy to deliver 1 million units of sustainable workforce housing within ten years, financed through effective use of philanthropic capital, where public funds are neither available nor sufficient. The **MOONSHOT** uses philanthropic capital as equity in housing projects, replacing profit-driven real estate investments that expect returns. As a result, rents can be kept significantly lower than those offered by the current market. Furthermore, under the **MOONSHOT**, a housing nonprofit retains ownership of the units, allowing units to be affordable in perpetuity.

Yet, in addition to its bold financing structure, the **MOONSHOT** is reshaping workforce housing development practices by taking a sustainable approach. The **MOONSHOT**'s integration of four sustainability pillars– Conscientious Construction, Resource Efficiency, Community Cohesion, and Climate Resiliency–into workforce housing is key to supporting the missing middle and their quality of life.

These pillars go beyond waste management or energy efficiency, incorporating social, material, and environmental considerations to maximize the quality of a housing project. By reducing utility bills for residents, engaging the community in the development process, enhancing safety and resilience in the face of climate change, and more, these principles improve the quality of life for the workforce that this country relies on.

Navy Medical Team Supports Louisiana Hospital

The **MOONSHOT** report has a total of six sections:

- **Section 1** provides an overview of the workforce housing challenge and explains why good workforce housing is important – for its affordability, impact on health, education, and economic factors.
- **Section 2** addresses the **MOONSHOT** initiative and suggests the innovative role that philanthropy can play in support of sustainable workforce housing.
- **Section 3** outlines the Sustainability Pillars associated with the **MOONSHOT**.
- **Section 4** explores the unique environmental and social considerations of each location. It also explains the custom housing model developed for the report and uses that model to identify the workforce housing need in each location.
- **Section 5** outlines housing recommendations for the three pilot projects: West Palm Beach, Florida; Nantucket, Massachusetts; and Northwest Arkansas. It then offers an extrapolation plan to help scale this model from the pilot projects to 1,000,000 units and beyond.
- Lastly, **Section 6** recommends key performance indicators to measure project success and instill future investor confidence.

The **MOONSHOT** initiative reimagines what's possible — not just by building housing, but by shifting systems to make housing equitable, sustainable, and accessible to the people who keep our communities running. ■

SECTION ONE

CURRENT STATE OF WORKFORCE HOUSING


Childcare worker (USDA via Flickr)

1.1 Background

Since the turn of the 21st century, the growth rate of median rental prices has continued to increase, while inflation-adjusted income rates have declined overall. Since 2019, this trend has only accelerated, with an increasing rate of rental growth and shifting back to a decline in real wages (*see Figure 1*) (Wedeen, 2024). As a result, U.S. households are paying an increasing share of their incomes on housing costs, including rent, mortgage payments, and utilities. A nationwide housing shortage, which has been especially acute since the 2008 financial crisis, has only exacerbated the growth in median rental prices.

Housing cost burdens are growing for middle-income households. According to the United States Census Bureau (2024), a household is considered cost-burdened when it spends over 30% of its income on housing costs, and nearly half of all U.S. renters fall under this category. The Housing and Transportation (H+T) Index goes further by including transportation costs in the equation, which are a significant cost category for households in most parts of the country. Using the Index as the metric, households become cost-burdened once they allocate more than 45% of their income to housing and transportation combined (Center for Neighborhood Technology, 2009).

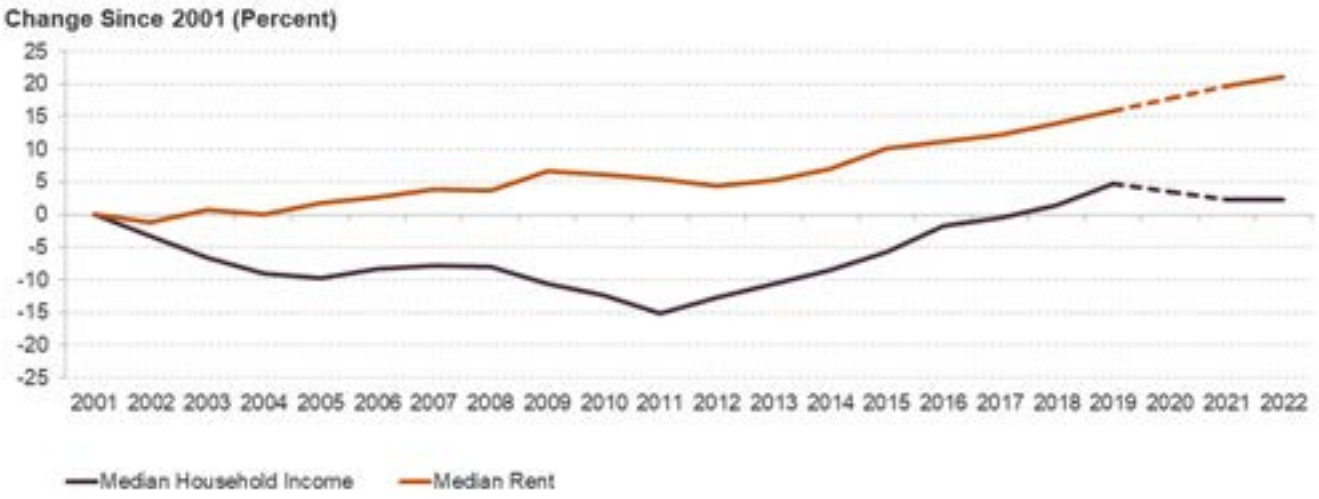
However, for many regions and locales across the US, experiencing rapid economic growth or population influxes, even these affordability benchmarks are exceeded.

Historically, affordable housing initiatives—primarily in the form of tax credits to developers for constructing affordable housing units in their developments—have targeted low-income renters, defined as

FIGURE ONE:

Rent Growth Has Outpaced Income Gains for Renters

Weeden, 2024



those earning less than 60% of the area median income (AMI). Tax credits, such as the Low-Income Housing Tax Credit (LIHTC), help offset the difference in rents and mortgages between market and subsidized units. In exchange for the tax credit, developers reserve a portion of the rental units for tenants who make below 60% of the Area Median Income. After 15 years, the income restrictions are lifted, and the rental units return to market rate, pricing out occupants (Kagan, 2024). In circumstances where tax credits or public funding are insufficient to cover the difference, developers can turn to a multitude of alternative funding sources—including federal block grants, local trust funds, or state housing trust funds—to close any financial shortfalls (Blumenthal, Handelman, and Tilsley, 2016).

For Workforce Housing Development, the situation is quite different. Identified as the "missing middle," our nation's workforce population makes between 60% and 120% of the area median income and is increasingly unable to live where they work (RSF Staff, n.d.). Unlike lower-income households, policymakers have not prioritized the 'missing middle' in addressing housing affordability. As a result, workforce housing development levels are critically insufficient for middle-income individuals and families (Robinson & Zollinger, 2024; "The Undersupply of Housing," 2023).

According to the National Apartment Association (NAA) and the National Multifamily Housing Council (NMHC), the U.S. needs to build 4.3 million new units by 2035 to address existing shortages and meet future demand across all income levels. While shortages exist for both workforce and low-income individuals and families, the largest renter demographic is the workforce,

which constitutes 9.7 million, or 23.6% of total renter households ("The Undersupply of Housing," 2023; NAA, n.d.).

Access to housing for the workforce individuals and families is made more challenging for two reasons. First, higher-income households can pay market rates, pricing out the workforce. Second, there is the overall lack of housing stock itself (Patel, Rajan, and Tomeh, 2024).

The shortage in housing stock is not uniform across the country. According to the NAA, Texas, Florida, and California collectively account for 40% of future demand and will require 1.5 million new apartment units by 2035 (NAA, n.d.). The housing shortage is most prominent in major metropolitan areas, especially those experiencing fast growth or with restrictive zoning laws (Edwards, 2024).

According to Up for Growth (2024), most Western States have successfully ramped up housing production to catch up with growing demand. However, much of the West also faces a chronic undersupply of housing, including states such as Washington, Arizona,

Workforce Housing targets members of the workforce who earn above the threshold to qualify for affordable housing or housing tax credits, but not enough to afford market-rate housing. Typically, workforce housing projects offer rents below the market rate.

Affordable Housing typically targets those who earn less than 60% AMI. These units can utilize Low-Income Housing Tax Credits.

Market-rate Housing consists of non-subsidized units that are rented at market-rate rents that are subject to local supply and demand. These projects are financed through private market investment, which expects returns.

and, most notably, California, which has a statewide housing underproduction of 840,000 units as of 2024 ("The Gap," n.d.). When looking at Texas, Florida, and California, California is the only state that is building sufficient new housing to reduce underproduction (Up for Growth, 2024).

1.2 Why Good Housing Matters

Housing goes beyond simply the building in which a person lives. Housing directly impacts access to education, job opportunities, green spaces, and other resources:

1. **Housing affects economic mobility:** Middle-income families often face difficult choices between high rent and long commutes, which impact their financial stability (McKinsey & Company, 2025). Families who pay a high share of their income on housing often sacrifice basic needs, which increases financial stress and reduces long-term stability (Urban Institute, n.d.).
2. **Housing shapes educational outcomes and job opportunities**: Middle-income households must either pay high rent to access nearby schools or relocate farther away, potentially sacrificing access to high-quality education (Brennan, Reed, & Sturtevant, 2014).
3. **Housing impacts the mental and physical health of residents:** Poor housing often leads to mold and air pollution, which increases the risk of both chronic and psychological illness. Poor housing quality typically affects low-income residents more than middle-income residents; however, understanding the impact of housing quality on health is crucial when constructing new units under the **MOONSHOT**. For example, including green spaces in new developments can improve resident mental health (Barton & Rogerson, 2017).

Sustainable housing projects adopt a holistic approach, addressing the economic, environmental, and social considerations of the residents and community, thereby enhancing long-term individual, family, and community well-being. The approach reduces environmental impact through energy-efficient materials and construction, and promotes affordability for middle-income families. Critically, sustainable housing allows residents to access essential services and live close to economic opportunities without being priced out of their communities.■

SECTION TWO

THE MOONSHOT

MTA Worker in NYC (M. Hermann via Flickr, CC BY 2.0)

2.1 Introduction

To address the workforce housing shortage, Sean Davis and Duke McLarty have proposed the **MOONSHOT** as an initiative, that seeks to leverage philanthropy as equity in housing projects to build one million sustainable homes within 5-10 years, beginning in 2025-2026. To facilitate the launch of the **MOONSHOT**, this report presents three pilot **MOONSHOT** projects in West Palm Beach, Florida, Nantucket, Massachusetts, and Northwest Arkansas.

Davis and McLarty currently lead efforts in leveraging philanthropy for workforce housing development projects. Davis, a founder of Merton Capital, is using his experience in private equity to help donors deploy large-scale philanthropy through private markets. Duke McLarty, a former policy advisor to the U.S. Department of Housing and Urban Development and now Executive Director of Groundwork NWA, advocates for mixed-income housing in Northwest Arkansas. Together, they share the expertise necessary to promote the **MOONSHOT** model.

2.2 The Giving Pledge Bottleneck

In his book, Solving the Giving Pledge Bottleneck, Davis identifies a key problem with philanthropy. As of 2024, over 240 billionaires have signed the Giving Pledge, a charitable campaign founded by Bill Gates, Melinda French Gates, and Warren Buffet to encourage wealthy individuals to donate more than 50% of their wealth to philanthropic causes during their lifetime or upon their death. Despite donors' promises to give away funds, they face a number of challenges in doing so:

1. First, many non-profit organizations can neither absorb nor effectively use funds

with measurable impacts, at a multi-million or billion-dollar level;
2. Second, donors themselves often feel responsible for the success or failures of the nonprofits they fund, leading them to be much more cautious about giving away large amounts of money;
3. Third, the growth in donors' wealth simply exceeds the rate at which they can give it away (Albrecht, 2020). Thus, philanthropic funds remain underutilized.

As an example of point 3, MacKenzie Scott, known for her generous multi-million-dollar donations with "no strings attached," has donated $19.2 billion to over 2,450 organizations since 2019 ("How MacKenzie Scott Built Her Net Worth", n.d.). However, in 2020, her net worth was $36 billion. Even after her large donations, in 2024, her net worth remained at $35.6 billion (Forbes, n.d.).

2.3 The **MOONSHOT** Approach

Davis suggests that a focus on workforce housing development will allow for the effective deployment of philanthropic funds. His approach is to utilize "Philanthropic Private Equity," in which philanthropy is invested in housing projects that cannot be financed by the private market. The model utilizes a Donor Advised Fund (DAF), a 501(c)(3) organization that manages charitable donations, and a housing nonprofit to ensure that the housing units remain permanently affordable.

The **MOONSHOT** operates through three core principles: Additionality, Permanence and Sustainability:

1. **Additionality:** By leveraging philanthropic investment as equity in housing projects, the model allows the creation of units beyond what the market or government can currently provide.
2. **Permanence**: For rents to be kept affordable in perpetuity, a nonprofit retains ownership of the building. This is a departure from the traditional expiration of government-funded affordable housing, which ages out of affordability after 15 years. Existing workforce housing projects can also age out of affordability after a few years, depending on the deals developers make with municipalities providing incentives.
3. **Sustainability**: With a commitment to sustainability, philanthropic funds can also help to achieve several desirable benefits for residents. These include enhancing resilience in the face of natural disasters (thereby potentially lowering insurance costs), improving indoor environments, promoting state-of-the-art infrastructure and building design, and encouraging community engagement. As a result, these buildings ensure a better quality of life for residents in both the immediate and longer term.

Figure 2 lays out the process of using Philanthropic Private Equity to build workforce housing at scale.

Davis is currently focused on the first stages of implementation of the **MOONSHOT** funding model. ImpactAssets serves as the 501(c)(3) as it is a donor-advised fund. Davis and Merton Capital currently source new housing projects for philanthropists that

make gifts to ImpactAssets, acting in a consulting capacity. Merton Community Housing, a Delaware-based nonprofit corporation, serves as the nonprofit that owns the housing to ensure its longevity and safeguard lasting affordability for workforce residents. Additional nonprofits could also serve in a similar way.

2.4 Addressing the Giving Pledge Bottleneck

The **MOONSHOT** directly addresses the "giving pledge bottleneck" through several mechanisms.

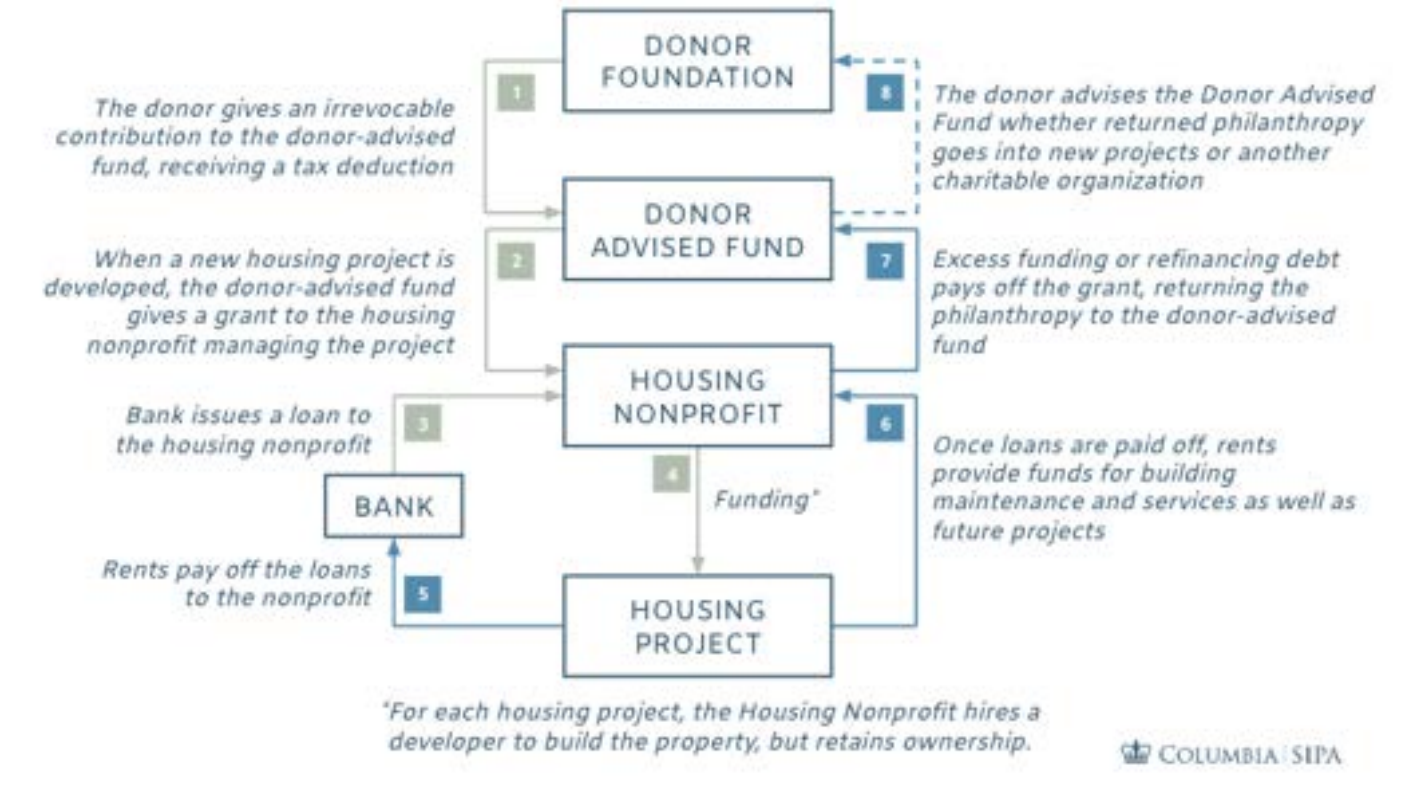
1. **Pilot Project Proof Points:** Secondary research and stakeholder interviews highlight that philanthropists are more likely to invest in projects that have a previous proven impact (G. Kemp, interview, April 10, 2025; K. Minkle, interview, March 7, 2025). The phased implementation of **MOONSHOT**, with three initial pilot projects, gives future philanthropists confidence that this funding model is effective and efficient.
2. **Scalability**: Because projects can be funded under the same model, philanthropists can choose to donate a larger amount of money and fund multiple projects without vetting multiple nonprofits.
3. **Returnable Philanthropy:** Once the bank loan has been paid off, the rents pay back the philanthropic contribution to DAF. The DAF is a 501(c)(3), so the returned funds must go back into a charitable cause. However, the original donor can reinvest the philanthropy into the next project to create double the housing with the same funds, creating a revolving fund. As a result, philanthropists can maximize the benefits their initial capital provides. ■

POTENTIAL TO SCALE TO LOW-INCOME RESIDENTS

While this report primarily focuses on workforce housing, the model can also be applied to low-income housing. Despite government funding for low-income housing, there is a shortage of over 7 million affordable homes for extremely low-income families (NLIHC, n.d.). Philanthropy could help fill this gap, creating additional affordable homes that exceed current government capacity. Furthermore, rents could be used to pay for critical wraparound services to help improve the economic mobility of these families.

FIGURE TWO

FINANCIAL FLOWS OF THE MOONSHOT



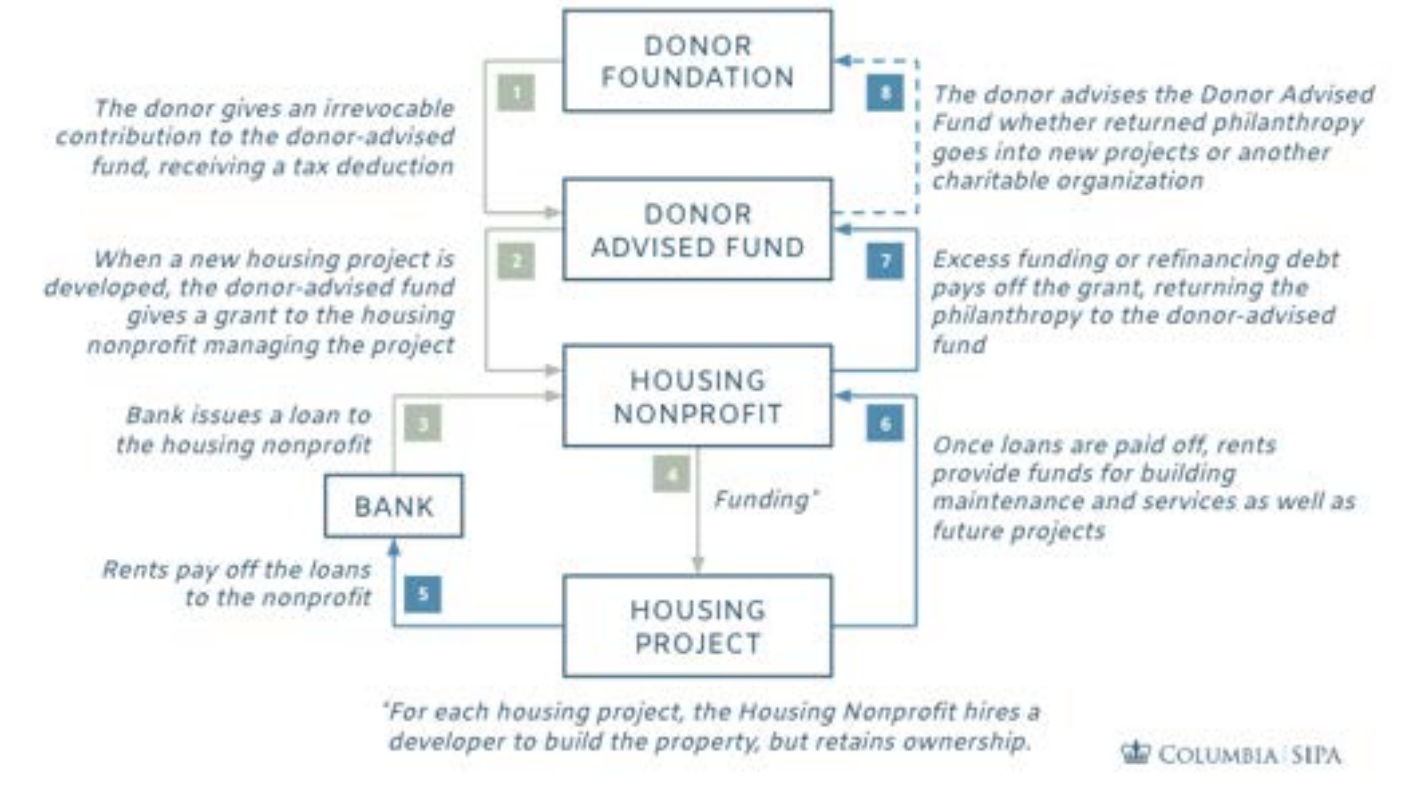
1 The donor gives money to the donor-advised fund (DAF). When a donor gives assets to a DAF, the contribution is irrevocable, but the donor receives an immediate tax deduction. The DAF, in turn, manages the assets and distributes grants to nonprofits over time. DAFs also allow for the tax-free growth of charitable assets within a fund. As a result, the donor can manage the timing of grants while receiving a tax deduction upfront and avoiding potential capital gains taxes on assets.

2 The DAF issues funding to the Housing Nonprofit for projects. These grants are used as the equity in each housing project. Under this model, donors to the DAF can suggest prioritizing different areas. Philanthropists are likely to be more willing to donate large sums of money when they feel particularly connected to a cause; allowing them to suggest preferences for projects would aid in fundraising (Minkle, K, Interview, 2025).

3 A Bank issues a loan to the Housing Nonprofit to provide additional financing for the project. The Housing Nonprofit utilizes grants from the DAF as equity in new Housing Projects, enabling them to secure loans from banks.

FIGURE TWO

FINANCIAL FLOWS OF THE MOONSHOT



4 The Housing Nonprofit hires a developer using philanthropic equity and a bank loan to build the Housing Project. Once the project is completed, the Housing Nonprofit would retain ownership of the building, allowing them to keep rents affordable in perpetuity. The Housing Nonprofit will rent apartments to individuals within 60%-120% of the Area Median Income.

5 The rents pay back the loan from the bank. Because the Housing Nonprofit only needs to repay the bank, not the philanthropists, it can maintain affordable rents while still paying down the housing project's debt.

6 Rent not used to pay down the debt will be allocated to building services to enhance the quality of life for residents.

7 Once the debt is refinanced or fully paid off, the nonprofit returns funds to the DAF. Because the DAF is a charitable organization, it must use the funds for another cause.

8 The donor can advise the DAF on how to use the returned funds, whether it be in a new housing project or another charitable organization.

SECTION THREE

SUSTAINABLE HOUSING PRINCIPLES OF THE MOONSHOT

MTA Worker in NYC (M. Hermann via Flickr, CC BY 2.0)

3.1 Background

Sustainable housing forms the foundation of the **MOONSHOT**, aiming to achieve and maintain a better quality of life for residents. Sustainable housing incorporates social, material, and environmental considerations to maximize the current benefits and ensure housing quality through time.

Distilled from the leading green certifications of LEED, Passive House, and Enterprise Green Communities, the **MOONSHOT**'s sustainable housing also ensures that buildings are constructed responsibly, resource-efficiently, and built to endure severe weather cycles, potentially reducing long-term costs and insurance burdens.

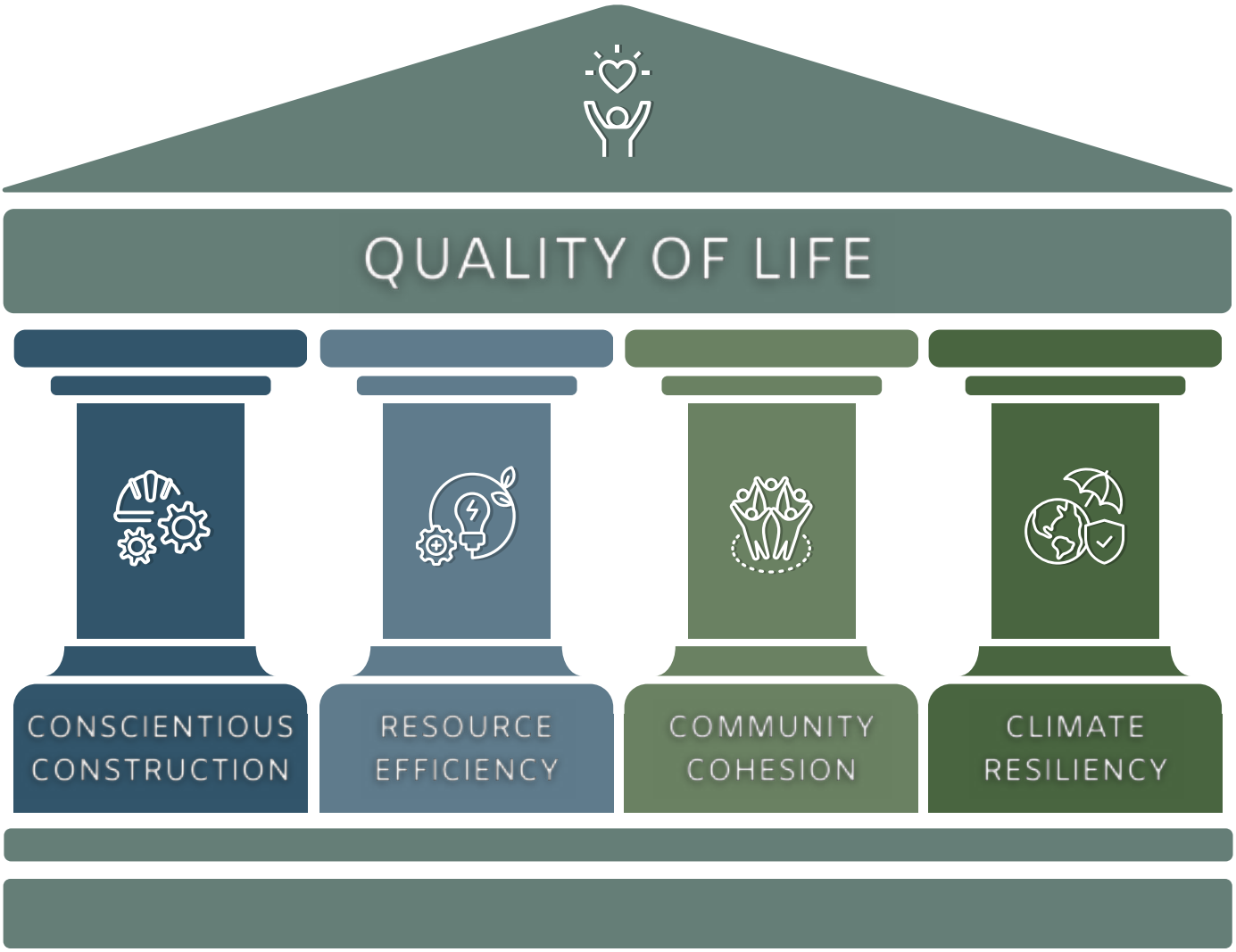
The **MOONSHOT** focuses on four sustainability pillars: Conscientious Construction, Resource Efficiency, Community Cohesion, and Climate Resilience:

- Conscientious Construction promotes responsible building practices to reduce environmental and social harm.
- Resource Efficiency ensures the smart use of energy, water, and materials.
- Community Cohesion strengthens neighborhood ties and local identity.
- Climate Resilience prepares buildings to endure climate-related challenges.

Taken together, these pillars support improved quality of life by:

- Ensuring environmental and ecosystem protection, making effective use of green design, materials, land use, and living and recreation space.
- Fostering social connection.
- Enhancing physical and mental well-being.
- Promoting financial stability.

THE **MOONSHOT** SUSTAINABILITY PILLARS



3.2 Conscientious Construction

The Conscientious Construction Pillar focuses on minimizing the negative environmental and social impacts of the construction process and its materials. Conscientious Construction aims to mitigate damage to surrounding human and natural systems while also reducing the carbon footprint of a housing project. Five potential strategies include:

- Environmental Impact Management.
- Construction Activity Pollution Prevention.
- Recycled Materials Use.
- Construction Waste Management.
- Adaptive Reuse.

Environmental Impact Management

Environmental Management of a housing development has two core components: Environmental Site Assessments (ESAs) and Environmental Impact Assessments (EIAs). ESAs and EIAs are sometimes interpreted as the same, but are, in fact, different in both depth and scope of review.

The U.S. Environmental Protection Agency defines two phases of ESAs: Phase I ESA and Phase II ESA. Phase I ESA is the necessary background efforts to compile historical records, regulatory database searches, and on-site inspections to identify recognized environmental conditions that could endanger residents or trigger costly cleanup obligations (U.S. Department of Housing and Urban Development, 2023; Rich, 2023).

When signs of contamination arise, a Phase II ESA provides targeted sampling and laboratory analysis to quantify hazards and guide remediation. Findings can then be integrated into the planning process so that possible changes, such as modifications of building footprints, different material handling, and an adjusted budget for site remediation up-front, can be incorporated if necessary (Morrison-Saunders et al., 2024).

An EIA expands the lens of the ESA from parcel-specific contamination to broader construction-phase and life-cycle impacts, including broader land-use change, stormwater runoff, embodied carbon in materials, and long-term energy and water demands. EIAs play an important role in guiding conscientious construction practices for new residential developments. They help identify and assess negative impacts tied to building materials, land use changes, water systems, air emissions, and other construction-related factors before ground is broken. Thus, EIAs inform project teams about the broader environmental implications of development, enabling the integration of mitigation measures and responsible decision-making (Cayabyab, 2024; Eslamain et al., 2018).

In summary, ESAs and EIAs help ensure good decision-making and the avoidance of costly mistakes and/or legal challenges. In some instances, local zoning and state-level environmental requirements must also be met. The legal requirements for Environmental Management are not uniform across all U.S. States. For more information about how Environmental Management is applied in the three target locations, please see Appendix 2.

Construction Activity Pollution Prevention

Reducing pollution during construction, by controlling erosion, sedimentation, and airborne dust, ensures minimal environmental disruption. The construction team can implement clear erosion control plans that comply with EPA standards, including the installation of silt fences, stormwater filters, and temporary vegetation to stabilize the soil. Additionally, the team can implement dust suppression methods, including regularly spraying water on exposed surfaces, applying biodegradable dust suppressants, and limiting vehicle speeds on unpaved areas to minimize dust generation (U.S. Green Building Council, n.d.).

Recycled Materials

Selecting materials with low environmental impact can reduce both construction costs and the environmental effects resulting from the extraction, processing, and transportation of raw materials.

Manufacturers may offer recycled materials at a reduced price to developers, making them ideal choices in material sourcing. Steel and drywall are recycled using industry standards; more, utilizing bespoke materials such as reclaimed wood, glass, and composite materials for custom design may be cost-effective and/or differ in price, depending on the region (US EPA, n.d.).

However, certain recycled materials are more expensive due to the higher material processing, energy expenditure costs, and the processing required to meet consumer standards (US EPA, n.d.). Additionally, recycled or low-impact materials may not be accessible in all regions ("Recycled materials – pros and cons", n.d.).

Aesthetically, recycled materials may be limited in size, color, and other attributes, so they are often used in structural rather than visible design elements. However, creative approaches can be used to integrate them effectively ("Recycled materials – pros and cons", n.d.).

Toxins present in reclaimed materials—such as volatile organic compounds (VOCs), adhesives, preservatives, and heavy metals—pose health risks, necessitating testing and expert guidance. Finally, pests can be an issue in deconstructed or reclaimed wood, making thorough inspection crucial for safety (Adrian Design House, n.d.).

Waste Management Plans

Strategies to divert construction waste from landfills include developing waste management plans that recycle demolition debris or implementing design techniques that minimize waste generation. Waste Management Plans develop and implement waste management plan to reduce non-hazardous construction and demolition waste through recycling, salvaging, or diversion strategies (Keter Environmental Services, 2024).

For projects with municipal recycling infrastructure and/or haulers, developers provide separate bins for trash collection and recycling for each dwelling unit and all shared community rooms. For projects without that infrastructure, developers can advocate for the local waste hauler or municipality to conduct regular collection of recyclables (Keter Environmental Services, 2024).

Recycling materials in construction poses additional issues. The cost of recycling—including equipment, transportation, and specialized facilities—often outweighs the financial incentives, particularly when markets for recycled materials are scarce or require long-distance transport. Logistical barriers, such as the difficulty of accessing recycling centers and the added emissions from transporting heavy materials, can further hinder adoption (Keter Environmental Services, 2024).

Adaptive Reuse

Adaptive reuse programs involve converting former industrial buildings, warehouses, churches, or other historic structures into residential buildings, offices, libraries, or other modern spaces, while maintaining their

architectural or historic significance. The choice between adaptive reuse for the entire building or part of the building depends on the building's condition, historical significance, and the intended new use. This method offers economic and environmental benefits by repurposing underutilized buildings, rather than demolishing them (Adaptive Reuse for Cities and Towns, 2024; A. Kuszupa, Interview, February 20, 2024).

An example of adaptive reuse - Old City Hall in Rockford, Illinois that was converted into apartments. (Randy von Liski via Flickr, CC BY-NC-ND 2.0)

3.3 Resource Efficiency

The Resource Efficiency pillar focuses on minimizing water and energy use and promoting the implementation of renewable resources. This section addresses efficient water use and management strategies, followed by those for energy.

Water Strategies

In the United States, the overuse of groundwater supplies and the increased prevalence of drought conditions have strained the water supply (World Green Building Council, 2023). As a result, water efficiency is a crucial consideration in the design of new housing. Additionally, ensuring the ongoing quality and safety of potable water is essential for both human and environmental health. Three potential strategies that address water usage include:

- Water metering
- WaterSense product implementation
- Xeriscaping

Water Metering

Water metering is a strategy to establish a baseline water use level to develop conservation goals. Through water metering, the water use from a building can be tracked

and compared to the water use of comparable buildings to gauge water conservation performance on a relative basis (USGBC, n.d.). Findings from water metering are used to inform the level of intervention necessary to bring water consumption levels to an acceptable maximum.

To limit the water use of building-wide plumbing fixtures, installed fixtures can be WaterSense certified. Maintaining an aggregate water use of 20 percent against a measured baseline level as per the Green Communities Criteria and Certification Standards (Enterprise Community Partners, n.d.). All appliances sourced for new developments can also be WaterSense certified.

WaterSense Product Implementation

The U.S. EPA's WaterSense program identifies plumbing fixtures, appliances, and irrigation technologies that are independently certified to use at least 20 percent less water than federal baselines while performing as well as —or better than—most standard models (US EPA, 2024). Specifying WaterSense-labeled faucets, showerheads, toilets, and flushing urinals in all units is one of the simplest ways to reduce indoor water demand, as these products achieve low flow rates without sacrificing user comfort and incorporate self-closing valves, motion sensors, or pressure-compensating aerators to prevent inadvertent overuse.

Additionally, WaterSense also certifies high-efficiency dishwashers and washing machines. Many states, utilities, and municipalities now offer rebates or expedited permitting for WaterSense products, making them attractive for urgent projects such as workforce housing development.

As an example, for **MOONSHOT**'s pilot housing development in Florida, the City of West Palm Beach Public Utilities Department offers a High-Efficiency Toilet Credit Program that provides up to $125 for each EPA WaterSense-labeled toilet installed in residential properties served by the city's water system (City of West Palm Beach, n.d.).

For exterior landscapes, WaterSense-labeled weather-based irrigation controllers (WBICs) and soil moisture sensors adjust watering schedules based on real-time weather data and site conditions, reducing outdoor water use by up to 30 percent compared to conventional timers (US EPA, 2021). Pairing WaterSense controllers with regionally appropriate plantings ensures that landscape irrigation complements indoor conservation efforts. Taken together, using WaterSense-verified products presents a cost-effective way to cut aggregate water consumption by at least 20 percent below the baseline.

Xeriscaping

Xeriscaping is a type of water-efficient landscaping approach designed to reduce or eliminate the need for supplemental irrigation (Wade, 2010). This process involves the selection of drought-tolerant native plants and uses efficient irrigation techniques like drip irrigation, applying mulch to retain soil moisture, or designing landscapes that conserve water naturally. By replacing water-

Xeriscaping at Los Angeles Air Force Base to Save Water
Sarah Corrice via Flickr

intensive lawns with drought-adapted vegetation, xeriscaping minimizes water use while creating functional outdoor spaces (Wade, 2010).

Xeriscaping can be used and is advantageous in areas that are prone to drought (Natural Resources Conservation Service, n.d.). Because of this, xeriscaping can help to meet water regulations during droughts and reduce long-term maintenance and operational costs for outdoor spaces. By carefully planning and implementing xeriscaping in developments, developers can create resilient outdoor spaces that thrive under arid conditions, contributing to sustainable community development and reduced water usage.

Energy Strategies

Energy management, efficiency, and renewable energy use are all critical elements to achieving sustainable housing, since buildings comprise about 40% of total energy use in the nation (Shoemaker, 2023). Four potential strategies include:

- Passive solar design.
- Efficient heat energy use.
- Efficient Appliances Implementation & Energy Building Performance Standards.
- Renewable Energy Implementation.

Passive solar design

Passive solar design is a green building design that considers onsite solar energy exposure when designing a building. This includes building orientation, shading, exposure to sunlight, and the strategic selection of building materials (NREL, 2025). Typically, passive solar design also involves the collection of solar energy through large, south-facing windows, the absorption and storage of this energy in building materials that readily absorb heat, and the distribution of this heat energy when necessary through convection and radiation.

Passive solar design utilizes an optimal degree of shading to maximise sunlight exposure during the winter months while shielding the interior of the building from sunlight during the summer. It is often combined with other strategies such as cross ventilation to maximize the natural airflow and uses high-quality building insulation to

ensure consistent interior temperatures that minimize heat loss during cold periods (WBDG, n.d.).

Passive solar design is most effective when incorporated into smaller or low-rise buildings in temperate and colder climates. Its design methods can still be beneficial and effective in warm climates, but design elements like incorporating cross-ventilation need to be included to avoid overheating. Specific passive design strategies that are of particular relevance in warmer climates include specifying high-performance glazing (glass panes) that maximise sunlight exposure while minimizing heat gain, incorporating adequate and strategic shading, and selecting high-efficiency HVAC systems (WBDG, n.d.).

Even a modest use of passive solar design can lead to a 5%-25% reduction in energy consumption, while more robust implementations can reduce energy consumption by 25%-75%. Moreover, passive solar design can be achieved with little upfront costs. If the strategies used are suitable for the local climate, it can lead to long-term cost savings through improved energy efficiency. The greatest potential upfront costs are the availability of experienced passive solar design architects and builders (WBDG, n.d.).

Efficient Heat Energy Use

Heat efficiency is about the design considerations and use of technology to retain and expel heat based on ambient air temperatures. Proper insulation is central to achieving heat efficiency. The building envelope benefits from high-quality insulation materials such as fiberglass, cellulose, and mineral wool (US DOE, n.d.). Effective high-quality insulation materials trap heat in cooler months while preventing heat from entering the building during warmer months. To support effective insulation and reduce the impacts of noise pollution, triple-panel windows can also be used (N. Golden, personal communication, March 25, 2025).

Heat pumps are an energy-efficient HVAC solution to ensure comfortable indoor air temperatures. They use electricity to expel heat from buildings in warm months and pull heat into buildings from outside during cool months (US DOE, n.d.). Other heat efficiency techniques include painting exterior walls and roofs with light coloring to minimize the internal heating of buildings. Using this principle, cool roofs work to reflect solar energy away from buildings due to their light color and high reflectivity.

Efficient Appliances Implementation & Energy Building Performance Standards

In residential settings, energy-efficiency efforts focus largely on appliances and lighting, which account for a significant portion of residential energy demand. Most residential appliances include cooking, refrigeration, and laundry. Conventional natural-gas cooking appliances can be replaced with electric or induction models, which are more energy efficient, improve indoor air quality, reduce greenhouse gas

Solar Panels on top of Hope Community's Wellstone Apartments in Minnesota
(Clean Energy Resource Team via Flickr, CC BY-NC 2.0)

reduces long-term building operating costs (Enterprise Community Partners, n.d.).

The most straightforward method for developers to demonstrate their energy efficiency achievements for new construction projects is to build them to ENERGY STAR

emissions, and comply with evolving state regulations. Household appliances like refrigerators, washing machines, and dryers can be specified for low standby power and high operational efficiency. Choosing ENERGY STAR-certified appliances represents a safe choice, as they are independently verified to use substantially less energy/water than standard models while delivering equal or better performance. Finally, LED interior lighting in adherence to fixture-efficacy guidelines detailed in the metrics section of this pillar is one of the most effective ways to reduce light-related energy usage (ENERGY STAR, n.d.).

Incorporating building performance standards and other energy efficiency strategies can help buildings achieve ENERGY STAR certification. This certification demonstrates the attainment of high energy efficiency standards that surpass those of equivalent buildings, makes developments more attractive to external investment, and

standards from the outset. To do so, developers can certify all residential buildings through the ENERGY STAR Residential New Construction Program using ENERGY STAR Multifamily New Construction (MFNC), ENERGY STAR Manufactured Homes, and/or ENERGY STAR Certified Homes as relevant. To be certified, new residential construction projects must be independently verified to meet energy efficiency standards. Developers can also provide projected operating energy use intensity and projected operating building emissions intensity for the development (Enterprise Community Partners, n.d.).

Ultimately, meeting ENERGY STAR standards can create a more energy-efficient building. However, ongoing measurement is necessary to ensure consistency throughout project development, certification, and its entire life cycle. To ensure that strategies to support ENERGY STAR building performance are effectively supporting efficiency, installing

energy meters and tracking energy use is needed (USGBC, n.d.).

Renewables Integration

A Renewables Integration strategy seeks to maintain a low carbon footprint of sourced energy and promote the development and proliferation of renewable energy infrastructure and systems. Renewable energy integration can be fulfilled through both on-site and off-site renewable energy generation. On-site renewable energy generation is often achieved through the installation of solar PV panels. In tandem with procured energy, onsite solar power generation can prevent load peaking in times of high energy demand and can even allow for net-metering, where excess energy is returned to the grid with financial compensation (SEIA, .n.d.).

3.4 Community Cohesion

The Community Cohesion pillar focuses on building strong, inclusive, and resilient communities by integrating community values, cultural identity, and local economic opportunities into building projects. Seven potential strategies include:

- Community engagement meetings
- Local Employment Opportunities
- Transit-oriented Development
- High Site Density
- Preservation of Green Spaces and Ecosystem Services
- Noise Pollution Reduction
- Light Pollution Reduction

Community Engagement Meetings

Community engagement meetings allow community members, developers, and other stakeholders to discuss priorities and cultural considerations. Community meetings should not just focus on housing needs but on pathways of new housing to support broader community goals and priorities. Working through considerations about the potential disruptions and downsides of housing construction, while also ensuring discussion about both short and long-term benefits, takes time and resources (G. Pressman, personal communication, May 10, 2025). Doing so, however, can help create an atmosphere of trust and confidence.

Effective community engagement starts with defining clear objectives. Organizers explain that the purpose is to shape the new development in ways that reflect community and public needs (i.e., improving street design, ensuring there are sufficient childcare services, and creating public gathering spaces) rather than solely focusing on the construction of the housing itself (American Planning Association, 2020). Proactively inviting those who are often underrepresented in these conversations, such as renters, shift workers, and non-English speakers (Urban Land Institute, 2019), is critical.

Transparency allows residents to form a realistic sense of what is being proposed and how it can benefit their community. Additionally, municipalities can prevent aesthetic concerns by adopting practices like by-right zoning for certain housing types, which implement objective design standards that clarify expectations for height, massing,

and setbacks. These standards reduce the number of discretionary hearings and help applicants move through the process more predictably (American Planning Association, 2020).

Local Employment

Local employment is a critical component of community-driven housing projects, ensuring that the economic benefits of new developments directly support residents. Communities building new developments can prioritize the hiring of local contractors whenever possible. This can spur local economic growth and strengthen ties between residents, policymakers, philanthropists, housing developers, and other community members.

A threshold of at least 20% local employment for construction and subcontractor hiring is an effective baseline; this figure is high enough to generate meaningful local benefits without compromising the specialized expertise often needed for complex construction projects (Enterprise Community Partners, 2025). This threshold also helps foster community ownership of projects and provides a community space for vocational skills training, benefiting both the building residents and community members.

By emphasizing local hiring, housing developers can deliver immediate employment benefits, ensuring that community members are benefiting from the impacts of new housing development and are, simultaneously, actively contributing to the local economy.

Transit-Oriented Development (TOD)

Wherever feasible, developers should locate new housing near existing public transportation infrastructure to maximise residents' mobility and promote sustainable transportation. Implementing TOD reduces automobile dependence, lowers carbon emissions, and increases economic opportunities by clustering housing and commercial space around transportation hubs. Prioritizing TOD strategies, expanding bicycle infrastructure, integrating electric vehicle charging stations, and implementing an unbundled parking policy are conducive to meeting decarbonization goals (USGBC, n.d.).

To ensure transit-oriented developments, developers should locate any functional entry of the development within a quarter mile of the closest bus or streetcar stop and a half mile of existing passenger rail stations (USGBC, n.d.).

Certainly, the aforementioned guidelines depend on the existing public transportation infrastructure in the locations where projects are being planned. If public transportation infrastructure exists but the project cannot be sited within a quarter or half mile of it, the building should provide shuttle service to the closest transit stations. Additionally, the building should have dedicated indoor bicycle storage stations and interconnection paths to main roads.

Ideally, new workforce housing developments should always be placed in proximity to existing public transportation infrastructure or networks, regardless of the

type of public transportation in the area. However, some locations may not feature any public transportation infrastructure, especially in more rural areas. In such cases, developers can site their buildings in close proximity to major roadways and offer shuttle service to essential services, such as grocery stores, schools, and hospitals, to ensure access.

High Site Density

A site density strategy can ensure well-conceived, structured, and sustainable land use by maximizing space and resources through clustered and multi-use developments. In areas of low-density residential housing, building higher-density housing increases the number of residents that can be housed. A focus on high site density is a prime strategy for sustainable development in any location.

In some areas, spatial constraints due to geography or zoning pose major challenges to housing development, so site density allows for land maximization. Most importantly, increasing the number of units per housing project lowers the land cost for developers. The level of costs that are passed along to renters can be kept within the goal of supporting housing affordability through lower overall rent.

Preservation of Green Spaces and Ecosystem Services

To the greatest extent possible, new developments ought to be built around the local ecosystem, including and maintaining adequate vegetation in development plans. In particular, vegetation that maintains native or climate-appropriate plants in the region and the site's soil and microclimate helps to create resiliency of both the natural and built environment.

Saltmarsh Senior Center Native Garden in Nantucket (Nantucket Garden Club, n.d.)

Native and climate-appropriate plants also help mitigate soil erosion, are less susceptible to disease, require less maintenance, and provide essential food and habitats for local fauna (Audubon, n.d.). Finally, using native plants typically reduces water usage and maintenance requirements, resulting in reduced operating

costs for landowners.

On the other hand, invasive plants or plant species, and in some cases, ornamental plants, can rapidly overpopulate and outcompete their native counterparts for resources, eliminating them and decreasing local flora biodiversity. These plants are also typically ill-adapted to the local environment and can threaten the survival of native vegetation, which in turn, increases the likelihood of damage from floods (USDA, n.d.).

Adapting landscaping to the local geography offers numerous benefits. It minimizes water runoff and intrusion by directing stormwater appropriately, which in turn, protects floodplains that act as natural reservoirs and help maintain water quality. This approach preserves vital aquatic ecosystems–supporting fish, wildlife, and human communities–while ensuring that areas housing threatened or endangered species remain undisturbed. Additionally, it safeguards the most productive agricultural soils by conserving prime, unique, and regionally important farmlands.

Noise Pollution Reduction

Noise reduction is critical for ensuring that people can live comfortably and maintain their health. Long-term exposure to excessive noise can adversely affect both mood and overall well-being, potentially leading to serious health issues. The approach focuses on minimizing both internal and external noise intrusions within living spaces. Testing and monitoring noise levels in areas such as bedrooms can help ensure compliance with recommended limits–specifically, 30 dB LAeq (A-weighted, equivalent continuous sound level) for continuous noise and 45 dB LAmax for single sounds (Enterprise Community Partners, n.d.).

In addition, targeted noise assessments and the creation of site-specific noise abatement programs are key strategies. Structural improvements play a major role as well, including sealing exterior walls and common wall penetrations with acoustical sealant, ensuring common walls have at least a 55 dB sound insulation rating, and that exterior windows and doors meet a minimum rating of 35 dB (*Healthy living environment*, n.d.).

Investing in these noise reduction measures not only improves the quality of life for residents but also carries significant economic benefits. The overall cost for soundproofing a residential room–including the walls, ceilings, and floors–ranges from approximately $1,000 to $4,000 (NIST). Research by Swinburn, Hammer, and Neitzel (2015) has shown that even a modest reduction of 5 decibels in noise levels can lower the risk of hypertension by 1.4% and coronary heart disease by 1.8%, culminating in an annual economic benefit of about $3.9 billion. This evidence supports the integration of comprehensive noise management programs in residential building design as both a public health intervention and a cost-effective investment.

Light Pollution Reduction

Minimizing light pollution is essential for community cohesion because of its far-reaching effects on ecosystems and human well-being. Over-illumination of the night environment can upset the natural behavior and movement of wildlife. Beyond ecological impacts, light pollution also affects humans by interfering with circadian rhythms and sleep. The human body's biological clock is adapted to the natural dark-light cycle, and excessive light at night (especially high-intensity or blue-rich light) can suppress melatonin production, leading to sleep disruptions and other potential health issues (DarkSky, 2024). For more information on the impact of light pollution on ecosystems and human health, please see Appendix 1.

To mitigate light pollution, planners and developers can implement a range of outdoor lighting design strategies that balance safety with environmental responsibility.

Using low-luminance fixtures–lighting that provides only the necessary level of illumination, and to avoid over-lighting an area. Equally important is directional control of lighting. Fully shielded fixtures, referred to as "full cut-off," cast light downward to illuminate the ground, rather than outward or upward into the sky.

Shielding any lights dramatically reduces glare and prevents light trespass into neighboring properties or natural areas (Florida Fish, 2020). Adhering to industry standards, like the Backlight-Uplight-Glare (BUG) rating system, ensures that selected outdoor luminaires meet strict criteria for minimizing spill light in all directions (Backlight, 2024). For instance, a well-designed streetlamp or building exterior light will have a low uplight rating (to prevent skyglow) and controlled backlight (to prevent shining into windows behind the fixture).

In addition, intelligent lighting controls can be employed to reduce unnecessary outdoor illumination: timers or curfews can dim or switch off non-essential lights during late-night hours, and motion sensors can be installed so that lights only activate when people are present, rather than burning all night. This way, areas that are typically dark stay dark, and light is only added when and where it's truly needed – a direct response to the principle of not adding light to an already dark place unless necessary.

Another important strategy is choosing an appropriate light color and spectrum. Lighting with warmer color temperatures (around 3000K or lower, such as amber or soft white LED bulbs) is preferred. Amber-hued lights not only reduce the amount of blue wavelength (which is most disruptive to wildlife and human circadian rhythms) but also appear dimmer to many nocturnal animals, thus less disturbing to their vision.

3.5 Climate Resiliency

Climate Resiliency ensures buildings can withstand climate-related hazards while maintaining functionality during and after

extreme events. Furthermore, this pillar addresses risks associated with the changing climate, such as flooding, extreme heat, and storm surge, through proactive design and adaptive strategies. Five potential strategies include:

- Site Adaptability.
- Stormwater Management.
- Heat Reduction.
- Resilient Energy Systems.
- Structural Durability.

Site Adaptability

Developers can prioritize locations less exposed to climate hazards by avoiding floodplains, coastal erosion zones, and seismic hotspots. Preserving natural buffers —such as wetlands, forests, and dunes— enhances resilience by leveraging ecosystem services like flood absorption and windbreaks (FEMA, 2021).

Pre-construction assessments identify site-specific risks, guiding interventions like elevated foundations in flood-prone areas or seismic retrofitting in earthquake zones. Pre-construction assessments are comprehensive evaluations conducted prior to development to identify environmental, geological, hydrological, and structural risks specific to a site. These assessments typically begin with a site visit and desktop review of historical land use, topography, soil composition, floodplain maps, and seismic activity data. In flood-prone areas, hydrologists use LiDAR data and predictive flood modeling to assess inundation risks under current and future climate scenarios (FEMA, 2020).

Stormwater Management

Stormwater management is the practice of controlling the quantity and quality of surface runoff, or stormwater, to prevent or mitigate issues like flooding, erosion, and water pollution (Holm, 2014). Excess stormwater exacerbates flooding, erodes infrastructure, and overwhelms sewer systems, leading to contaminated overflows.

Effective strategies may vary by region: in urban areas, permeable pavements and bioswales that reduce runoff volume by mimicking natural infiltration may be preferable to impermeable surfaces; high-density zones may benefit from green roofs and rainwater harvesting systems to mitigate runoff while providing secondary water sources; and coastal regions can consider retention basins paired with vegetation to filter pollutants and slow water flow (US EPA, 2021).

Heat Reduction

As climate change intensifies, many areas across the United States will experience an increase in temperatures and the frequency of extreme heat events. By mid-century, there will be an estimated 20-30 more days over 90 degrees F in most areas. (Center for Climate and Energy Solutions, n.d.). Implementing strategies to lessen the impact of heat can improve the health of and lower cooling costs for residents.

In cities, extreme heat can be especially pronounced. Urban Heat Islands (UHIs) are localized zones in urban areas where temperatures are significantly higher than in

Fairfax County Garage Green Roof (Fairfax County via Flickr, CC BY-NC-ND 2.0)

the surrounding areas due to the concentration of heat-absorbing surfaces like asphalt, concrete, and buildings. UHIs increase energy demand, worsen air quality, and elevate health risks for residents, especially during heat waves. The intensity of UHIs varies within cities, with the densest, least vegetated neighborhoods experiencing the highest temperature spikes—sometimes up to 15–20°F warmer than nearby green spaces (Druckenmiller, 2023; What Are Heat Islands?, 2021).

Mitigation strategies may include using high reflective surfaces and materials—measured by their Solar Reflectance Index (SRI)---on roofs and pavements to reduce heat absorption; using shading trees and green roofs to lower ambient temperatures while improving air quality; and considering open-grid pavements that allow soil cooling through evaporation, as opposed to impermeable surfaces (Druckenmiller, 2023).

Resilient Energy Systems

New buildings in flood-prone areas should be elevated whenever possible. FEMA (Federal Emergency Management Agency) designation identifies when buildings are in flood-prone areas, specifically through their Flood Insurance Rate Maps (FIRMs). They identify buildings located in areas prone to flooding, designating different zones based on flood risk to help communities and developers understand and manage those risks.

If building and/or equipment elevation is prohibitively costly, developers should floodproof new buildings, with special consideration for the protection of first and basement building levels. Special consideration should be given to protecting any utility and power infrastructure, and such infrastructure should be located away from onsite areas of heightened risk whenever possible (Enterprise Community Partners, n.d.).

Structural Durability

High winds often cause the most damage to a building's roof. To reduce this risk, builders use strong fastening systems such as hurricane clips and interlocking metal panels. Hip-shaped roofs perform better than gable roofs because they allow wind to flow over more smoothly (FEMA, 2021). Adding a sealed

roof deck and using tighter nail spacing helps keep the roof in place during storms. These methods lower the chance of roof failure and prevent water infiltration (FEMA, 2021).

Reinforcing the entire structure also makes buildings safer in strong winds. Metal connectors between the roof, walls, and foundation create a continuous load path that directs wind pressure into the ground. Installing triple-paned or impact-resistant windows helps protect the inside of the home from flying debris (Institute for Business & Home Safety, 2020). The FORTIFIED Home™ Standard gives clear guidelines for using these techniques in both construction and retrofits (FEMA, 2021).■

SECTION FOUR

PILOT PROJECTS' HOUSING NEED

Construction worker laying pavement

4.1 Background

The three pilot locations for the **MOONSHOT** serve as models for future projects: Northwest Arkansas (NWA) West Palm Beach, Florida, and Nantucket, Massachusetts:

- **Northwest Arkansas** is experiencing a sharp increase in population and economic growth, largely driven by the relocation of employees for Walmart, J.B. Hunt, and Tyson Foods (Groundwork, n.d.; University of Arkansas, 2024).
- **West Palm Beach, Florida** has also attracted affluent newcomers that shift the rental market upwards and reduce availability for households in the 60-120% of AMI range (Avalanche, 2018; FloridaCommerce, 2024).
- **Nantucket, Massachusetts**, is a high-profile tourist destination with a significantly higher temporary population in summer months and a relatively small year-round population. An increasing population, paired with tensions between preserving historic character and sustaining a permanent workforce has increased rents for housing significantly (Town of Nantucket & Kim Lundgren Associates Inc., 2020; Data USA, n.d.).

While the three locations face a rapidly growing shortage of affordable workforce housing, their unique circumstances have attracted the interest of local donors, making them ideal projects for the **MOONSHOT**.

The Workforce Housing Model, or the WHM, presented in this report is designed with the objective of determining the housing need in the three pilot locations. The WHM uses an AMI range of 60 to 120% over 10 years to determine demand and supply for rental units. The WHM makes several assumptions in its calculations.

THE WORKFORCE HOUSING MODEL

Housing need estimates vary in their baseline assumptions and often use AMI ranges that include both affordable and workforce housing. As a result, it is difficult to isolate the exact workforce housing need using current estimates. To address this, the Columbia **MOONSHOT** team developed a unique housing need model that identifies housing demand over a ten-year period for renters between 60% and 120% of the area median income for each locale. The WHM assumptions are below and can be adjusted by the client for analytic purposes.

MODEL ASSUMPTIONS

VARIABLE ASSUMPTIONS

- Construction rates (including a construction affordability ratio that determines new development affordability)
- Obsolescence rates, such as demolition
- Rent shifts

FUTURE DEMAND

- Population growth due to local conditions
- Salary increases and the resulting shift rate of AMI
- Different shares of rental units across income groups
- Constant household sizes

SUPPLY

- The current, available rental units within the AMI range
- The distribution of rent at each location

CURRENT DEMAND

- The number of households
- Share of households in the AMI range
- Share of households that currently rent

CALCULATING THE RENTAL NEED

1. First, all households below the AMI lower cutoff (60%) are matched with units that have an affordable rent.

2. The households and rental units are then effectively matched upward as it would be in a fair housing market. For example, households in the 0-10% of AMI range get the cheapest rental units, households in the 10-20% range get the next cheapest rental units, and so on.

3. The supply shortage is determined by taking rental supply within range, deducting rental demand within range, and adding the shortage from below the AMI range.

4.2 Identified Housing Need over the Next 10 Years

The housing need for each location is based on parametrically derived construction rate and distribution of construction. In other words, the default housing need represents a business-as-usual scenario that assumes construction rates and rents of new properties will be similarly distributed as apartments in the past.

In the generous housing need scenario, the number of required affordable rental housing units is estimated by assuming a lower share of new housing units that fall within the AMI range. This happens through a decrease in the construction adjustment factor (how many of the newly constructed rental units per year will fall in the AMI range) by 20 percentage points. Housing needs would, therefore, be generously met if developers were to build this many units.

The converse of this scenario is the conservative scenario in which a higher construction adjustment (+20 percentage points) is assumed, thereby reflecting a world in which the market "more automatically" meets the housing demand in each location– whether through policy or other groups that provide workforce housing.

PILOT PROJECT HOUSING NEED

	Nantucket	West Palm Beach	Northwest Arkansas
2024 AMI in USD (U.S. Census Bureau)	$119,750	$64,356	$79,480
Baseline Estimate	150 Units	10,500 Units	12,900 Units
Generous Estimate	180 Units	12,300 Units	19,900 Units
Conservative Estimate	130 Units	8,600 Units	5,200 Units

4.3 Nantucket

Nantucket is a small island located 30 miles off the coast of Cape Cod, Massachusetts. Known for its scenic beaches and historical architecture, many tourists are attracted to the Island for vacation and recreation. Year-round, the Island has a population of 10,479, a figure that, while currently declining year over year, still represents a 40.1% increase in population from 2015 to 2025 (Data USA, n.d.).

The median household income on the Island is $119,750, which is higher than the Massachusetts State median of $101,341. The median property value on Nantucket is $1.18 million, which is four times the national average; it also reflects a 19.9% increase in median housing value between 2021 and 2022 due to persistent limited inventory, an increase in the popularity of the Island, and a new demographic of buyers. (Data USA, n.d.; Fischer Real Estate, 2023).

Monomoy Beach Nantucket Island (Massachusetts Office Of Travel & Tourism via Flickr, CC BY-ND 2.0)

The need for workforce housing on Nantucket stems from a combination of factors. The Island's economy is highly seasonal, driven largely by tourism, which, in turn, creates demand for temporary and year-round workers. The majority of these workers cannot afford to live on the Island (Blair, n.d.; A. Kuszupa, Interview, February 20, 2024; S. Daily, Interview, February 21, 2024). Many of these workers find themselves homeless due to a lack of affordable units and may have to resort to living in their vehicles (Quigley, 2024).

Anne Kuszpa (Interview: February 20, 2024), from Housing Nantucket, a nonprofit dedicated to ensuring workforce housing for Nantucket's year-round community, highlighted that many year-round residents are forced into overcrowded living arrangements—where multiple families share a single-family residence—or end up in substandard makeshift housing.

Out of the 12,600 housing units across 9,700 properties on Nantucket, only 2,325 are owner-occupied year-round. Over 8,500 units are used seasonally and, thus, remain unoccupied for large portions of the year (Dey, 2024).

The Island's housing crisis impacts its local workforce retention. Positions like teachers, firefighters, and

construction workers face challenges with finding housing options that remain affordable to them, resulting in the underemployment of over 100 necessary town positions as of 2023 (Ferrantella & Kuszpa, 2024).

With rising housing costs and the strain on local services, Nantucket is expected to require a substantial increase in year-round affordable units over the next decade to support its local economy and services.

Nantucket faces distinct infrastructure challenges due to its geography, seasonal population fluctuations, and environmental vulnerabilities. This following sections examines how water management, energy infrastructure, climate change impacts, transportation systems, and regulatory frameworks collectively influence the Island's workforce housing development. Incentives to encourage the development of workforce housing on Nantucket are described as well.

Wastewater and Wastewater Management

The EPA designated Nantucket's two underground freshwater aquifers as a sole source in 1984, requiring strict protection measures (Where does water come from?, n.d.). The Island's sandy soils allow rainwater to recharge the aquifers efficiently, but also produce conditions which enable pollutants to seep into groundwater. As a result, the aquifer can be vulnerable to many debilitating issues such as overuse, saltwater intrusion, and chemical contamination (Town of Nantucket, n.d.).

This vulnerability was well demonstrated when elevated levels of PFAS were detected inside one of the wells drawn from the aquifer. In 2025, officials declared a state of emergency after PFAS contamination was found in a shallow public well at Wyer's Valley, which had been offline since 2022 (Graziadei, 2025). This contamination underscores the risk of relying on shallow wells and highlights the need to protect deeper aquifer sources. Scientists plan to explore a potential offshore freshwater aquifer, but it remains an unproven resource (Graziadei, 2025).

Coastal erosion also threatens Nantucket's wastewater infrastructure. Recent storms stripped away over 40 feet of protective dunes near the south shore wastewater facility, exposing critical components and forcing emergency mitigation with thousands of cubic yards of dirt, with these temporary fixes emphasizing the fragility of existing systems (Graziadei, 2025). As the Island addresses growing housing needs, developers must ensure that new construction does not strain septic systems or increase the risk of groundwater contamination. All development should include thorough water impact assessments and invest in resilient, forward-looking infrastructure.

Energy Infrastructure

The Island relies on two undersea cables that deliver up to 74 megawatts of electricity from Cape Cod, replacing a former diesel-powered system that caused frequent blackouts (National Grid, n.d.). While these cables

significantly improved the energy reliability, demand still surges during peak seasons. Tourists—not the seasonal workforce—drive the largest increases in demand, especially during summer in the months of July and August and around Christmas in December, both of which see sharp population spikes (National Grid, n.d).. These fluctuations place stress on the electrical system. As a result, they also complicate the design of economically viable housing projects that must perform well under highly variable loads.

The Town's Energy Office continues to manage these challenges through initiatives like the "Beat the Peak!" Program, which encourages reduced electricity use during peak evening hours to avoid the need for a costly third undersea cable (Town of Nantucket Energy Office, n.d.). The Island also hosts a 6 MW / 48 MWh battery energy storage system, which provides critical support during both high-demand periods and any cable disruptions (Balducci et al., 2019).

For developers, these conditions lead to higher construction and operational costs compared to the mainland. New housing must include energy-efficient designs and, where possible, renewable energy installations to reduce load and cut utility costs. Because energy expenses heavily influence housing affordability, especially for lower-income and middle-income residents, efficient energy planning becomes essential for any sustainable workforce housing development.

Climate Change Impacts

For workforce housing development, climate resilience considerations necessitate thoughtful site selection, architectural designs that can withstand severe weather, elevated structures in vulnerable areas, and community emergency planning. These requirements add complexity and cost to housing projects but prove essential for long-term viability. Housing developments must also account for potential disruptions to supporting infrastructure systems during severe weather events, particularly for essential workers who need reliable access to their workplaces during emergencies. The next section on climate change suggests important vulnerabilities and how a focus on resilience matters in workforce housing development.

Climate change poses existential challenges for Nantucket, with coastal erosion, sea level rise, and increasingly severe storms threatening infrastructure, properties, and the Island's economic viability. While most workforce housing developments are situated away from immediate coastal zones, the entire island faces growing climate-related risks such as sea level rise, erosion, and severe storms that affect transportation networks, utility infrastructure, and emergency services that support residential communities (Coastal Resilience Plan, n.d.). With more than 2,300 buildings on Nantucket, 84% of these residential buildings are at risk from coastal flooding and erosion (FEMA Flood Risk Maps, n.d.). Nantucket has begun monitoring coastal erosion through

"Erosion Monitoring Stations" established as part of the Shoreline Change Project. Details of Shoreline Change are outlined in the Nantucket Coastal Resilience Plan (Localized Erosion Monitoring, n.d.).

The Nantucket Coastal Resilience Plan provides a comprehensive framework for addressing these challenges, outlining strategies to protect the island's community, economy, and environment. The Plan's stated goals include building coastal resilience, enhancing safe access to and across the island, promoting healthy natural ecosystems, generating waterfront public space, and developing implementable risk reduction strategies (Coastal Resilience Plan, n.d.). This planning process recognizes that climate adaptation must be integrated into all aspects of Island development, including workforce housing initiatives.

Transportation Systems

One critical area that is a pressing and overlooked issue tied to workforce housing in Nantucket is transportation. The only ways to reach Nantucket are by ferry or plane, both of which come with potential financial or logistical challenges. Taking a passenger-only ferry may seem affordable at anywhere from $10 to $20 each way, but these costs can quickly add up for daily commuters. Furthermore, passengers face the additional costs of Nantucket's bus or taxi ground transportation. For workers needing tools or equipment, bringing a vehicle on the ferry to Nantucket can cost anywhere from $150-$300 round trip, making regular commuting with a vehicle cost-prohibitive (Competitive Salary & Benefits, n.d; Average Salary in Nantucket, Massachusetts, 2025).

The high cost of transporting construction materials to the Island also directly increases workforce housing development expenses, with builders typically adding a 30% premium ($1,200 per sqft versus $600 to $1,200 elsewhere on Cape Cod; for comparison, estimates place New York State construction at $150 to $300 per sqft) compared to construction costs on the mainland (Nantucket Real Estate Trends & Market Insights, 2025).

Weather dependence further compounds transportation affordability and reliability issues. Ferry cancellations due to storms, high winds, or rough seas occur regularly during winter months, potentially stranding workers or preventing critical personnel from reaching the island. These transportation constraints not only affect daily commuters but also influence housing development by limiting construction seasons, increasing material costs, and creating logistical challenges for builders.

Finally, on-Island transportation also presents challenges, particularly for workers without personal vehicles. The seasonal nature of public transportation services leaves gaps in coverage during shoulder and off-seasons when many year-round workers still need to commute to jobs (Murphy, 2023). These transportation limitations must be considered in workforce housing development planning, with proximity to employment centers, services, and

transportation nodes representing key factors in site selection and design (Murphy, 2023).

In short, these transit limitations reduce the number of off-island workers who can reliably access jobs on Nantucket, increasing the need for sufficient year-round workforce housing on the island itself.

Regulatory Frameworks

Zoning policies and regulations in Nantucket represent the most significant barriers to developing workforce housing. The majority of the Island is zoned for single-family homes, with multifamily developments and apartments historically restricted. 60% of the Island is designated as conservation land, putting further limits on where development can occur (Baltzer, 2024).

Density is tightly regulated by subcodes and proposals for higher-density housing often face fierce opposition from local residents during town hall meetings, particularly from seasonal residents who fear impacts on neighborhood aesthetics, utilities, traffic, and parking. Historic Preservation rules on Nantucket add another layer of complexity because the rules require specific building materials, such as single-pane windows. Additionally, other aesthetic requirements increase construction costs. (Nantucket Real Estate Today, 2023)

Incentives

Nantucket is actively addressing its housing challenges through various programs and incentives designed to expand workforce housing options. In January 2024, KBS Builders signed a $2 million contract to manufacture modular units for a seasonal workforce housing project for the Town of Nantucket (KBS Builders Wins $2 Million, 2024). This development will create 20 apartments providing affordable, high-quality, and energy-efficient housing for island workers, with units manufactured off-site during the off-season and installed before peak tourism periods to minimize disruption (KBS Builders Wins $2 Million, 2024).

Nantucket's designation as a Massachusetts Green Community allows the Town to take advantage of the State's financial incentives that support municipal energy efficiency projects. Nantucket has received $477,488 in state grant funding for energy efficiency improvements such as high-efficiency heat pumps, LED lighting fixtures, and electric vehicle charging stations. (Town of Nantucket, n.d.).

Housing Nantucket, the Island's sole non-profit dedicated to affordable housing, manages several programs, including the Covenant Program, which enables property owners to subdivide their lots to create affordable housing units (Nantucket Workforce Housing Needs Study, 2015). These Covenant homes sell at below-market rates to qualified year-round residents earning under 150% of the median income. Furthermore, the resale prices are capped to maintain affordability for future residents (Nantucket Workforce Housing Needs Study, 2015).

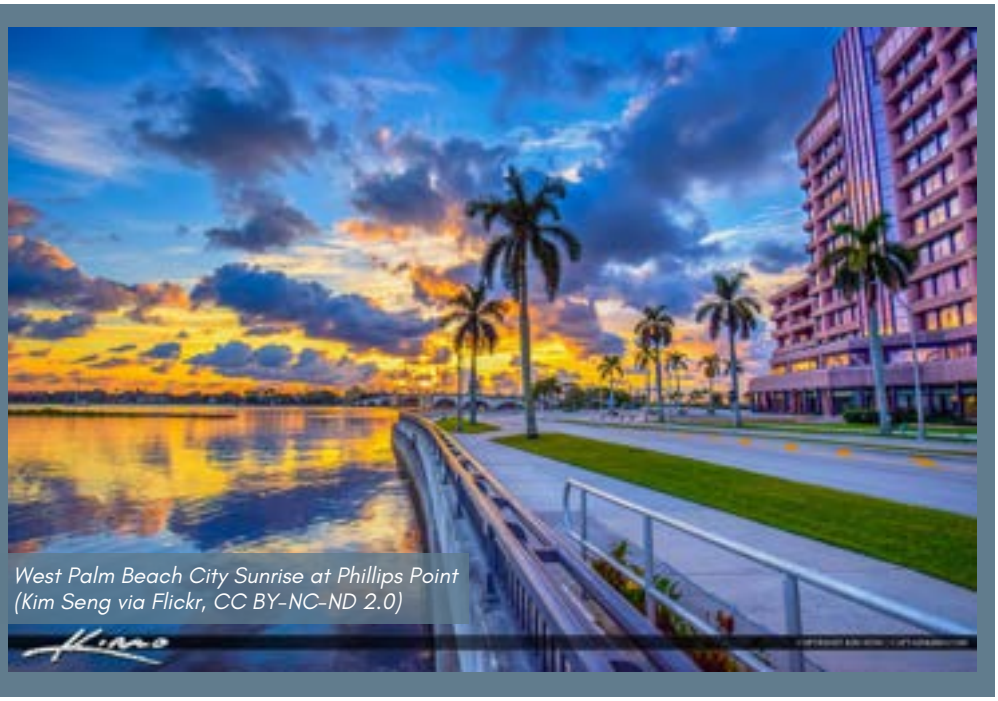
4.4 West Palm Beach

West Palm Beach, Florida, is a medium-sized coastal city experiencing steady growth and rising housing costs. The City's population of about 176,000 (U.S. Census Bureau, 2025) has been increasing by roughly 1-2% annually (FloridaCommerce, 2024). Economic expansion, including an influx of high-paying financial firms, has pushed the AMI from $46,099 in 2018 to $64,356 in 2023. Unemployment remains low (3.2% in late 2024), and the poverty rate, while improving, is about 16% (Carmiel, 2024; U.S. Census Bureau, 2025).

This economic vibrancy masks a widening affordability gap for the local workforce. Housing production has not kept pace with demand. Both longtime workers, in sectors like healthcare, aerospace, and agriculture, and newer, more affluent residents are putting upward pressure on prices (Lopez, 2025). Median rent now exceeds $2,000 per month, and the average effective rent (net rent) in the metro area has reached $2,578 (Real Capital Analytics, 2025).

As of 2022, Palm Beach County had 20,000 fewer rental units priced below $2,000, a decline of approximately 23% from the 85,000 such units recorded just a few years earlier, in 2018 (Diamond, 202%). 29.8% of West Palm Beach households spent over 50% of their income on housing, making them severely cost-burdened (Florida International University, 2023).

Today, a moderate-income household must devote a significant share of income to housing and transportation in West Palm Beach: the combined "Housing + Transportation Affordability Index" was about 50% in 2024, above the recommended 45% threshold for these expense categories (Center for Neighborhood Technology, 2025). Limited public transit use by residents at 2% (Palm Beach Transportation, 2022) makes for a largely car-dependent commuting pattern. Residents often drive long distances from more affordable areas, incurring daily transportation costs.



West Palm Beach City Sunrise at Phillips Point (Kim Seng via Flickr, CC BY-NC-ND 2.0)

Local officials have recognized the lack of affordable units for those in the 60–120% AMI workforce range. Current initiatives target both Affordable Housing (60%

AMI and lower) and Workforce Housing (60-120%).

In 2020, West Palm Beach's Mayor Keith A. James announced ambitious housing programs – starting with the "300 in 3" initiative to build 300 affordable units or workforce units in three years, a goal that was surpassed by 300 additional units. By 2024, the City had again exceeded its target, prompting a new "1,400 in 8" campaign to create 1,400 affordable or workforce units by 2027 (City of West Palm Beach, 2025).

Additionally, Palm Beach County has also expanded its inclusionary zoning through a Workforce Housing Program requiring larger new developments to include units for middle-income households (Discover South Florida, 2024).

Even if the City achieves these housing goals, however, the Workforce housing needs will not be met. In the coming decade, West Palm Beach will need 7,500 additional rental units to be affordable to households in the 60–120% AMI range to close the gap between supply and demand for this income group.

West Palm Beach faces distinct workforce housing challenges due to its geography, rapidly growing population, and environmental vulnerabilities. This section discusses how water management, energy infrastructure, climate change impacts, transportation systems, and regulatory frameworks collectively can influence the area's workforce housing development. Incentives that encourage the development of workforce housing in West Palm Beach are also discussed.

Water and Wastewater Management

West Palm Beach's water supply system faces unique vulnerabilities related to both quality and capacity. The city relies on surface freshwater from reservoirs and wetlands rather than the deep aquifers that many Florida cities use. This makes the water supply highly dependent on rainfall and prone to drought-related stress. During a 2021 drought and heat wave, the city's main reservoir experienced a toxic cyanobacteria bloom, leading to detectable levels of the algal toxin cylindrospermopsin in drinking water. This unprecedented contamination forced the utility to activate emergency wells and add treatments in May 2021 (Tuser, 2021).

Events like this one show how rising temperatures and changes in rainfall patterns can threaten water quality for local residents, in particular if buildings don't have additional filtering infrastructure. Additionally, the city's water treatment infrastructure, one of the oldest in South Florida, requires continual upgrades to adapt to emerging contaminants and saltwater intrusion risks—a risk that new developments can anticipate and counteract by ensuring saltwater is kept separate from any building materials.

Energy Infrastructure

Energy considerations in West Palm Beach are shaped by Florida's policy environment and the City's coastal geography. Electricity

in West Palm Beach is provided by Florida Power & Light (FPL) via a robust statewide grid, so reliability is generally high, but fuel mix and costs are largely outside of local influence. The region's electricity generation is approximately 75% dependent on natural gas, with only about 5% from wind and solar combined (Florida State Energy Profile, 2024).

Climate Change Impacts

West Palm Beach is acutely aware that climate change poses direct risks to housing and infrastructure (Coastal Resilience Partnership, 2021). Being a low-lying coastal city in South Florida, it faces intensifying threats from heat, flooding, and storms.

West Palm Beach already experiences a significant urban heat island effect; in fact, 94% of its population lives in areas at least 8°F hotter than surrounding rural areas (Reynolds, 2024). leading to higher cooling energy consumption. Average temperatures have been rising, and projections indicate the city could see around 95 days per year above 93°F by 2050, up from only seven such days historically (ClimateCheck, n.d.). For these reasons, ensuring affordable and sustainable energy is critical for workforce housing, as high utility costs can undermine affordability just as much as high rents. This extreme heat also endangers vulnerable populations and outdoor workers.

Flooding is another predominant concern: roughly 65% of buildings in West Palm Beach are already at some level of flood risk, and there is an estimated 44% chance of a major flood (exceeding 1 foot) in the next 30 years. Climate models predict that sea-level rise and more intense rainfall events will exacerbate both coastal storm-surge flooding and interior drainage flooding (Avalanche, 2018).

Transportation Systems

West Palm Beach's transportation context influences the cost of living and the feasibility of workforce housing. The city is part of the sprawling South Florida metropolis, and despite having an urban core, it has historically been dominated by car travel. Public transit options exist – Palm Tran buses serve the county, and the Tri-Rail commuter train and Brightline higher-speed rail connect West Palm Beach to Miami and other cities – but usage remains low (ULI Leadership Institute, 2020).

As a result, most working residents depend on personal vehicles for daily travel. This reality creates significant costs. Transportation often ranks second only to housing in household budgets. In fact, when combined with housing, the typical West Palm Beach household spends around 50% of its income on these expenses, as noted above.

Regulatory Frameworks

West Palm Beach is shifting away from historically low-density zoning to enable more housing units on less space. The county's Workforce Housing Program mandates that large developments include affordable units (60–140% AMI), offering density bonuses and faster permitting as incentives. The city supports this through its "1400 in 8" plan, which relaxes zoning

restrictions for qualifying projects (Baltz, 2025).

Incentives

The City and Palm Beach County use a mix of financial and regulatory incentives to support workforce housing. West Palm Beach offers gap financing, impact fee waivers, and access to public land for affordable projects (Avalanche, 2018). The County's $200 million Housing Bond has already funded over 1,100 units and continues to fill financing gaps for developments (Brutus, 2024). Florida's 2023 Live Local Act adds support with tax breaks and fast-tracked approvals for mixed-income housing. Nonprofit partnerships and employer-backed efforts further expand the housing toolkit.

4.5 Northwest Arkansas

Northwest Arkansas (NWA) is the region in the northwest corner of the State of Arkansas encompassing the Counties of Benton, Madison, and Washington. Among cities in this region, Bentonville – home to Walmart's headquarters, is particularly notable for its role in driving economic and population growth. In 2023, Benton's AMI reached $86,300, while Washington's and Madison's were $62,000 and $51,200, respectively (U.S. Census Bureau, 2025; Arkansas Economic Development Institute, 2024). The entire region has a population of about 590,000 and has been growing at a rate of 2 to 3% per year (University of Arkansas, 2024). While the population consists of long-time residents and newcomers, these cities have seen increases due to the expanding opportunities in healthcare, education, and public safety, as well as service jobs and the private sector.

Downtown Fayetteville, AR skyline (Brandonrush via Flickr, CC BY-SA 3.0)

Private sector employment in NWA largely stems from the major employers headquartered in the region, including Walmart, J.B. Hunt, and Tyson Foods. Additionally, the Alice L. Walton School of Medicine is currently under development in Bentonville to support regional healthcare workforce needs (Alice L. Walton School of Medicine, n.d.). The expansion of these corporations has attracted above-median wage earners and driven up property values by 71 percent between 2018 and 2023 (Groundwork, n.d.). This increase in AMI has confronted longtime residents that earn lower wages with escalating rental costs—up 44 percent in 2023, compared

to 2018 (Grajeda, 2024; Groundwork, n.d.).

Philanthropy, from organizations like the Walton Family Foundation, has contributed to workforce housing projects designed to meet the needs of essential workers (Walton Family Foundation, n.d.), these efforts often cannot keep pace with population and rent growth (University of Arkansas, 2024). In NWA, these developments have contributed to a current supply shortage of 6,200 affordable rental units within the range of 60 to 120% of AMI.

NWA's population is projected to exceed 1 million people by the year 2050, intensifying pressures in particular on the rental housing market (Northwest Arkansas Council, 2024; Northwest Arkansas Regional Planning Commission, 2023). Current household AMI stands at $79,480 (U.S. Census Bureau, 2024), but a quasi-bimodal distribution of income results in a misalignment of rental units demanded with those supplied over the next 10 years. Over the next 10 years, 9,100 rental units need to be built within the range of 60 to 120% of AMI to satisfy the rental housing demand of the workforce, given current trends.

Northwest Arkansas faces distinct workforce housing challenges due to its suburban nature, rapidly growing population, and zoning restrictions. This section discusses how water management, energy infrastructure, climate change impacts, transportation systems, and regulatory frameworks collectively can influence the area's workforce housing development. Incentives that encourage the development of workforce housing are also explored.

Water and Wastewater Management

NWA relies heavily on the Beaver Lake watershed for drinking water, which faces nutrient pollution from urban and agricultural runoff (Beaver Water District, 2025). While the region rarely experiences severe water shortages, expanding urban development without special attention to runoff risks increases phosphorus and nitrogen levels, which can negatively impact water quality. The State of Arkansas has allocated a loan of $55 million to Bentonville in Benton County for water resource recovery facility improvements (Sanders, 2025), but many areas, including other counties of NWA, nonetheless continue to grapple with aging wastewater systems that are at risk of reaching capacity levels as the population increases (University of Arkansas, 2024).

Energy Infrastructure

NWA's energy comes from a mix of municipal utilities, electric cooperatives, and private providers like SWEPCO (Southwestern Electric Power Company) and Ozarks (City of Fayetteville, n.d.; Red Door, n.d.). Despite the region benefiting from Arkansas' relatively low electricity prices, electricity demand is expected to rise due to population growth and expansion of industry (Northwest Arkansas Economic Development District, 2023; Trevino, 2024). Given the region's relatively high average of 5.2 peak-sun hours per day, the potential gain from solar energy is higher than the average of the Midwest

(TurbineGenerator, n.d.). Additionally, many local corporations contribute to the promotion of solar and wind projects, indicating the region's general ambition to switch to renewable energy (University of Arkansas, 2024). For instance, Walmart has committed to using 50% renewable energy in their operations (Northwest Arkansas Regional Planning Commission, 2025). Yet widespread adoption of rooftop solar and other clean energy measures remains limited by high upfront costs and patchwork permitting policies.

Climate Change Impacts

While NWA is not at risk of coastal flooding or hurricanes, heavier rain events and an uptick in storms pose risks of localized flooding and infrastructure damages (NWA Land Trust, n.d.; EPA, 2016). NWA experiences tornadoes on occasion, but not at a frequency as high as other parts of Arkansas (University of Arkansas, 2024). Air-quality concerns are relatively low, but rising temperatures, especially during the summer, can increase cooling costs and fine particle pollution. A $100 million Climate Pollution Reduction grant was recently frozen by the federal government, but funds might become available again in the future (Northwest Arkansas Regional Planning Commission, 2025; Powell, 2025).

Transportation Systems

Transportation costs in NWA constitute a substantial share of household expenses—often nearing half of a family's total budget when combined with housing (MIT Living Wage Institute, 2025). With limited public transit options, the region's workforce (as well as the rest of the population) generally relies on cars for commuting, which in addition to driving up transportation costs, also increases greenhouse gas emissions (transportation contributes 28% of the region's total greenhouse gas emissions) (Northwest Arkansas Regional Planning Commission, 2025; University of Arkansas, 2024).

In a 2024 survey of NWA residents, 9 in 10 residents say traffic congestion has increased in the past five years, and when it comes to satisfaction, residents place public transit near the bottom—ranking availability 23rd and ease of use 24th out of 25 categories (Jones, 2024). Planned improvements are detailed in the 10-year Transit Development Plan (Connect NWA), aimed at enhancing bus service and creating more walkable neighborhoods (Northwest Arkansas Regional Planning Commission, 2021).

Additionally the policymakers of the region have expressed their desire to focus on more sustainable transit options, such as bike lanes, electric vehicles, and improved public transportation (Northwest Arkansas Regional Planning Commission, 2025).

Regulatory Frameworks

Current zoning practices in NWA largely favor single-family homes on larger plots, which restricts higher-density multifamily developments (City of Fayetteville Long Range Planning Division, 2023; Urban Land Institute Northwest Arkansas District Council, 2023). This government-imposed restriction

has helped to create a shortage of rental units that are priced for the workforce. Additionally, land cost for multi-family housing developments remain high, further restricting opportunities to expand housing in NWA (Stock, 2025).

NWA residents have consistently ranked green space as one of the most important features of the area (D. McLarty, personal communication, 2025; Grajeda, 2024). Future regulation to conserve green space would likely be desirable for residents. However, in the absence of this, workforce housing should prioritize conserving green space to match resident preferences.

Incentives

State and philanthropic efforts, such as Low-Income Housing Tax Credits and Walton Family Foundation funding, have largely focused on traditional affordable housing, targeting the population below 60% of the AMI (Walton Family Foundation, n.d.; Grajeda, 2024; Grajeda, 2023). Financing workforce housing remains difficult as there are fewer government investment opportunities, like tax credits, for housing developments that serve populations above 60% of AMI. These developments–often priced at market rate–are typically planned on tight margins due to the high land and construction costs, and are additionally influenced by the high-interest environment that has been prevailing since 2022. ■

SECTION FIVE

PILOT PROJECT RECOMMENDATIONS

5.1 Nantucket

Recommendations for Nantucket come with unique considerations given the Island's geography, strong community oversight on housing development, and unique transportation considerations. The recommendations focus on balancing these unique considerations with sustainability over the long term.

The development of sustainable and community-appropriate housing on Nantucket presents several key challenges, notably strong community oversight, environmental sensitivity, limited space, and the need for long-term climate resilience. To address concerns around heritage conservation and public trust, strategies such as community meetings and surveys offer low-cost, high-impact engagement tools that foster goodwill and increase trust. Hiring local contractors not only boosts the Island's economy but also ensures compliance with Nantucket's unique architectural standards. Environmental concerns are tackled through early-stage Environmental Impact Assessments, which help mitigate issues like wetland disruption, and by incorporating green infrastructure that supports biodiversity, stormwater management, and climate adaptation. These measures, while sometimes costly upfront, offer significant long-term savings and ecological value. Energy efficiency and climate resilience are addressed through a combination of building and systems upgrades. Triple-paned windows, low-flow water fixtures, and Energy Star appliances improve overall performance and reduce resource consumption. Investments in heat pumps, solar cell systems, and emergency power generators contribute to energy independence and

protection from weather-related disruptions, a growing concern for Nantucket given its exposure to hurricanes.

While these improvements involve higher initial costs—such as $20,552 per solar unit or up to $20,000 per heat pump—they offer long-term savings, reduced emissions, and eligibility for federal and local incentives.

Strategically placing energy systems above flood zones and incorporating waterproofing adds another layer of resilience. Ultimately, these integrated solutions balance cost, community needs, and environmental stewardship, aligning development with both present-day realities and long-term sustainability goals.

Strategy	Rationale	Upfront Cost
Community Meetings and Surveys	To address the strong community oversight, stemming from conservation of the island and a deeply rooted architectural heritage, community meetings and surveys can help build stakeholder trust. Also, engaging with local residents to foster goodwill, mitigate any conflict, and identify site specific concerns (Local Housing Solutions, n.d.) is recommended. The cost for community surveys is relatively modest, and can be extremely beneficial for engaging local residents.	$27,750 - $31,125* *Based on estimates from similarly sized cities
Hiring Local Contractors	The preferential hiring of local contractors can help to stimulate the Island's economy and attract local expertise familiar with Nantucket's stringent historical design standards. In the processes of construction and development, working with contractors to undertake a noise assessment can help to mitigate disturbances during and after construction. The cost for noise assessments depend on factors such as the project's size, complexity and location.	Varies. No cost premium.
Triple Paned Windows	Construction options like choosing triple-paned windows which offer superior noise insulation and energy efficiency can contribute to a significant reduction of heating and cooling costs overtime and to the overall energy consumption. Although triple-paned windows are more expensive than double-paned windows, the benefits suggest it is worth the investment.	$150-$400 more per window* *depends how many windows per unit
Heat Pumps	Heat pumps provide a more efficient and environmentally friendly way to heat and cool homes compared to traditional heating and cooling systems. Federal tax credits can offset some expenses covering up to 30% or $2,000 of costs for air-source heat pumps (Dellinger, 2025). Heat pumps have a 15 to 20 year life span and will produce significant energy savings (Dellinger, 2025).	$1,300 to $20,000 per unit

Strategy	Rationale	Upfront Cost
Green Spaces and Green Infrastructure	Green spaces that utilize native species local to Nantucket can improve aesthetics in housing developments and offer or reinforce biodiversity and ecosystem services (Coutts & Hahn, 2015). Based on insights from built projects, communities that integrate green infrastructure can realize cost savings by 30% to 60% when integrating green projects with planned infrastructure improvements such as road improvements and utility restorations. A holistic approach, that takes into consideration both the necessary natural and built infrastructure, together, can be very beneficial.	$320,000 per hectare
Transit Oriented Development	By positioning new projects near existing public transit, developments can lower costs. Spending large amounts on parking is not recommended due to limited development space.	Negligible
Recycled Construction Materials	Sustainable materials can deliver lower maintenance expenses, reduced waste and up to 30% annual energy savings (Green, 2024). Recycled materials tend to be cheaper than new, as discussed in Section 3.	No premium* *Varies, depending on the material used.
Water Saving Plumbing Fixtures	Installing low flow faucets, showerheads, or aerators can cut water consumption by 30% to 50% and save $50 to $90 or more annually (HGTV, n.d.). WaterSense certified fixtures can save more than 2,300 gallons of water a year while also reducing the energy needed for heating (HGTV, n.d.)	$12-$20 per faucet* *Depends on how many faucets in the house
Emergency Power	Nantucket is potentially at risk of increasing frequency of eastern seaboard hurricanes. Adding generators to the building which can either be installed permanently or purchased as a portable unit can be considered.	$6,897 per unit
Placement of Energy Systems & Waterproofing	A construction strategy to mitigate potential climate risks like flooding would be to place energy systems such as electrical panels, HVAC units, and generators above flood levels. Elevating these systems could save costly repair costs and prolonged power outages (FEMA, 2017). If elevating is not feasible, flood-proofing lower floors becomes an alternative. However, waterproofing measures could add significant costs both in labor/construction and in materials.	$2,250 to $7,063 per unit

Strategy	Rationale	Upfront Cost
Energy Star Appliances	Energy Star rated appliances can provide considerable energy savings for homeowners. Qualified refrigerators and freezers use 10% less energy than a new non-qualified model; they cost ,on average, 100% more than standard refrigerators with a breakeven around 6.5 years. Dehumidifiers use 15% less energy and can result in potential savings of $175 in the unit's lifetime. Room air cleaners and purifiers can save over $200 during the unit's lifetime. Dishwashers can see costs less than $35 per year for operating and save an average 1,900 gallons of water over lifetime use. (Energy Star, n.d.; WorkMoney, n.d.).	Depends on appliances use and quantity.
Potential Solar Cell Systems	Implementing renewable energy systems like solar energy could be a potential solution to reduce reliance on mainland energy. Nantucket currently has a Local SOLAR Rebate Program providing over $632,304 in rebates and supporting 138 solar installations on year-round housing (Town of Nantucket Energy Office, n.d.).	$20,552 per unit
Environmental Impact Assessment	Due to Nantucket's conservation considerations, an environmental impact assessment ensures that potential issues like wetland disturbance and habitat preservation are addressed early. In Nantucket, soil restoration may significantly increase costs due to transportation requirements. Light pollution controls such as shielded outdoor fixtures and restricted nighttime lighting can be implemented to protect Nantucket from light pollution, Costs are minimal and can yield ecological and community benefits.	$1,900 to $3,200

5.2 West Palm Beach

West Palm Beach's main differentiating factors include coastal geography, hurricane vulnerability, and accelerating urban development. The region's low-lying topography, exposure to storm surges, and reliance on aging stormwater infrastructure create unique challenges for resilience and energy efficiency. To address these, new developments must integrate strategies that mitigate climate risks, reduce long-term operational costs, and align with key goals outlined in Palm Beach County's Climate Resilience Partnership.

Foremost is disaster-resilient construction. Elevated mechanical systems, impact-resistant triple-paned windows, and reinforced structural elements—designed to withstand 170 mph winds—are critical in Evacuation Zone A (the most vulnerable zone during a Hurricane), where 60% of the city's population resides (Hurricane Milton, 2024).

While these measures add $500–$2,500 per unit upfront, they reduce post-storm recovery costs by up to 40% and lower insurance premiums (Lewis, 2024).

Energy efficiency is equally vital. Variable-speed heat pumps, which outperform conventional HVAC systems in South Florida's humid climate, lower cooling costs by 30–40% despite higher initial installation costs ($10,500–$22,400 per unit) (Heat Pumps in Florida, 2023). Pairing these with rooftop solar arrays capitalizes on the region's 5.8 daily peak sun hours, offering a 5–7 year payback period under current federal tax incentives (Kielar, 2025).

Water management strategies are also indispensable. Bioswales and rain gardens, mandated for projects exceeding 5,000 sq. ft. in the Coastal Management Zone, reduce flood risks (D'Abreau, 2010; Rain Gardens, 2012). Low-flow fixtures further ease strain on wastewater systems grappling with saltwater intrusion into the Biscayne Aquifer, which has raised treatment costs by 18% since 2020 (Sanborn, 2013).

Strategy	Rationale	Upfront Cost
Community Meetings and Surveys	Proactive community engagement is crucial in West Palm Beach, where rapid coastal development and climate-related risks heighten residents' concerns about overdevelopment, displacement, and environmental impacts. Structured meetings and surveys ensure that redevelopment integrates local priorities, builds trust, and aligns with Palm Beach County's Climate Resilience Partnership, which emphasizes equitable adaptation for vulnerable populations.	$1,667 per unit
Preferential Hiring of Local Contractors	Local contractors possess specialized expertise in hurricane-resistant construction techniques mandated by Florida's building codes, like reinforced roofing and impact-resistant window installations. While cost data isn't public, hiring locally likely reduces delays from familiarity with Palm Beach County's coastal development permits. Furthermore, hiring local contractors also encourages local economic development.	Varies. No cost premium.
Noise Assessment	Urban infill projects near high-traffic corridors require noise studies to address mixed-use zoning challenges. Assessments also inform window specifications and garage isolation, critical near railway lines.	Not publicly available
Stormwater Management	West Palm Beach is facing increasing risks from flooding and sea level rise. Implementing bioswales and rain gardens improves the stormwater retention of new developments, minimizing runoff.	$5-$25/sq ft (bioswales)

Strategy	Rationale	Upfront Cost
Triple-paned Windows	Triple-paned windows are essential for energy efficiency and hurricane resilience, a unique challenge in West Palm Beach. The Green Dwellings LEED Platinum modular home demonstrated its dual role in reducing cooling loads by 30% in South Florida's humid climate while providing impact resistance equivalent to winds of up to 170 mph.	$267 per window
Garage Isolation, Electric Vehicle (EV) Chargers	West Palm Beach's reliance on cars for transportation makes garage isolation and electric vehicle infrastructure necessary. Physically separating garages prevents carbon monoxide infiltration in low-lying coastal areas prone to flooding, a key concern in West Palm Beach. Furthermore, adding chargers can encourage the adoption of electric vehicles, promoting sustainability.	$300-$400 per charger
Light Pollution Controls	As a city, West Palm Beach already has significant light pollution. Using light pollution controls, like amber LEDs and motion sensors, ensures that this pollution is not exacerbated and that native species, like sea turtles, are not disrupted in their migratory patterns.	Not publicly available
Green Spaces (Native Plants)	Green spaces that utilize native species, like the Bald Cypress and Standing Cypress, offer numerous benefits to residents, including stormwater management. Native species are more likely to thrive in West Palm Beach, making them a more cost-effective option.	About $17
Transparency of Materials	The Climate Resilience Partnership's 2025 adaptation plan requires Embodied Carbon Reporting for public projects, incentivizing low-carbon concrete mixes. Sourcing locally milled impact-resistant glass reduces transport emissions, aligning with Palm Beach County's goal to cut construction-sector CO2 by 40% by 2030.	Varies with choice of materials, majority has no additional cost.
WaterSense Fixtures	Saltwater intrusion into the Biscayne Aquifer has increased water treatment costs by 18% since 2020, making conservation of water critical. WaterSense Fixtures minimize water usage, reducing the strain on the aquifer.	Negligible
Heat Pump	West Palm Beach's 90°F+ summer temperatures and 80% humidity make variable-speed heat pumps 40% more efficient than central AC. These decrease utility costs for residents in the long run, while lowering emissions.	$10,500-$22,400 per unit (though multi-unit options exist)

Strategy	Rationale	Upfront Cost
Solar Photovoltaic Systems	West Palm Beach's sunny climate makes solar photovoltaic systems a prime option for integrating renewable energy. With 5-6 peak sun hours daily, the solar return on investment exceeds national averages.	$267
Environmental Impact Assessment (EIA)	EIAs ensure that coastal zone projects in West Palm Beach address risks such as saltwater intrusion, flooding, and habitat loss. By identifying site-specific hazards, such as flood risk, EIAs can expedite permitting and improve long-term sustainability. Recent regulations require EIAs to incorporate sea-level rise projections, ensuring developments are future-proofed against climate change impacts	$17-$60 per unit

5.3 Northwest Arkansas

Northwest Arkansas's rapid growth, car-centric layout, and single-source drinking-water supply create a distinct sustainability profile for any new multi-family project. In any case, a new multi-unit housing development should incorporate certain recommendations that ensure the project's resilience and cost-effectiveness in the long term.

First, installing high-efficiency heat pumps should be part of any new workforce housing project in NWA. The region's mixed-humid climate lets modern air-source units deliver two to three times more heating energy than they consume while providing effective summer cooling and humidity control. While heat pumps come with an increased upfront cost of roughly $1,500-2,500 per apartment unit after tax credits and local utility rebates, utility payers quickly earn their investments back through 25 to 40 percent lower energy bills and a quieter system. Second, using low-flow water faucets, showerheads, and toilets typically comes at no additional costs but reduces water usage by around 30 percent.

Additionally, protecting the watershed and improving quality of life by performing an Environmental Impact Assessment for a total of $1,900 to $6,500, and combining rain gardens or bioswales planted in low-maintenance native species keeps sediments and nutrients out of Beaver Lake and creates an attractive communal green space. While these come at slightly higher costs per square foot, long-term maintenance costs are lower so net costs are expected to be lower. Inside the building, high-performance windows–like low-E double glazing throughout and triple-pane units on the noisiest facades–add only 1 to 3 percent to upfront costs yet reduce HVAC loads and reduce electricity costs.

Finally, given Northwest Arkansas's solid solar resource, adding a roof-mounted photovoltaic array should be a part of any

new housing development. While the upfront costs are roughly $8,700, solar energy can be used at near-zero costs and typically pays back after 5 to 7 years in an area like NWA. Given the rapidly decreasing prices of solar-photovoltaic, upfront investment prices might be considerably lower even in two to three years. Taken together, these upgrades may increase upfront investment slightly but deliver reduced operating and maintenance costs over the years, regulatory compliance, and readiness for future market trends.

Strategy	Rationale	Upfront Cost
Community Meetings	Community meetings reduce resistance of the local community against multi-unit housing. By ensuring local participation in the planning process, this can overcome NIMBY opposition, avoiding potential delays to the project.	$5 per unit(Parks & Recreation Bentonville, n.d.)
Preferential Hiring of Local Contractors	Hiring local contractors, if possible, keeps economic benefits in the community and leverages regional expertise. In particular, contractors from the region might be familiar with NWA regulations and climate considerations, which avoids potential delays. It can also foster goodwill in the community.	Varies, potentially no cost premium.
Noise Assessment	Given NWA's high reliance on cars, residential housing is likely to be in proximity to larger streets. A noise assessment study can identify the best noise mitigation strategies as well as reduce disturbance to neighbors. It ensures residents' quality of life and health, which heads off potential complaints.	No prices available (cf. West Palm Beach)
Triple-paned Windows	Triple-paned windows improve energy efficiency, which is particularly important for a region like NWA where hot and humid summers are the norm. Pending the outcome of the noise assessment, triple-paned windows also ensure quieter interiors.	$2100-3000 per unit *Given 7-10 triple-paned windows per unit
Environmental Impact Assessment (EIA)	An EIA would ensure that the region's drinking water source, Beaver Lake, does not suffer from pollution due to urban runoff from construction. Moreover, the reduction of environmental and climate risks can aid in permitting and community acceptance, is expected to prevent future remediation costs and reduce impacts such as soil contamination, both of which could result in construction delays.	$10 - $80 per unit (depending on site size)
Light Pollution Controls	Using modern and smart lighting (warm LEDs, motion sensors for common spaces, etc.) reduces electricity costs and the disruption to wildlife and human health (National Park Service, 2024).	No additional cost.

Strategy	Rationale	Upfront Cost
Garage Isolation	Physically separating garages and preventing air circulation with residential quarters ensures car exhaust doesn't seep into units and any noise from car parking is buffered. Given NWA's high reliance on car travel, it is crucial to maintain good indoor air quality through garage isolation and ventilation.	No premium.
Electric Vehicle (EV) Chargers	As electric vehicle use is expected to eventually pick up in all regions of the U.S., installing EV chargers helps future-proof the housing project for electric cars, may facilitate a switch to cleaner vehicles over time. and avoid costs associated with any retrofitting in 10 to 15 years. Additionally, EV charging can be effectively paired with solar panels, if batteries/cars charge during peak solar radiation hours. Current federal rebate programs are extensive.	$800-$2000 per parking space ($800-$2000 per unit)
Green Spaces	Green spaces with native plants serve as a buffer for stormwater and the handling of increased nutrient runoff. Native plants adapt to local climate soils, requiring less maintenance and irrigation, which reduces costs. Native plant specific to NWA are purple coneflower (Echinacea purpurea), American beautyberry (Callicarpa americana), or an Eastern redbud tree (Cercis canadensis).	Varies with site size and baseline.
Transparency of materials	NWA has limited recycling and manufacturing capacity, but the region doesn't generate enough recyclables to fully supply local manufacturing (Jebaraj & Sorto, 2020). Yet, common construction materials often include recycled contents, especially if transparency is demanded from suppliers. One potential option is Arkansas's forests and new Conway plant produce engineered wood products that are low-carbon (potentially carbon-negative) alternatives to steel and concrete (Conway Chamber of Commerce, 2023)	Varies with choice of materials, majority have no additional cost.
Solar photovoltaic on roofs	The region has an average of 5.2 peak-sun hours per day, so the potential gain from solar energy is higher than the average of the Midwest (TurbineGenerator, n.d.). Residential electricity rates in Arkansas have risen 18 percent since 2019, and, on-site (roof) solar-pv would lock in a portion of future power at near-zero marginal costs, offsetting rising rates. The payback period of a solar panel in NWA is currently estimated to be 5 to 7 years. Other advantages include additional revenues/cost reductions through net-metering and the potential to charge electric cars during peak hours.	$2,000-$8,700 per unit

Strategy	Rationale	Upfront Cost
Water Saving Fixtures	NWA's high population growth brings its wastewater infrastructure closer to capacity limits. Using low-flow fixtures eases the load on septic and sewer systems and wastewater treatment plants. Ancillary benefits may also be seen in reduced utility bills for residents, because of lower water and electricity usage.	No additional costs.
Heat Pump	NWA sits in mixed-humid climate zone 4A (U.S. Department of Energy, 2015), making it particularly suitable for heat pumps as the temperature rarely drops below freezing (U.S. National Weather Service, n.d.). Air source heat pumps deliver 2-3 times the heating energy they consume, provide significantly more efficient cooling than (central) A/C systems, and control humidity when correctly sized (Kinder Heating, 2023).	$1,500-$2,500 per unit* *Highly dependent on building size, energy efficiency, etc.

PILOT PROJECT COSTS

The following section highlights the costs associated with each pilot project. For each location, the average cost per unit was provided by a local developer who knew the area's housing market. These costs include everything associated with building the unit, from appliances to land acquisition. Then, using the recommendations in the preceding sections, the cost per unit with sustainability was calculated. This was then multiplied by the total units in the pilot project to derive the total cost. Nantucket, due to its high cost of construction, has a pilot project of only 100 units to keep the project cost at a reasonable level.

NANTUCKET, MASSACHUSETTS:

Average Cost Per Unit	$950,000
Costs for 100 Units	$95,000,000
Average Cost Per Unit with Sustainability	$982,796 to $1,008,393 (3.4% to 6.14% Premium)
Costs for 100 Units with Sustainability	$98.2 million to $100.8 million

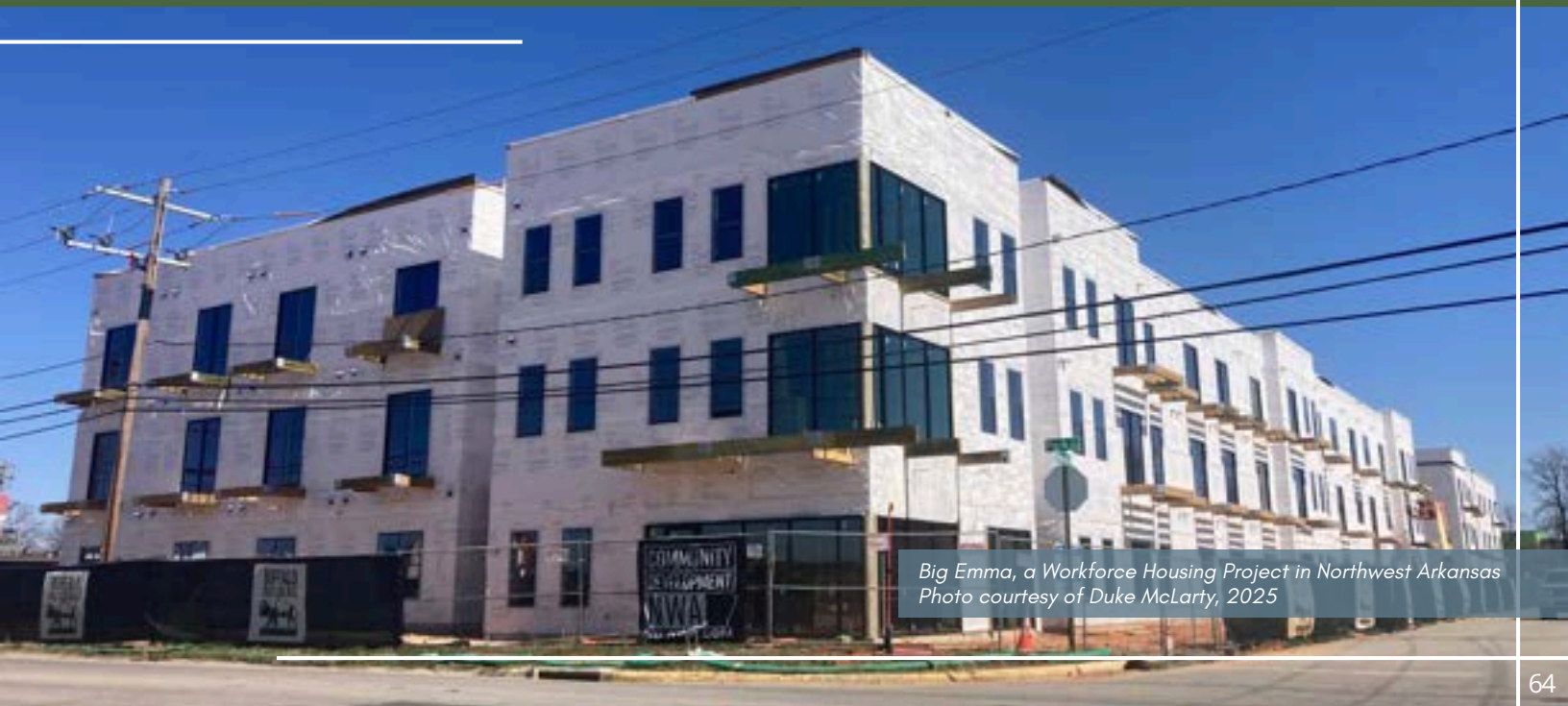
PILOT PROJECT COSTS

WEST PALM BEACH, FLORIDA:

Average Cost Per Unit	$320,000
Costs for 100 Units	$96 million
Average Cost Per Unit with Sustainability	$333,350 to $351,750 (4.2% to 10.0% Premium)
Costs for 100 Units with Sustainability	$100 million to $105.52 million

NORTHWEST ARKANSAS:

Average Cost Per Unit	$250,000
Costs for 100 Units	$75,000,000
Average Cost Per Unit with Sustainability	$256,400 to $266,300 (2.6% to 6.5% Premium)
Costs for 100 Units with Sustainability	$76.9 million to $79.9 million



Big Emma, a Workforce Housing Project in Northwest Arkansas
Photo courtesy of Duke McLarty, 2025

MEETING THE HOUSING NEED

The following housing estimates are only for the workforce housing need over the next ten years. As discussed previously, the number of units needed is likely lower than most publicly available estimates, as they do not include the Affordable Housing (low-income) units needed. To derive the total philanthropic need, the total cost of building every unit to meet the need was adjusted by using a debt-to-equity ratio of 60% to 40%.

	Nantucket	NW Arkansas	West Palm Beach
Cost per Unit	$950,000	$250,000	$320,000
Cost per Unit with Sustainability	$982,796 to $1,008,393	$256,400 to $266,300	$333,350 to $351,750
Number of Units Needed	150	12,900	10,500
Total Philanthropy Need	$60.4 million to $62.0 million	$1.32 billion to $1.37 billion	$1.40 billion to 1.48 billion

NYC Police Officers
(Thomas Hawk via Flickr, CC BY-NC 2.0)

SECTION SIX

PERFORMANCE METRICS

6.1 Green Certifications

Some prominent green certification standards exist and are used to certify housing projects. These include: 1.) *LEED (Leadership in Energy and Environmental Design)*; 2.) *Enterprise Green Communities Criteria*; 3.) *Passive House*; 4.) *WELL*; and 5.) *Fitwel.*

The first three standards are particularly relevant to workforce housing projects. LEED is the world's most widely used green building certification standard, while Enterprise Green Communities Criteria was designed for affordable housing projects. Passive House focuses on energy efficiency strategies, which help promote long-term housing affordability by reducing utility costs.

Despite the value these certification standards provide, this report does not recommend requiring workforce housing developments under the **MOONSHOT** initiative to obtain certification. While these standards offer helpful guidance on design and construction practices, they can also significantly increase project costs and extend timelines, potentially conflicting with the **MOONSHOT** goals of affordability and scalability. Moreover, most of the aforementioned green building design certifications are formulated to be widely applicable to all building types and are not tailored to innovative and unique workforce housing models. Given the urgent national housing shortage and the necessity to maximize philanthropic capital, the costs associated with formal certification may outweigh the benefits for **MOONSHOT** projects.

However, for those pursuing green

certifications in the long term—either due to market demand, philanthropic preferences, or jurisdictional incentives—the following sections outline some of the strengths and tradeoffs of each:

- **LEED (Leadership in Energy and Environmental Design)** is widely recognized and offers market value through branding. However, pursuing LEED can become expensive, especially for smaller developments. Moreover, LEED serves as a measurement rather than a design tool and lacks a climate-specific score (Brampton Brick, n.d.).
- **Enterprise Green Communities** targets affordable housing and strongly emphasizes social equity. It includes mandatory health, resilience, and energy performance standards that align with nonprofit housing goals (Enterprise Community Partners, n.d.). However, its extensive criteria can be challenging to meet in regions with limited green infrastructure or higher construction costs.
- **Passive House** emphasizes energy efficiency to support drastic reductions in energy consumption. This approach can deliver significant long-term utility savings but often requires expensive materials and highly specialized labor, making it challenging to implement at scale in diverse geographic and labor market conditions (International Passive House Association, n.d.).

IMPACT MEASUREMENTS

Evidence-based metrics allow the **MOONSHOT** to measure progress towards reaching the core goals of the initiative: affordability, permanence, and sustainability. Furthermore, demonstrating impact with reliable indicators is essential for maintaining accountability to donors and can inspire future philanthropic interest. The **MOONSHOT** recommends the following impact indicators for any project, including the three pilots.

Theme	Rationale	Sample Measurement
Rent Burden Alleviation	Each development aims to reduce residents' housing cost burden, ensuring that most households spend under 30% of their income on rent and utilities. Households paying above 30% qualify as "cost-burdened," which limits their ability to afford necessities like food (Hernández, 2016).	• Percentage of residents paying below 30% of their income on rent and utilities • Average utility cost • Housing and Transportation Affordability Index
Housing Stability	Lower rent burdens can increase the length of stay and reduce turnover (Ambrosy, 2023). High housing stability signifies that residents can "look forward and prosper" without the disruption of displacement (Ambrosy, 2023).	• Unit turnover rates • Tenant satisfaction surveys

Theme	Rationale	Sample Measurement
Resident Health and Well-Being	To emphasize healthy living conditions and resilience for residents, projects monitor indoor environmental quality and thermal comfort metrics. Ideally, buildings maintain safe temperatures and air quality even during extreme weather events, contributing to residents' health. Sensors and periodic surveys can track these indicators.	• Indoor Air Quality (levels of pollutants like PM2.5) • Percentage of units with indoor temperatures within the ASHRAE-defined comfort range (around 68-75°F)
Conscientious Construction	To reduce environmental and social harm, projects can utilize responsible building practices.	• Percentage of recycled construction materials used • Percentage of low carbon construction materials used • Percentage of left over materials re-purposed or recycled • Level of embodied carbon in materials
Community Cohesion	To improve opportunities and reflect the local community, and values. Projects integrate input from communities but also strengthen local identity. New housing projects can also improve residents' access to jobs, education, and transportation.	• Number of community members involved in planning activities • Percentage of local workers employed in construction (at least 20%) • Public transit usage rates • Average commute time to jobs and essential services • Percentage of greenfield preserved • Percentage of native vegetation
Resource Efficiency	To improve resource efficiency, buildings aim to minimize energy and water consumption through efficiency appliances and systems. Performance can be tracked through data, buildings certifications and onsite monitoring.	• Percentage of building energy that is renewable • Energy efficiency rating, like Energy Star • Water usage rate • Energy usage rate
Climate Resiliency	For projects to be resilient against climate-related disruptions strategies include stormwater retention, green roofs and energy systems. Ideally, buildings provide shelter during extreme weather events. Measurement of resiliency includes infrastructure audits and incident tracking.	• Percentage of runoff retained • Percentage of vegetated roof • Number of blackouts • Duration of power outages during extreme weather events

"The **MOONSHOT** initiative reimagines what's possible — not just by building housing, but by shifting systems to make housing equitable, sustainable, and accessible to the people who keep our communities running."

GLOSSARY

Affordable Housing: Affordable-housing—also referred to as Affordable Low Income Housing—is generally defined as housing for individuals earning less than 60% percent of Area Median Income (AMI) (1).

Area Median Income (AMI): The midpoint of income distribution within a specific geographic area, calculated annually by The United States Department of Housing and Urban Development (2).

Cost-Burdened Household: Cost-Burdened Household is defined as one that spends more than 30 percent of their income on housing costs (3).

Donor Advised Fund (DAF): DAF accounts allow donors to make a charitable contribution, receive an immediate tax deduction and then recommend grants from the fund over time. Donors can contribute to the fund as frequently as they like, and then recommend grants to their favorite charitable organizations whenever it makes sense for them (4).

Energy Burden: Energy burden refers to the percentage of household income spent on home energy bills. A high energy burden indicates households that struggle to afford basic energy needs, which can exacerbate housing instability and health issues (5).

Energy Efficiency Ratio (EER): EER is a metric that evaluates the efficiency of a cooling device, calculated by dividing the cooling output (in BTUs) by energy input (in watts). A higher EER indicates better performance (6).

Energy Star Certification: Energy Star Certification is a United States Department of Environmental Protection Agency program that helps individuals and organizations save money and reduce greenhouse gas emissions by identifying and promoting energy-efficient products, buildings, and practices (7).

FEMA Flood Zone: FEMA Flood zones are geographic areas designated by the Federal Emergency Management Agency based on the level of flood risk, used to inform insurance requirements and resilient construction practices (8).

Heat Island Effect (Urban Heat Island, UHI): The Urban Heat Island effect refers to the phenomenon in which urban and suburban areas experience higher temperatures than nearby rural areas due to human activities and heat-retaining infrastructure like concrete and asphalt (9).

Housing + Transportation Affordability Index: The Housing + Transportation Affordability Index provides a comprehensive view of affordability that includes both the cost of housing and the cost of transportation at the neighborhood level (10).

Intergenerational Mobility: Intergenerational Mobility refers to the relationship between a specific socio-economic factor of parents and the same factor of their offspring, often focusing on income or earnings over the long term to account for fluctuations (11).

GLOSSARY

Leadership in Energy and Environmental Design (LEED) Certification: LEED certification is defined as a globally recognized symbol of sustainability achievement, and it is backed by an entire industry of committed organizations and individuals paving the way for market transformation (12).

Light Pollution: Light pollution refers to the human-made alteration of outdoor light levels from those occurring naturally. When humans over-light, fail to use timers and sensors, or use the wrong color of light, we can negatively affect many parts of our world, including migratory birds, pollinators, sea turtles, and mammals, including humans (13).

Market-rate Housing: Market-rate Housing refers to non-subsidized properties that are rented or owned by those who pay market-rate rents or who paid market value to purchase properties (14).

NIMBY (Not In My BackYard): NIMBY are used to describe people, typically existing residents (especially homeowners), who oppose new housing development near their homes—particularly denser or more affordable housing (15).

Program-Related Investments (PRIs): vehicle through which philanthropic funding can be deployed to support specific underfunded programs that drive social or environmental impact (16).

Resilient Design: Resilient design refers to the intentional design of buildings and infrastructure that can withstand and adapt to natural hazards such as floods, windstorms, and extreme heat, thereby protecting residents and reducing recovery costs (17).

Sustainable Workforce Housing: Sustainable Workforce Housing refers to housing developments that are both affordable to middle-income workers—typically those earning 60% to 120% of the area median income (AMI)—and built to ensure long-term environmental, social, and economic sustainability. These projects not only aim to fill the affordability gap left by traditional affordable housing programs, but also incorporate features like energy efficiency, resilience to climate risk, and proximity to employment and services (18).

Transit-Oriented Development (TOD): Transit-Oriented Development is a type of urban development that maximizes the amount of residential, businesses, and leisure space within walking distance of public transport (19).

Triple-Paned Windows: Triple-paned windows consist of three layers of glass with air or gas-filled spaces between, offering superior insulation and noise reduction, and are commonly used in wind-resistant or energy-efficient building designs (20).

Workforce Housing: Workforce housing is defined as housing affordable to households earning between 60% and 120% of Area Median Income (AMI) (21).

GLOSSARY

YIMBY (Yes In My BackYard): YIMBY describes advocates who support housing development as a response to the outcomes of restrictive zoning and planning policies (22).

Sources:

1. Chapman, M., & Lowery, L. (2024, January 8). *What is affordable housing?*. National League of Cities. https://www.nlc.org/article/2024/01/08/what-is-affordable-housing/
2. Hamann, J. (2024, October 23). *What is area median income (AMI)?*. HUD Loans. https://www.hud.loans/hud-loans-blog/what-is-area-median-income-ami/
3. US Census Bureau. (2024, September 12). *Nearly half of renter households are cost-burdened, proportions differ by race*. Census.gov. https://www.census.gov/newsroom/press-releases/2024/renter-households-cost-burdened-race.html#:~:text=Households%20are%20considered%20cost%2Dburdened,are%20considered%20severely%20cost%2Dburdened
4. US Internal Revenue Service. (n.d.). *Donor-advised funds*. Internal Revenue Service. https://www.irs.gov/charities-non-profits/charitable-organizations/donor-advised-funds
5. US Department of Energy. (n.d.). *Low-income household energy burden varies among states*. Energy.gov. https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf
6. US Department of Energy. (2024, December 30). *Room Air Conditioners*. Energy.gov. https://www.energy.gov/energysaver/room-air-conditioners
7. US Department of Energy. (n.d.-a). *Energy Star®*. Energy.gov. https://www.energy.gov/eere/buildings/energy-starr
8. US Department of Homeland Security. (n.d.). *FEMA Flood Maps and Zones Explained*. FEMA.gov. https://www.fema.gov/blog/fema-flood-maps-and-zones-explained
9. US Environmental Protection Agency. (n.d.). *Heat Island Effect*. EPA. https://www.epa.gov/heatislands
10. *H+T® index*. The H+T Affordability Index. (n.d.). https://htaindex.cnt.org/
11. ScienceDirect. (n.d.). *Intergenerational Mobility*. ScienceDirect. https://www.sciencedirect.com/topics/social-sciences/intergenerational-mobility
12. U.S. Green Building Council. (n.d.). *LEED rating system*. LEED rating system | U.S. Green Building Council. https://www.usgbc.org/leed
13. *What is light pollution?*. DarkSky International. (n.d.). https://darksky.org/resources/what-is-light-pollution/
14. *What is Market-Rate Housing?*. National League of Cities. (2024, January 19). https://www.nlc.org/article/2024/01/09/what-is-market-rate-housing/
15. Axel-Lute, M. (2021, November 17). *What is NIMBYism and how do affordable housing developers respond to it?*. Shelterforce. https://shelterforce.org/2021/11/17/what-is-nimbyism-and-how-do-affordable-housing-developers-respond-to-it/#:~:text=NIMBY%20stands%20for%20"Not%20in%20My%20Back,their%20homes—particularly%20denser%20or%20more%20affordable%20housing
16. Osili, U., Bhakta, R., Thayer, A., Hayat, A., Kalugyer, A. D., Hyatte, C., Qu, H. (Ellie), & Patterson, Z. (n.d.). *Leveraging the Power of Foundations*. SquareSpace. https://static1.squarespace.com/static/577434ede4fcb5f238e9b8b3/t/59690cba2994ca0bae4485c6/1500056777537/PRI+Report+-+Lilly+School+of+Philanthropy.pdf
17. *The Resilient Design Principles*. resilientdesign.org. (2023, February 13). https://www.resilientdesign.org/the-resilient-design-principles/
18. Richard, P. (2024, September 5). *Investing for impact: The rationale for Sustainable Workforce Housing*. Urban Land. https://urbanland.uli.org/capital-markets-and-finance/investing-for-impact-the-rationale-for-sustainable-workforce-housing
19. Federal Transit Administration. (n.d.). Valleymetro.org. https://www.valleymetro.org/not-found?q=sites%2Bdefault%2Bfiles%2Blegacy-images%2Buploads%2Bgeneral_publications%2BTCRP-Report-102_TOD-in-the-US-Experiences-Challenges-and-Prospects_10-04.pdf
20. US Department of Energy. (2022, June 23). *BTO Seeks to Increase Adoption of Energy-Saving Triple-Pane Windows*. Energy.gov. https://www.energy.gov/eere/buildings/articles/bto-seeks-increase-adoption-energy-saving-triple-pane-windows
21. *What is a YIMBY?: Planopedia*. Planetizen. (n.d.). https://www.planetizen.com/definition/yimbys

APPENDICES

APPENDIX 1

Environmental Management uses ESAs and EIAs to obtain environmental approvals and permits for housing projects. If multifamily housing projects are federally funded, they must comply with the National Environmental Policy Act (NEPA). extend NEPA requirements to privately financed projects, as well (U.S. Department of Housing and Urban Development, 2024).

The NEPA requirements for **MOONSHOT** are not uniformly applied across pilot locations in Florida, Massachusetts, and Arkansas.

For example, for workforce housing in Florida, the Palm Beach County's Unified Land Development Code (ULDC) requires a Phase I and Phase II ESA, if deemed necessary, to be submitted before final site-plan approval for multifamily projects. This holds for developments that receive funds from either government and private funding, or both (Abruzzo, 2023).

On the other hand, for Nantucket, the Massachusetts' Environmental Policy Act (MEPA) only applies when a project both meets a certain impact threshold and needs state permit, land transfer, or financial assistance. A purely private housing project that can be built under local zoning does not typically trigger MEPA review (Massachusetts Environmental Policy Act Office, 2025). However, a local board, like that in Nantucket, may ask for targeted studies.

In Northwest Arkansas, neither a Phase I nor a Phase II ESA is required unless the developer voluntarily enters the state Brownfield/Voluntary Cleanup Program or needs a federal permit. Hence, ESAs are recommended but are more lender-driven and thus an act of liability-projection rather than a statutory mandate (Arkansas Department of Environmental Quality, 2015; Schnier, 2021).

APPENDIX 2

Nocturnal animals rely on darkness for foraging, navigation, and reproduction. Bright lights at night can disorient them and alter these patterns (DarkSky, 2024). For example, glare from urban lighting can confuse migratory birds or sea turtles, and constant illumination near wetlands can disrupt the breeding cycles of frogs and other nocturnal creatures. In effect, artificial night lighting can act as a form of habitat disturbance, drawing some species out of their normal habitat and repelling others (Florida Fish, 2020).

Beyond ecological impacts, light pollution also affects humans by interfering with circadian rhythms and sleep. The human body's biological clock is adapted to the natural dark-light cycle, and excessive light at night (especially high-intensity or blue-rich light) can suppress melatonin production, leading to sleep disruptions and other potential health issues (DarkSky, 2024). Studies have linked chronic nighttime light exposure to higher risks of sleep disorders and even metabolic and cardiovascular problems due to this

APPENDICES

APPENDIX 2

circadian disruption. Additionally, unnecessary lighting in areas that were historically dark can diminish residents' enjoyment of the night sky and sense of place – for instance, skyglow from city lights washes out stars that communities might otherwise cherish as part of their environment.

APPENDIX 3

More detailed information on West Palm Beach recommendations follows in the table below:

Strategy	Rationale	Upfront Cost
Community Meetings / Surveys	In West Palm Beach, structured community engagement aligns with the Northwood Anchor Site's Community Involvement Plan, which utilized public workshops and CRA meetings to integrate neighborhood feedback into brownfield redevelopment. These efforts can help address concerns about mitigating opposition in the overdevelopment of coastal zones, where mixed-use projects can impact density and the environment. Proactive engagement also supports compliance with Palm Beach County's Climate Resilience Partnership goals, which prioritize equitable adaptation strategies for vulnerable populations.	$1,667 per unit
Preferential Hiring of Local Contractors	Local contractors possess specialized expertise in hurricane-resistant construction techniques mandated by Florida's building codes. These include reinforced roofing and impact-resistant window installations. The Net Zero Passive House project demonstrated how regional firms can implement International Passive House Premium standards while incorporating native landscaping for stormwater management. While cost data isn't public, hiring locally reduces delays from familiarity with Palm Beach County's coastal development permits.	Varies. No cost premium.
Noise Assessment	Urban infill projects near high-traffic corridors like Okeechobee Boulevard require noise studies to address mixed-use zoning challenges. The Resia Okeechobee Development, located along a major arterial road, incorporated acoustic buffers to comply with West Palm Beach's Coastal Management Element, which prioritizes resident health in areas with commercial-residential overlap. Assessments also inform window specifications and garage isolation, which are critical near the FEC railway lines.	Not publicly available ($3000 chosen as placeholder)

APPENDICES

APPENDIX 3

Strategy	Rationale	Upfront Cost
Triple-paned Windows	Essential for balancing energy efficiency and hurricane resilience, triple-paned windows align with the Florida Building Code's windborne debris requirements. The Green Dwellings LEED Platinum modular home demonstrated its dual role in reducing cooling loads by 30% in South Florida's humid climate while providing impact resistance equivalent to 170 mph winds. Coastal projects like the Net Zero Passive House further validated their effectiveness in noise reduction for downtown high-rises.	$267 (total $80,000)
Environmental Impact Assessment (EIA)	Environmental Impact Assessments are mandatory for coastal zone developments under the Town of Palm Beach's Conservation Element, addressing risks such as saltwater intrusion into stormwater systems and habitat loss in mangrove corridors. At the Northwood Anchor Site, the EIA identified soil contamination from historic gas stations, allowing for targeted remediation that expedited permitting. Following Hurricane Ian, EIAs must now incorporate 2050 sea-level rise projections to inform flood mitigation designs. Additionally, Palm Beach County's Unified Land Development Code (ULDC) mandates a Phase I Environmental Site Assessment (ESA)—and potentially a Phase II—before final site-plan approval for multifamily projects, regardless of private funding (Abruzzo, 2023). However, Phase I ESAs are typically lender-driven and function more as tools for liability protection than statutory requirements (Arkansas Department of Environmental Quality, 2015; Schnier, 2021).	$17–$60 per unit (total $5,000–$18,000)
Garage Isolation, EV Chargers	Physically separating garages prevents carbon monoxide infiltration in low-lying coastal areas prone to flooding, a key concern in Palm Beach County's Disaster Housing Strategy. EV infrastructure supports Florida's 2030 goal of 50% electric vehicle adoption, with projects like Resia Okeechobee integrating Level 2 chargers to comply with state sustainability incentives. Chargers paired with solar arrays (e.g., Green Dwellings' 80-gallon solar water heaters) maximize renewable synergy.	$300–$400 per charger ($90,000–120,000 total)

APPENDICES

APPENDIX 3

Strategy	Rationale	Upfront Cost
Light Pollution Controls	Coastal developments must adhere to sea turtle lighting ordinances under the Coastal Management Element, requiring amber LEDs and motion sensors. The Climate Resilience Partnership's vulnerability assessment identified light pollution as a threat to migratory bird corridors in Southeast Palm Beach County, prompting smart lighting mandates in the 2025 Unified Land Development Code.	Negligible
Green Spaces (Native Plants)	Native species like Bald Cypress and Standing Cypress reduce irrigation needs by 60% compared to turfgrass while providing flood resilience. Palm Beach County's Climate Vulnerability Assessment prioritizes green buffers to filter stormwater runoff in low-lying census tracts, where 33,900 households face flood risks.	~$17 (total $5,000)
Stormwater Management	Bioswales and rain gardens are mandated in the Coastal Management Element for projects exceeding 5,000 sq. ft. in the WPB CRA district. The Net Zero project achieved 95% stormwater retention using pervious paving and native gardens, critical in areas where 48% of households are below the poverty line and vulnerable to flood recovery costs.	$5-$25/sq ft (bioswales), 50 sqft is $250-1250
Transparency of Materials	The Climate Resilience Partnership's 2025 adaptation plan requires Embodied Carbon Reporting for public projects, incentivizing low-carbon concrete mixes validated in the Resia Okeechobee mid-rise. Sourcing locally milled impact-resistant glass reduces transport emissions, aligning with Palm Beach County's goal to cut construction-sector CO2 by 40% by 2030.	Not publicly available ($5000 chosen as placeholder)
Low-flow Fixtures	Saltwater intrusion into the Biscayne Aquifer has increased water treatment costs by 18% since 2020, making conservation critical. The Northwood Anchor Site's low-flow fixtures reduced wastewater loads by 35%, easing strain on aging sewer systems in historic neighborhoods.	Negligible

APPENDICES

APPENDIX 3

Strategy	Rationale	Upfront Cost
Heat Pump	West Palm Beach's 90°F+ summer temperatures and 80% humidity make variable-speed heat pumps 40% more efficient than central AC, as demonstrated in the Gardens Vista Apartments' energy model. The Disaster Housing Strategy prioritizes heat pumps for post-hurricane temporary housing due to rapid deployment and low grid dependence.	$10,500-$22,400 per unit (though multi-unit options exist)
Solar Photovoltaic Systems	With 5-6 peak sun hours daily, solar ROI exceeds national averages—the Green Dwellings home achieved net-zero status via a 10 kW array, offsetting 85% of its cooling costs. The Climate Resilience Partnership's 2030 roadmap targets 200 MW of rooftop solar, with tax credits covering 30% of costs for multifamily projects.	$333-$667 (total $100,000-$200,000; multi-unit options exist)

REFERENCES
EXECUTIVE SUMMARY

1. Larry Lindner. In the shadows. (2023, July 31). Nantucket Magazine. https://www.n-magazine.com/in-the-shadows
2. Hickey, J. P. (2024, November 27). Northwest AR development leads to housing crisis for educators. Public News Service. https://www.publicnewsservice.org/2024-11-27/housing-homelessness/northwest-ar-development-leads-to-housing-crisis-for-educators/a93795-1
3. WPTV. (2022, November 30). Could School District of Palm Beach County help employees find affordable housing? WPTV. https://www.wptv.com/news/education/could-school-district-of-palm-beach-county-help-employees-find-affordable-housing
4. U. S. Census Bureau, (n.d.). Nearly Half of Renter Households Are Cost-Burdened, Proportions Differ by Race. Census.Gov. Retrieved April 7, 2025, from https://www.census.gov/newsroom/press-releases/2024/renter-households-cost-burdened-race.html
5. Torres, F. (n.d.). *Preserving Long-Term Affordability in LIHTC Housing | Bipartisan Policy Center*. Retrieved April 29, 2025, from https://bipartisanpolicy.org/blog/preserving-lihtc-housing/

Big Emma Rendering in Northwest Arkansas
Photo courtesy of Duke McLarty

REFERENCES

Adaptive Reuse for Cities and Towns. Performance Services. (2024, September 30). https://www.performanceservices.com/resources/adaptive-reuse-for-cities-and-towns-a-more-cost-effective-sustainable-solution-for-underutilized-buildings/

Adrian Ramsay Design House. (n.d.). Recycled materials – pros and cons. https://ardesignhouse.com/recycled-materials-pros-and-cons/

Advanced Control Corp. (n.d.). Green materials for Palm Beach buildings. https://www.advancedcontrolcorp.com/green-materials-for-palm-beach-buildings/

Albrecht, L. (2020, August 10). The Giving Pledge turns 10: These billionaires pledged to give away half their wealth, but they soon ran into a problem. MarketWatch. https://www.marketwatch.com/story/giving-away-money-well-is-very-hard-the-giving-pledge-turns-10-and-its-signers-are-richer-than-ever-2020-08-08

Alice L. Walton School of Medicine. (n.d.). Our story. https://www.alwmedschool.org/

Ambrosy, L. (2023). Affordable Housing Offers Unparalleled Opportunity to Invest for Impact. Affordable Housing Finance. Retrieved from https://www.housingfinance.com/finance/affordable-housing-offers-unparalleled-opportunity-to-invest-for-impact

American Planning Association. (2020). Planning for Equity Policy Guide. https://planning.org/publications/document/9178541/

Angi. (n.d.). How much does it cost to build a house? https://www.angi.com/articles/how-much-does-it-cost-build-house.htm

Arkansas Economic Development Institute. (2024). Getting Ready For School. Office of Early Childhood. https://www.arkansasedc.com/docs/default-source/compare-arkansas/employers-by-county/madison-county.pdf?sfvrsn=ab008d58_2

Arkansas Economic Development Institute. (2024). Getting Ready For School. Office of Early Childhood. https://youraedi.com/wp-content/uploads/2024/05/24_01_2024GettingReady4School_05082024.pdf

Association, I. P. H. (n.d.). Passive House Certification Criteria. International Passive House Association | Criteria. https://passivehouse-international.org/index.php?page_id=150&level1_id=78

Audubon. Why Native Plants Matter | Audubon. (2025, April 23). https://www.audubon.org/content/why-native-plants-matter

Avalanche. (2018, July). West Palm Beach Economic Development Study [Report]. City of West Palm Beach. https://www.wpb.org/files/assets/city/v/1/mayors-office/documents/eco-development/2018-wpbcompetitiveassessment.pdf

Backlight, Uplight, and Glare (BUG) Ratings for Outdoor Lighting Systems. (2024, February 1). Global Lighting Forum. https://www.shine.lighting/threads/backlight-uplight-and-glare-bug-ratings-for-outdoor-lighting-systems.122/

Baltz, H. (2025, February 14). Workforce housing: Here are some places with affordable apartments, homes [News]. Workforce Housing: Here Are Some Places with Affordable Apartments, Homes.

Baltzer, C. R. (2024, April 25). Hoarding vs. protecting the Island. Nantucket Current. https://nantucketcurrent.com/opinion/article-59-is-hoarding-the-island-not-protecting-it

REFERENCES

Barton, J., & Rogerson, M. (2017). The importance of greenspace for mental health. BJPsych International, 14(4), 79–81.

Bay Area Stormwater Management Agencies Association (BASMAA). (n.d.). Rain garden fact sheet. California Coastal Adaptation Guide. https://ccag.ca.gov/wp-content/uploads/2020/06/5.7-A2-Exhibit-B-BASMAA_Rain_Garden_Fact_Sheet.pdf

Blair, A. (n.d.). The Impact of COVID-19 on a Tourism-dependent Economy. https://www.nantucket-ma.gov/DocumentCenter/View/36344/Nantucket-COVID19-Blog-by-Adam-Blair-EBP-PDF

Blumenthal, P., Handelman, E., & Tilsley, A. (2016). How affordable housing gets built. Urban Institute. https://www.urban.org/urban-wire/how-affordable-housing-gets-built

Brennan, M., Reed, P., & Sturtevant, L. A. (2014). The impacts of affordable housing on education: A research summary. Center for Housing Policy, National Housing Conference. https://nhc.org/wp-content/uploads/2017/03/The-Impacts-of-Affordable-Housing-on-Education-1.pdf

Brutus, W. (2024, May 8). Palm Beach commissioners debate how to spend $200 million bond to stem housing crisis. WLRN. https://www.wlrn.org/government-politics/2024-05-08/palm-beach-county-affordable-housing-crisis-200-million-bond

Carmiel, O. (2024, August 25). How West Palm Beach won COVID's real estate wars [News]. How West Palm Beach Won COVID's Real Estate Wars. https://nypost.com/2024/08/25/real-estate/how-west-palm-beach-won-covids-real-estate-wars/

Carrier. (n.d.). How much does a heat pump cost? https://www.carrier.com/residential/en/us/products/heat-pumps/how-much-does-a-heat-pump-cost/

Cayabyab, G. (2024, September 27). EIAs in Construction: A Short Guide. SafetyCulture. https://safetyculture.com/topics/construction-management/construction-environmental-impact-assessment/#

Center for Climate and Energy Solutions. (n.d.). Heat waves and climate change. C2ES. https://www.c2es.org/content/heat-waves-and-climate-change/

Center for Neighborhood Technology. (2025). The H+T Index provides a more complete measure of affordability. H+T Affordability Index. https://htaindex.cnt.org/map/

ChargeHub. (n.d.). City of West Palm Beach - Clematis Garage charging station. https://chargehub.com/en/ev-charging-stations/united-states/florida/west-palm-beach/city-of-west-palm-beach-clematis-garage/electric-car-stations-near-me?locId=44079

CHI Water. (n.d.). USEPA SWMM. https://www.pcswmm.com/Downloads/USEPASWMM

City of Fayetteville. (n.d.). Utility Billing. City of Fayetteville, Arkansas. Retrieved March 27, 2025, from https://www.fayetteville-ar.gov/

City of Menlo Park. (2019). Direction of Biennial Community Survey Methodology and Vendor. [PDF]. https://www.menlopark.org/DocumentCenter/View/22972/F1-20191001-2019-community-survey-CC

City of West Palm Beach. (2012, April 26). Sustainability action plan. https://www.wearestillin.com/sites/default/files/sustainability-plan/SAP%204.26.12%20for%20web.pdf

REFERENCES

City of West Palm Beach. (2025). 1400 in 8 [Official government website]. 1400 in 8. Retrieved February 18, 2025, from https://www.wpb.org/Departments/Housing-Community-Development/1400-in-8

City of West Palm Beach. (n.d.). Water Conservation Programs. Retrieved April 12, 2025, from https://www.wpb.org/Departments/Sustainability/City-Initiatives/Water-Conservation-Programs

ClimateCheck. (n.d.). West Palm Beach, Florida Climate Change Risks and Hazards: Heat, Precipitation. ClimateCheck. Retrieved February 18, 2025, from https://climatecheck.com

Coastal Resilience Partnership of Southeast Palm Beach County. (2021). Climate change vulnerability assessment: Executive summary. Palm Beach County Office of Resilience. https://discover.pbcgov.org/resilience/PDF/FINAL%20-%20Climate%20Change%20Vulnerability%20Assessment%20Report%20-%20ADA.pdf

Conway Chamber of Commerce. (2023). Structurlam Puts Down Roots in Conway. https://conwaychamber.org/news/structurlam-puts-down-roots-in-conway-north-metro-business-journal/

Corte Madera Town Council. (2021). CORTE MADERA TOWN COUNCIL STAFF REPORT. Honorable Mayor and Members of the Town Council.

Coutts, C., & Hahn, M. (2015). Green Infrastructure, Ecosystem Services, and Human Health. American Journal of Public Health, 105(9), e13–e14. https://pmc.ncbi.nlm.nih.gov/articles/PMC4555311/

DarkSky. (2024, September 11). Light pollution harms wildlife and ecosystems. DarkSky International. https://darksky.org/resources/what-is-light-pollution/effects/wildlife-ecosystems/

Data USA. (n.d.). Nantucket, MA. Retrieved February 11, 2025, from https://datausa.io/profile/geo/nantucket-ma

Data USA. (n.d.). Nantucket, MA. Retrieved February 11, 2025, from https://datausa.io/profile/geo/nantucket-ma

Davis, S. (2021). Solving the giving pledge bottleneck: How to finance social and environmental challenges using venture philanthropy at scale. Palgrave Macmillan

Dellinger, A. (2025). Considering a heat pump? Here's what you'll really pay for a sustainable heating system. CNET. https://www.cnet.com/home/energy-and-utilities/what-you-will-really-pay-for-sustainable-heating-system/

Dey, P. (2024). Time For The Facts: Understanding Nantucket's Housing And Rental…. Nantucket Current. https://nantucketcurrent.com/opinion/time-for-the-facts-understanding-nantuckets-housing-and-rental-situation

Diamond, M. (2025). "It's stunning": FIU study paints a grim picture of affordable housing in Palm Beach County. The Palm Beach Post. Retrieved February 11, 2025, from https://www.palmbeachpost.com/story/news/local/2025/02/06/fiu-study-affordable-housing-palm-beach-county/78086827007/

Discover south florida. (2024, September 26). Who gets first priority to live in this new West Palm Beach building [Market News and Blog]. Who Gets First Priority To Live In This New West Palm Beach Building. https://www.discoversouthflorida.com/blog/who-gets-first-priority-to-live-in-this-new-west-palm-beach-building/

Driving up the COST of LIVING How Housing and Transportation Costs Pressure Economic Development in Northwest Arkansas. (2011). https://cnt.org/sites/default/files/publications/Driving-Up-the-Cost-of-Living_final.pdf

REFERENCES

Druckenmiller. (n.d.). Urban heat islands 101. Resources for the Future. https://www.rff.org/publications/explainers/urban-heat-islands-101/

Ebbini, G. W. (2024). Transforming health: The WELL Building Standard's role in sustainable development. Retrieved from https://www.sciencedirect.com/science/article/pii/S2949790624001599#:~:text=Its%20purpose%20extends%20beyond%20just,%2C%20construction%2C%20and%20operational%20strategies.

Edwards (2024). Real estate map shows cities with worst housing shortages. Newsweek. https://www.newsweek.com/real-estate-map-cities-worst-housing-shortages-1916548

ENERGY STAR. (n.d.). Energy Efficient Products | ENERGY STAR. Retrieved April 14, 2025, from https://www.energystar.gov/products

ENERGY STAR. (n.d.). ENERGY STAR appliances brochure. https://www.energystar.gov/sites/default/files/tools/ENERGY%20STAR%20Appliances%20Brochure_508.pdf

Energy Star. (n.d.). Products. https://www.energystar.gov/products

EnergySage. (2025). Solar panel cost in 2025: It may be lower than you think. EnergySage. https://www.energysage.com/local-data/solar-panel-cost/

EnergySage. (n.d.). Arkansas Solar Panel Cost: Is Solar Worth It In 2025? EnergySage. Retrieved April 11, 2025, from https://www.energysage.com/local-data/solar-panel-cost/ar/

Enterprise Community Partners. (n.d.). Green Communities criteria checklist. Green Communities. https://www.greencommunitiesonline.org/checklist

Enterprise Community Partners. (n.d.). Introduction. Green Communities Online. Retrieved April 20, 2025, from https://www.greencommunitiesonline.org/introduction

Environmental Protection Agency. (2016). What Climate Change Means for Arkansas. https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-ar.pdf

Estimator Florida. (n.d.). Multi-family building HVAC system cost estimator. https://estimatorflorida.com/multi-family-building-hvac-system-cost-estimator/

Everdry Waterproofing. (2024). Understanding the cost and benefits of waterproofing your basement. Everdry Waterproofing Blog. https://www.everdryny.com/blog/cost-and-benefits-of-waterproofing-basement

Federal Emergency Management Agency (FEMA). (2017). Protecting building utility systems from flood damage: Principles and practices for the design and construction of flood resistant building utility systems (FEMA P-348, 2nd ed.). U.S. Department of Homeland Security. https://www.fema.gov/sites/default/files/2020-07/fema_p-348_protecting_building_utility_systems_from_flood_damage_2017.pdf

Federal Emergency Management Agency. (2021). Code-based wind-resistant roofing: CNMI risk assessment. https://www.fema.gov/sites/default/files/documents/fema_CNMI-RA1-code-based-wind-resistant-roofing_09282021.pdf

Federal Emergency Management Agency. (2021). Home builder's guide to coastal construction: Technical fact sheet series (FEMA P-499). https://www.fema.gov/sites/default/files/2020-08/fema499_2010_edition.pdf

REFERENCES

FEMA Flood Risk Maps, n.d. FEMA Flood Map Service Center https://msc.fema.gov/portal/home

Ferrantella, K., & Kuszpa, A. (2024. Nantucket Affordable Housing Status Update. Nantucket Current. https://nantucketcurrent.com/opinion/nantucket-affordable-housing-status-update

Fisher Real Estate Nantucket. (2023). Nantucket Real Estate Market Metrics. https://fishernantucket.com/nantucket-real-estate-market-metrics/

Florida Fish and Wildlife Conservation Commission. (2020). About Lighting Pollution. Florida Fish and Wildlife Conservation Commission. https://myfwc.com/conservation/you-conserve/lighting/pollution/

Florida Housing Coalition. (2022). Home Matters Report 2022: The State of Housing Affordability in Florida. Retrieved from https://flhousing.org/wp-content/uploads/2022/08/Home-Matters-Report-2022.pdf#:~:text=Florida%20still%20has%20a%20housing,in%20homelessness%20over%20the%20past

Florida International University Jorge M. Pérez Metropolitan Center & Housing Leadership Council of Palm Beach County, Inc. (2023, June 30). Palm Beach County Housing Equity Study. https://www.hlcpbc.org/wp-content/uploads/2023/10/Palm-Beach-County_HousingEquityStudy07142023.pdf

Florida State Energy Profile. (2024, February 15). Www.eia.gov. https://www.eia.gov/state/print.php?sid=FL

FloridaCommerce. (2024). FloridaCommerce Announces the West Palm Beach Area November 2024 Employment Data. FloridaCommerce. https://www.floridajobs.org/news-center/DEO-Press/2024/12/20/floridacommerce-announces-the-west-palm-beach-area-november-2024-employment-data

Forbes. (n.d.). MacKenzie Scott. Forbes. Retrieved March 31, 2025, from https://www.forbes.com/profile/mackenzie-scott/

Gardenia.net. (n.d.). Florida native plants that are drought tolerant. https://www.gardenia.net/guide/florida-native-plants-that-are-drought-tolerant

Geo Forward. (n.d.). Phase I Environmental Site Assessment Cost. https://www.geoforward.com/phase-i-environmental-cost/

Grajeda, A. (2023, July 18). Northwest Arkansas project aims to provide affordable housing for area's workers • Arkansas Advocate. Arkansas Advocate. https://arkansasadvocate.com/2023/07/18/northwest-arkansas-project-aims-to-provide-affordable-housing-for-areas-workers/

Grajeda, A. (2024, May 21). Stalled affordable teacher housing project finds new life in Northwest Arkansas • Arkansas Advocate. Arkansas Advocate. https://arkansasadvocate.com/2024/05/21/stalled-affordable-teacher-housing-project-finds-new-life-in-northwest-arkansas/

Green Dwellings. (2016, August 1). LEED Platinum award. Retrieved from https://greendwellings.net/leed-platinum-award/

Green, E. (2024). Traditional vs. sustainable building materials: Cost and performance. Sigma Earth. https://sigmaearth.com/traditional-vs-sustainable-building-materials-cost-and-performance/

GreenLancer. (2022, October 25). Peak sun hours: What are they and how do they affect solar production? https://www.greenlancer.com/post/peak-sun-hours

REFERENCES

Greentech Media. (n.d.). Back-up generators: How much are they worth?https://www.greentechmedia.com/articles/read/back-up-generators-how-much-are-they-worth

Groundwork. (n.d.). Groundwork, Workforce Housing for Northwest Arkansas. Northwest Arkansas Council. Retrieved February 17, 2025, from https://groundworknwa.org

Healthy living environment. Green Communities criteria & certification. (n.d.-b). https://www.greencommunitiesonline.org/healthy-living-environment

Heatpumppriceguide. (n.d.). Heat Pump Price Guides – Heat Pump Prices and Replacement Costs. Retrieved April 11, 2025, from https://www.heatpumppriceguides.com/

Hernández, D. (2016). Affording housing at the expense of health: Exploring the housing and neighborhood strategies of poor families. Journal of Family Issues, 37(7), 921–946. doi: 10.1177/0192513X14530970

HGTV. (n.d.). Lower bills with low-flow faucets. https://www.hgtv.com/design/remodel/interior-remodel/lower-bills-with-low-flow-faucets#:~:text=Low-flow%20showerheads%20and%20faucets%20cost%20%2410%20and%20upward%2C%20and,couple%20of%20water-saving%20fixtures.

Hillsborough County Extension, UF/IFAS. (n.d.). Rain garden manual for Hillsborough County residents. University of Florida Institute of Food and Agricultural Sciences. https://gardeningsolutions.ifas.ufl.edu/pdf/articles/rain-garden-manual-hillsborough.pdf

Holm, B., Holm, K., Shelton, D. P., Rodie, S. N., Feehan, K. A., & Franti, T. G. (2014). What is stormwater management and why is it important (Bulletin 1217). University of Nebraska-Lincoln Extension.

Home Depot. (n.d.). Cost to install generators. https://www.homedepot.com/services/c/cost-install-generators/efecec25e

Homeyou. (n.d.). EV charging installation costs in Palm Beach, FL. https://www.homeyou.com/fl/ev-charging-installation-palm-beach-costs

Housing + Transportation Affordability Index. (2009, January 1). Center for Neighborhood Technology. https://cnt.org/tools/housing-and-transportation-affordability-index

Housing Nantucket. (n.d.). About—Housing Nantucket. Retrieved February 11, 2025, from https://www.housingnantucket.org/about/

Housing Nantucket. (n.d.). Housing Nantucket's Covenant Homes: Affordable Homeownership. Housing Nantucket. (2025, March 18). https://www.housingnantucket.org/covenant-homes/

How Mackenzie Scott built her net worth. (2025, March 27). Simple. https://andsimple.co/cases/mackenzie-scott-net-worth/

Indian Trails Native Nursery. (n.d.). Plant price list. https://www.indiantrailsnativenursery.com/price-list

Institute for Business & Home Safety. (2020). FORTIFIED Home™ standard (2020 ed.). https://fortifiedhome.org/wp-content/uploads/2020-FORTIFIED-Home-Standard.pdf

REFERENCES

International Dark-Sky Association. (2021, January). Light pollution wastes energy and money. https://darksky.org/app/uploads/2021/01/Light-Pollution-Wastes-Energy-and-Money-English.pdf

Jebaraj, M., & Sorto, D. (2020). MEASURING THE ECONOMIC IMPACT OF CIRCULAR MATERIAL FLOW IN NORTHWEST ARKANSAS. University of Arkansas. https://nwacouncil.org/wp-content/uploads/2021/07/Circular-Economy-Final-Report.pdf#:~:text=,from%20other%20regions%20of

Jones, S. M. (2024). 2024 Northwest Arkansas Regional Transportation Survey. NWA Regional Planning Comission. https://www.nwarpc.org/wp-content/uploads/2025/01/2024-NWA-Regional-Transportation-Survey-Results_web.pdf

Joseph, K., Eslamian, S., Ostad-Ali-Askari, K., Nekooei, M., Talebmorad, H., & Amiri, A. (2018). Environmental Impact Assessment as a Tool for Sustainable Development. In Encyclopedia of Sustainability in Higher Education (p. https://link.springer.com/referenceworkentry/10.1007%2F978-3). Springer Nature Switzerland AG.

Kagan (2024). Low-Income Housing Tax Credit (LITHC): How It Works. Investopedia. Retrieved April 10, 2025, from https://www.investopedia.com/terms/l/long-income-housing-tax-credit.asp

KBS Builders. (n.d.). Nantucket workforce housing. https://www.kbsbuildersinc.com/nantucket-workforce-housing/

Keter Environmental Services. (2024, January 8). Recyclable building materials help construction companies reduce waste. https://www.keteres.com/resource/recyclable-building-materials

Kinder Heating. (2023, February 10). 4 Factors To Consider When Buying A Heat Pump | Fayetteville. https://www.kinderheatingandair.com/4-factors-to-consider-when-buying-a-heat-pump/

Kokernak, K., & Maloney, M. (2023, November 17). Six Myths: ULI Convenes Construction, Developer, Concrete, and Steel Industries to Accelerate Embodied-Carbon Reductions. Urban Land. https://urbanland.uli.org/sustainability/six-myths-uli-convenes-construction-developer-concrete-and-steel-industries-to-accelerate-embodied-carbon-reductions

Lakeside Net Zero Passive House. (2023, December 5). Lakeside Net Zero Passive House | U.S. Green Building Council. Retrieved from https://www.usgbc.org/projects/lakeside-net-zero-passive-house

LEED program. LEED Program | Brampton Brick. (n.d.). https://bramptonbrick.com/en/about-us/leed-program

LEED rating system. LEED rating system | U.S. Green Building Council. (n.d.-a). https://www.usgbc.org/leed

LiveAbout. (n.d.). Water-Saving Plumbing Fixtures: Low-flow fixtures: Types, benefits, and costs. https://www.liveabout.com/low-flow-fixtures-types-benefits-and-costs-844731

Local Housing Solutions. (n.d.). Engaging the Community in a Local Housing Strategy. https://localhousingsolutions.org/policy-insights/engaging-the-community-in-a-local-housing-strategy/

Lopez, J. (2025, January 28). 80,000+ new affordable units needed for projected housing crisis in Palm Beach County. WPTV News Channel 5 West Palm. https://www.wptv.com/money/real-estate-news/80-000-new-affordable-units-needed-for-projected-housing-crisis-in-palm-beach-county

McKinsey & Company. (2025, February 11). Investing in housing: Unlocking economic mobility for Black families and all Americans. https://www.mckinsey.com/institute-for-economic-mobility/our-insights/investing-in-housing-unlocking-economic-mobility-for-black-families-and-all-americans

REFERENCES

MIT Living Wage Institute. (2025, February 10). Living Wage Calculator—Living Wage Calculation for Fayetteville-Springdale-Rogers, AR. https://livingwage.mit.edu/metros/22220

Modernize. (n.d.). How Much Do Triple-Pane Windows Cost?. https://modernize.com/windows/energy-efficient/triple-pane-windows

Morrison-Saunders, A., Nykiel, A., & Atkins, N. (2024). Understanding the impact of environmental impact assessment research on policy and practice. Environmental Impact Assessment Review, 104, 107334. https://doi.org/10.1016/j.eiar.2023.107334

Mounts Botanical Garden. (n.d.). O'Keeffe rain garden. https://www.mounts.org/gardens/okeeffe-rain-garden/

Municipal Housing | Nantucket, MA - Official Website. (2022). Nantucket-Ma.gov. https://nantucket-ma.gov/3183/Municipal-Housing

Murphy, B. (2023, August 9). Nantucket Transportation Congestion. ArcGIS StoryMaps. https://storymaps.arcgis.com/stories/b16476d650ee4b9183d63aaf1eb42066

NAA. U.S. Needs 4.3M More Apartments by 2035 to Address Demand, Deficit and Affordability | National Apartment Association. (n.d.). Retrieved April 7, 2025, from https://naahq.org/us-needs-43m-more-apartments-2035-address-demand-deficit-and-affordability

Nantucket Current. (2024, April 9). PFAS contamination prompts town water department to seek treatment system, pursue new deep well. https://nantucketcurrent.com/news/pfas-contamination-prompts-town-water-department-to-seek-treatment-system-pursue-new-deep-well

Nantucket Current. (2024, March 13). Tourism on Nantucket has reached critical mass. Here's what to do next. https://nantucketcurrent.com/opinion/tourism-on-nantucket-has-reached-critical-mass-heres-what-to-do-next

Nantucket Current. (2024, March 25). Scientists to mine for freshwater beneath the ocean floor off Nantucket. https://nantucketcurrent.com/news/scientists-to-mine-for-freshwater-beneath-the-ocean-floor-off-nantucket

Nantucket Open the Door. (n.d.). Where does the water come from? https://nantucketopenthedoor.com/where-does-the-water-come-from/

Nantucket Real Estate Today (2023, April 4). Building a house on Nantucket? here's what you need to know about the HDC's guidelines. Marion RE. https://www.nantucketrealestate-today.com/post/building-a-house-on-nantucket-here-s-what-you-need-to-know-about-the-hdc-s-guidelines

National Grid. (n.d.). Nantucket Home Energy Assessment. https://www.nationalgridus.com/nantucket. https://www.nationalgridus.com/nantucket

National Park Service. (2024). Night Sky Viewing—Buffalo National River (U.S. National Park Service). https://www.nps.gov/buff/planyourvisit/night-sky-viewing.htm

NBC News. (2024, July 8). Hurricane Milton live updates. https://www.nbcnews.com/news/weather/live-blog/hurricane-milton-live-updates-rcna174253

NIST. (n.d.-d). https://nvlpubs.nist.gov/nistpubs/Legacy/IR/nbsir81-2233.pdf

REFERENCES

NJ Soil Remediation. (n.d.). New Jersey Soil Remediation. https://njsoilremediation.com/#:~:text=The%20industry%20average%20for%20soil,%248%2C890%20for%20soil%20remediation%20service.

NLIHC. (n.d.). The Problem. National Low Income Housing Coalition. Retrieved March 31, 2025, from https://nlihc.org/explore-issues/why-we-care/problem

NOAA Office for Coastal Management. (n.d.). Nature-based solutions: Installation and maintenance considerations. https://coast.noaa.gov/data/digitalcoast/pdf/nature-based-solutions-installation-maintenance.pdf

Northwest Arkansas Council. (2022). Diversity Report 2022. https://nwacouncil.org/wp-content/uploads/2022/07/DiversityReport2022.pdf

Northwest Arkansas Council. (2024). Regional Growth. Northwest Arkansas Council. https://nwacouncil.org/wp-content/uploads/2024/04/NWAGrowthSummary_2024-1.pdf

Northwest Arkansas Economic Development District. (2023). 2024–2028 Comprehensive Economic Development Strategy. Arkansas Economic Development Institute. https://youraedi.com/wp-content/uploads/2023/11/23_03_NWAEDD_2024_2028_CEDS_11292023.pdf

Northwest Arkansas Regional Planning Commission. (2021). NORTHWEST ARKANSAS REGIONAL PLANNING COMMISSION 2045 METROPOLITAN TRANSPORTATION PLAN. Northwest Arkansas Regional Planning Commission. https://www.nwarpc.org/wp-content/uploads/2022/09/NWARPC_2045_MTP.pdf

Northwest Arkansas Regional Planning Commission. (2023). NWARPC 2045 Metropolitan Transportation Plan Chapter 3. NWARPC. https://www.nwarpc.org/wp-content/uploads/2023/09/MTP2045Chapter3.pdf

Northwest Arkansas Regional Planning Commission. (2025). NWA Energy and Environment Innovation Plan. https://www.nwarpc.org/wp-content/uploads/2025/02/NWA-EEI-CAP_DRAFT_2025-02-27_web.pdf

NRTA. (n.d.). Nantucket Regional Transit Authority https://www.nrtawave.com

NWA Land Trust. (n.d.). CLIMATE CHANGE IN NWA. NWA Land Trust. Retrieved February 17, 2025, from https://www.nwalandtrust.org/climate-change-in-nwa

Office of Resilience. (2025, March 27). Climate risk assessment and action plan. Palm Beach County. Retrieved from https://discover.pbcgov.org/resilience/Pages/Climate-Risk-Assessment.aspx

Pacific Northwest National Laboratory. (2019). Grid energy storage technology cost and performance assessment report (PNNL-28941). https://energystorage.pnnl.gov/pdf/PNNL-28941.pdf

Palm Beach County Board of County Commissioners. (2016, April 5). Board of county commissioners: Economic sustainability—Brownfields cleanup revolving loan fund program. Retrieved from https://discover.pbcgov.org/countycommissioners/Agenda_Master/20160405.pdf

Palm Beach County Disaster Housing Strategy. (2014, June 1). Disaster housing strategy FY 2014-2015. Retrieved from https://discover.pbcgov.org/HED/PDF/PublicNotices/06-13-14-PBC-DisasterHousingStrategy-June.pdf

REFERENCES

Palm Beach County Office of Resilience. (n.d.). Climate risk assessment and resilience action plan. Retrieved from https://discover.pbcgov.org/resilience/Pages/Climate-Risk-Assessment.aspx

Palm Beach County Planning Division. (n.d.). Urban redevelopment area master plan. https://discover.pbcgov.org/pzb/planning/PDF/Projects/URA/master_plan.pdf

Palm Beach County. (2024). Resident feedback survey. https://discover.pbc.gov/iss/Documents/GovXAwards/2024/GOVX%202024%20-%20Resident%20Feedback%20Survey123%20.pdf

Palm Beach Transportation Planning Agency. (2022, September 22). Performance Measures - Palm Beach TPA. Palm Beach TPA. https://palmbeachtpa.org/performance-measures/

Parks & Recreation Bentonville. (n.d.). Rentals and Reservations | Bentonville, AR. Retrieved April 11, 2025, from https://www.bentonvillear.com/1291/BCC-Rentals-and-Reservations

Passive Solar Heating | WBDG - Whole Building Design Guide. (n.d.). Retrieved April 13, 2025, from https://www.wbdg.org/resources/passive-solar-heating

Passive Solar Technology Basics | NREL. (2025). Retrieved March 31, 2025, from https://www2.nrel.gov/research/re-passive-solar

Patel, Rajan, and Tomeh. (2024). Make it count: Measuring our housing supply shortage. Brookings. Retrieved April 11, 2025, from https://www.brookings.edu/articles/make-it-count-measuring-our-housing-supply-shortage/

Powell, P. (2025). $100M clean energy grant for Arkansas frozen by Trump executive order—Arkansas Times. Arkansas Times. https://arktimes.com/arkansas-blog/2025/02/06/100m-clean-energy-grant-for-arkansas-frozen-by-trump-executive-order

qmerit. (2024). EV Home Charging Station Costs for Installation | Qmerit. Https://Qmerit.Com/. https://qmerit.com/blog/understanding-your-ev-home-charging-station-costs-for-installation/

Quigley, Kaie. (2024). Attainable housing crisis remains an uphill battle. https://www.ack.net/townnews/economics/2024-top-story-attainable-housing-crisis-remains-an-uphill-battle/article_8264a130-bfd2-11ef-93b7-2fa94ab08830.html

Quora. (n.d.). What is the average cost for a landscaping company to install plants in a yard?https://www.quora.com/What-is-the-average-cost-for-a-landscaping-company-to-install-plants-in-a-yard

R.S.F. Staff. (n.d.). Is Workforce Housing the Answer to America's Affordable Housing Crisis? – RSF Website. Retrieved April 7, 2025, from https://schalkenbach.org/is-workforce-housing-the-answer-to-americas-affordable-housing-crisis/

Ramakrishnan, K., Champion, E., Gallagher, M., & Fudge, K. (2021). Why Housing Matters for Upward Mobility: Evidence and Indicators for Practitioners and Policymakers. Retrieved from https://www.urban.org/sites/default/files/publication/103472/why-housing-matters-for-upward-mobility-evidence-and-indicators-for-practitioners-and-policymakers.pdf#:~:text=Where%20a%20person%20lives%20has,influence%20upward%20mobility%2C%20this%20brief

Real Capital Analytics. (2025). West Palm Beach Multifamily Market Report. https://www.marcusmillichap.com/research/market-report/west-palm-beach/west-palm-beach-2025-investment-forecast-multifamily-market-report

Red Door. (n.d.). Utility Reference Guide for NWA. Red Door. https://www.reddoorar.com/utilities-guide

REFERENCES

Resia. (n.d.). Resia Okeechobee in Florida. Retrieved from https://www.liveresia.com/portfolio/resia-okeechobee

Resource Management Associates. (n.d.). How much does a Phase I ESA cost in Florida?https://www.rmagreen.com/rma-blog/how-much-does-a-phase-i-esa-cost-in-florida

Reynolds, K. (2024, July 16). Study: Urban heat island effect boosts temperatures for millions in Florida, across US | The Invading Sea. The Invading Sea. https://www.theinvadingsea.com/2024/07/16/urban-heat-island-effect-florida-cities-climate-change-orlando-hotter-temperatures/

Rich, N. J. (2023). New ASTM Standard for Phase I Environmental Site Assessments Takes Legal Effect: What This Means for Scoping Due Diligence. Katten Real Estate Advisory. https://katten.com/files/1348354_2023_02_13_frm_re_new_astm_standard_for_phase_i_environmental_site_assessments_takes_legal_effec.pdf

Robinson, Jack P., & Zollinger, M. (2024). Missing Middle: Workforce and Affordable Housing in the US. 16, 60–67.

Rocky Mountain Institute. (2021). Low-Cost, High-Value Opportunities to Reduce Embodied Carbon in Buildings—RMI. https://rmi.org/low-cost-high-value-opportunities-to-reduce-embodied-carbon-in-buildings/#

Roof Crafters. (n.d.). Cost to prepare and repair a roof for a hurricane. https://www.roof-crafters.com/learn/cost-prepare-repair-roof-hurricane-edition

Rosen, K. T., Bank, D., Hall, M., Chernikova, I., & Reed, S. (2022). New York Building Electrification and Decarbonization Costs.

SalaryExpert. (n.d.). Salary in Nantucket, Massachusetts, United States. https://www.salaryexpert.com/salary/area/united-states/massachusetts/nantucket

Sanborn, K. (2013). Creating a suitability model for rain gardens in the Town of Franklin, MA (Tufts University GIS for Environmental Analysis Final Project). https://sites.tufts.edu/gis/files/2013/11/Sanborn_Kelsey.pdf

Sanders, S. H. (2025). Governor Sanders Announces $66.5 Million in Arkansas Water Funding—Arkansas Governor—Sarah Huckabee Sanders. https://governor.arkansas.gov/news_post/governor-sanders-announces-66-5-million-in-arkansas-water-funding/

SEIA. Net Metering. (n.d.). Retrieved April 1, 2025, from https://seia.org/net-metering/

Stock, D. (2025, February 20). The Rising Cost of New Construction Homes: How Northwest Arkansas Compares to National Trends. NWA Look. https://www.nwalook.com/new-construction-northwest-arkansas-2024/

Stormwater Report. (2015, December). The Real Cost of Green Infrastructure. https://stormwater.wef.org/2015/12/real-cost-green-infrastructure/

Sullivan, B. (2017). Construction blog part 4: Cost to build on Nantucket per square foot. Fisher Real Estate Nantucket. https://fishernantucket.com/construction-on-nantucket-part-4-cost-per-square-foot/

Swinburn, T. K., Hammer, M. S., & Neitzel, R. L. (2015, September). Valuing quiet: An economic assessment of U.S. environmental noise as a cardiovascular health hazard. American journal of preventive medicine. https://pmc.ncbi.nlm.nih.gov/articles/PMC4819987/

REFERENCES

The Gap | National Low Income Housing Coalition. (n.d.). Retrieved April 11, 2025, from https://nlihc.org/gap

The Plant Native. (n.d.). Lawns vs. native gardens: What's easier? https://theplantnative.com/faqs/lawns-vs-native-gardens-whats-easier

The Undersupply of Housing is Particularly Acute in the Workforce Housing Sector – Kingbird. (n.d.). Retrieved April 7, 2025, from https://kingbird.com/the-undersupply-of-housing-is-particularly-acute-in-the-workforce-housing-sector/

TNS. (2024, March 29). DeSantis Quietly Supports Ban of Wind Energy in Florida. Governing. https://www.governing.com/policy/desantis-quietly-supports-ban-of-wind-energy-in-florida

Town of Nantucket & Kim Lundgren Associates Inc. (2020). Nantucket Sustainability Recommendations Report. Town of Nantucket, MA. https://www.nantucket-ma.gov/DocumentCenter/View/35632/Nantucket-Sustainability-Assessment-Recommendation-Report-PDF

Town of Nantucket Energy Office. (n.d.). Local Solar Rebate Program. Town of Nantucket. https://www.nantucket-ma.gov/970/Local-SOLAR-Rebate-Program

Town of Nantucket. (n.d.). Coastal resilience plan. https://www.nantucket-ma.gov/2962/Coastal-Resilience-Plan

Town of Nantucket. (n.d.). Does the aquifer that the Island gets groundwater from have PFAS in it? https://nantucket-ma.gov/FAQ.aspx?QID=607

Town of Nantucket. (n.d.). Green Community Designation | Nantucket, MA - Official Website. https://www.nantucket-ma.gov/2871/Green-Community-Designation

Town of Nantucket. (n.d.). Localized erosion monitoring. https://nantucket-ma.gov/2628/Localized-Erosion-Monitoring

Town of Nantucket. (n.d.). Sewer Department. Sewer Department | Nantucket, MA - Official Website. https://nantucket-ma.gov/1516/Sewer-Department

Town of Palm Beach. (2016). Coastal management/conservation element data & analysis. Retrieved from https://palmbeach.novusagenda.com/agendapublic/AttachmentViewer.ashx?AttachmentID=38666&ItemID=14542

Trevino, M. B. (2024). Arkansas and energy production. https://www.ebsco.com/research-starters/power-and-energy/arkansas-and-energy-production

TurbineGenerator. (n.d.). Solar Power in Fayetteville, Arkansas. Retrieved April 11, 2025, from https://www.turbinegenerator.org/solar/arkansas/fayetteville/

Tuser, C. (2021, June 7). Blue-Green Algae Toxins Found in West Palm Beach, Florida, Drinking Water. Waterworld.com; WaterWorld. https://www.waterworld.com/residential-commercial/news/14306294/blue-green-algae-toxins-found-in-west-palm-beach-florida-drinking-water

U. S. Census Bureau, (n.d.). Nearly Half of Renter Households Are Cost-Burdened, Proportions Differ by Race. Census.Gov. Retrieved April 7, 2025, from https://www.census.gov/newsroom/press-releases/2024/renter-households-cost-burdened-race.html

U.S. Census Bureau. (2023). Census Bureau Data. https://data.census.gov/

REFERENCES

U.S. Department of Agriculture (USDA). (n.d.) Invasive Plants. Retrieved April 13, 2025, from https://www.fs.usda.gov/wildflowers/invasives/index.shtml

U.S. Department of Agriculture, Natural Resources Conservation Service. (2001). Creating native landscapes in the Northern Great Plains and Rocky Mountains. Bridger Plant Materials Center. https://www.nrcs.usda.gov/plantmaterials/mtpmcpunatland.pdf

U.S. Department of Energy. (2015). Guide to Determining Climate Regions by County. Pacific Northwest National Laboratory. https://www.energy.gov/sites/prod/files/2015/10/f27/ba_climate_region_guide_7.3.pdf

U.S. Department of Housing and Urban Development. (2023). Administrative Memorandum Office Of Multifamily Housing Production. https://www.hud.gov/sites/dfiles/Housing/documents/PHASE_I_ENVIRONMENTAL_SITE_ASSESSMENT_STANDARD_ASTM_E1527-21_sj.pdf

U.S. Environmental Protection Agency. (2015). Storm Water Management Model (SWMM) user's manual version 5.1(EPA/600/R-14/413b). https://www.epa.gov/sites/default/files/2019-02/documents/epaswmm5_1_manual_master_8-2-15.pdf

U.S. Environmental Protection Agency. (n.d.). CMORE: Greener products and embodied carbon. https://www.epa.gov/greenerproducts/cmore

U.S. Environmental Protection Agency. (n.d.). Storm Water Management Model (SWMM).

U.S. Environmental Protection Agency. (n.d.). What are heat islands? https://www.epa.gov/heatislands/what-are-heat-islands

U.S. Green Building Council. (n.d.). Construction Activity Pollution Reference Guide. Retrieved April 29, 2025, from https://www.usgbc.org/node/2754165

U.S. National Weather Service. (n.d.). Bentonville/Siloam Springs Climatology. NOAA's National Weather Service. Retrieved April 11, 2025, from https://www.weather.gov/tsa/climo_benton

University of Arkansas. (2024). State of the Northwest Arkansas Region 2024. Northwest Arkansas Council. https://online.flippingbook.com/link/361372/16/

University of Arkansas. (2024). State of the Northwest Arkansas Region 2024. Northwest Arkansas Council. https://online.flippingbook.com/link/361372/16/

University of Arkansas. (n.d.). Arkansas Native Plants | What are Arkansas Native Plants and shrubs. Arkansas Native Plants | What Are Arkansas Native Plants and Shrubs. Retrieved April 11, 2025, from https://www.uaex.uada.edu/yard-garden/in-the-garden/native-plants.aspx

Up for Growth. (2024). Housing underproduction in the U.S. 2024. https://upforgrowth.org/wp-content/uploads/2024/10/2024_Housing-Underproduction-in-the-U.S.-Report_Final-c-1.pdf

Urban Institute. (n.d.). Housing affordability. Upward Mobility Framework. Retrieved April 18, 2025, from https://upward-mobility.urban.org/framework/neighborhoods/affordability

Urban Land Institute (2020) Streamlining the Development Process. https://uli.org/wp-content/uploads/ULI-Documents/SmartGrowth_MythFact.ashx_.pdf

REFERENCES

Urban Land Institute Northwest Arkansas District Council. (2023). Aligned for Affordability: A Roadmap for Local Government Policy and Practice in Northwest Arkansas. Northwest Arkansas District Council. https://ulidigitalmarketing.blob.core.windows.net/ulidcnc/sites/79/2023/04/ULI_AlignedForAffordability_V4_ForDigital_HighRes.pdf

US DOE. Heat Pump Systems. (n.d.). Energy.Gov. Retrieved March 31, 2025, from https://www.energy.gov/energysaver/heat-pump-systems

US DOE. Insulation Materials. (n.d.). Energy.Gov. Retrieved March 31, 2025, from https://www.energy.gov/energysaver/insulation-materials

US EPA. (2016, March 8). Sustainable Management of Construction and Demolition Materials [Overviews and Factsheets]. https://www.epa.gov/smm/sustainable-management-construction-and-demolition-materials

US EPA. (2021, March 17). Weather-Based Irrigation Controllers [Overviews and Factsheets]. https://www.epa.gov/watersense/weather-based-irrigation-controllers

US EPA. (2024, February 6). WaterSense Program [Collections and Lists]. https://www.epa.gov/climate-change-water-sector/watersense-program

USGBC. (n.d.). Building-Level Energy Metering. Retrieved April 1, 2025, from https://www.usgbc.org/credits/new-construction-core-and-shell-schools-new-construction-retail-new-construction-healthc-166

Wade, G. L., Midcap, J. T., Coder, K. D., Landry, G. W., Tyson, A. W., & Weatherly, N. (2010). Xeriscape: A guide to developing a water-wise landscape (Bulletin 1073). University of Georgia.

Walton Family Foundation. (n.d.). Our Housing Future Updated. Retrieved February 17, 2025, from https://8ce82b94a8c4fdc3ea6d-b1d233e3bc3cb10858bea65ff05e18f2.ssl.cf2.rackcdn.com/03/c3/4a9f42e34eb79a028f4d1fd7430d/our-housing-future-updated.pdf

Wedeen, Sophia. (2025, June 12). High Housing Costs Are Consuming Household Incomes | Joint Center for Housing Studies. (2024, June 12). https://www.jchs.harvard.edu/blog/high-housing-costs-are-consuming-household-incomes

Wierson, Arick. (2025, April 14). Can Mega-Philanthropy Fuel Trump's Efforts to Tackle the Housing Crisis? Newsweek. https://www.newsweek.com/can-mega-philanthropy-fuel-trumps-efforts-tackle-housing-crisis-opinion-2058321

Window World Southern Nevada. (n.d.). Triple-pane windows: Are they worth it? https://www.windowworldsouthernnevada.com/article/triple-pane-windows-guide

WorkMoney. (n.d.). Do Energy Star appliances really save money? https://workmoney.org/money-tips/daily-savings/do-energy-star-appliances-really-save-money

World Green Building Council. (2023). Building a water-resilient future for everyone, everywhere. [https://worldgbc.org/wp-content/uploads/2023/11/C23.9497-WGBC-Water-Guide-2023_AW_V8_Spreads.pdf]

World Population Review. (2024). West Palm Beach, Florida Population 2024. https://worldpopulationreview.com/us-cities/florida/west-palm-beach