The Impact of Green Affordable Housing

A Report by Southface and the Virginia Center for Housing Research

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Executive Summary

The impact of green building certification programs on the cost and energy performance of multifamily affordable housing has long been misunderstood due to a lack of data and analysis, particularly in the Southeast United States. The research presented in this report addresses this data gap by comparing a sample of green building program certified multifamily affordable housing to non-green multifamily affordable housing in the Southeast.

The research team, consisting of Southface, a nonprofit in Atlanta, GA, and the Virginia Center for Housing Research (VCHR) at Virginia Tech University, conducted a year-long research project to collect and analyze data on the cost and efficiency impact of green building certification programs on affordable housing development. A total of 18 affordable housing developments in Alabama, Georgia, North Carolina and South Carolina participated in the study. Eleven of which are green building program certified or "green" developments, and 7 represent conventional or "non-green" developments. The sample consists of Low Income Housing Tax Credit funded multifamily new construction properties with a minimum of one year of occupancy. The developments, otherwise, represent a wide variety of rural and urban locations, building characteristics and amenities, construction methods and residents. Despite the limitations of the variability and scale of the sample evaluated in this study, the research presents a large amount of compelling, significant data to compare the cost and energy performance of affordable housing developments across the Southeast.

Contractors, developers, housing finance agencies (HFA), property managers and residents provided cost documentation, operations and maintenance (O&M) reports, one year of utility data and surveys to inform this study. The research uses comparative statistics to evaluate the qualitative and quantitative difference between green and non-green affordable developments.

Overall, the research findings suggest that the green developments are performing better than the non-green developments in terms of construction and development costs, energy efficiency and utility costs, and satisfaction. That said, however, the research also highlights some areas of improvement for the green building industry, challenging green building certification programs and practitioners to continue to push the bar beyond energy code to achieve even greater energy savings throughout the buildings lifecycle by providing enhanced training and guidelines for building operations and maintenance.

Key findings from the report are:

- Families residing in green developments save nearly $8/month and $96/year, and seniors save more than $10 per month and $122 per year more on energy costs when compared to non-green developments.
- Green developments in this study save nearly $5,000 per year on owner-paid utility costs when compared to non-green developments.

- Green developments spend 12% less on energy (common areas) per square foot than non-green developments. Residents of green developments use 14% less energy per square foot.
- Green developments are nearly 5% less expensive on total construction costs per square foot and more than 13% less expensive on soft construction costs than the non-green developments. More specifically, analysis indicates that green certified developments in GA, NC and SC cost less to design and build than non-green alternatives in AL and SC.
- Non-green developments are only 1.6% less expensive in terms of hard construction costs when compared to green developments.
- Total operations and maintenance costs are 15% less expensive for non-green developments when compared to green developments.
- Developers, property managers and Housing Finance Agencies agree that green developments are more energy efficient.
- The majority of developers indicate that green buildings provide benefits in terms of quality of end product and achieving their firm's objectives and mission.
- Property managers and residents require a greater level of education on how to properly operate and maintain green developments in order to fully realize savings.

In summary, when affordable housing is green-certified, developers are constructing higher quality housing at a lower cost while low-income residents are saving more energy and money. Housing finance agencies that administer the state affordable housing development programs are also recognizing that properties with a green building certification are providing a higher quality and more efficient product, which saves money for residents and provides the agencies with additional quality assurance. Savings and benefits could be even greater with improved education, training and technical assistance to housing finance agencies, property managers, maintenance staff and residents. This research demonstrates that green building program certified affordable housing does not cost more to construct and provides short and long-term benefits, challenging the argument that green development comes with an excessive premium that prohibits cost-effective development.

The research presented in this report adds substantive data evidence to the anecdotal argument that green buildings save energy and money, and disputes the perception that upfront costs for green building are prohibitively significant for affordable housing development. Empirical data indicates that green buildings are providing an array of benefits to affordable housing stakeholders including: contractors, developers, housing finance agencies, property managers and residents. It is our goal that this research is used by other researchers, industry associations and policymakers to advocate for the adoption of green building policies and requirements for affordable housing development across the Southeast and nation.

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Introduction

In the past decade, across the United States, there has been a substantial increase in requirements and incentives for green development. However, many states in the Southeast have fallen behind this national trend. Furthermore, Southeastern states that have adopted green building programs and technologies as affordable housing program incentives and requirements, specifically Georgia and Virginia, are experiencing efforts to undermine current provisions that promote energy and water efficiency and other sustainability measures. Other Southeastern states, such as Alabama, North Carolina and South Carolina, have been considering providing incentives for green building and sustainable development. However, many are facing opposition to adoption, primarily due to concerns related to cost containment and whether green building programs and technologies provide cost-benefits and a return on the investment made by developers, investors and the taxpayer.

Some in the affordable and market-rate development community contend that the potential cost premiums of green building outweigh the benefits, and additional capital expenditures cannot be recouped in a reasonable payback period. This push-back has come as states are looking at cost containment for all aspects of affordable housing. Some housing finance agencies (HFAs) in the Southeast have concerns about increased administrative workloads that green requirements might impose on their staff, the potential technical hurdles imposed by green building programs on developers and contractors with less experience, reduced profit margins for developer-owners and a lack of region-specific data related to the cost-benefit of green building programs. However, other HFAs that include green building programs in their respective Qualified Allocation Plans (QAPs) are anecdotally recognizing the benefits afforded by third-party green building certification programs on their administrative budgets, resident comfort, affordability, quality of construction and the potential for more accurate utility allowances. All HFAs, whether they have or have not implemented green building programs or measures in their QAPs, require more empirical data to make the most informed decision regarding the role of green building certification in the delivery of affordable housing.

While there are thousands of green affordable homes in the Southeast, few have collected and analyzed data on actual costs and benefits. The lack of data collection and analysis on a portfolio of properties is predominantly due to limited funding and capacity for research and the difficulty collecting data from developers, property managers and residents. It is imperative to collect actual cost and operations data on green-certified and non-green affordable housing in order to develop sound housing policy.

Analysis of the costs and benefits of green building and sustainable development practices is especially critical for the Southeast. The U.S. Census Bureau projects that over the next twenty years, the Southeast, which is the most impoverished region in the nation, will lead the nation in both housing starts and net change in population growth, indicating that the opportunities to further sustainability practices within the affordable housing sector are immense. In the coming decades, it will be crucial to design affordable housing policies and programs that serve low-income, underserved and vulnerable communities to the greatest extent possible.

The research presented in this report makes the case that green building combined with affordable housing is a good decision from an economic, environmental and equity (triple bottom line) perspective for developers, housing finance agencies, property managers, residents and taxpayers.

The research project assumptions are:

- Determine and compare costs to design, develop and construct green affordable housing.
- Determine and compare operations and maintenance costs associated with property management.
- Determine and compare utility costs for low-income residents.

Background

LIHTC Overview

Whether it is a rental payment or a mortgage payment, housing costs are approximately 30% of Americans' monthly spending. The U.S. Department of Housing and Urban Development (HUD) uses residents' levels of monthly income spent on housing to determine low-income classifications for housing assistance and affordable housing creation. Affordable housing is vital for promoting vibrant communities and strong economies. Throughout its history, the U.S. has used different approaches to alleviate housing payment burdens for low and moderate-income households. Federal government programs include public housing, housing choice vouchers, Community Development Block Grants (CDBG), and most recently, the Low-Income Housing Tax Credit (LIHTC). Today, the LIHTC is the largest low-income rental subsidy in the U.S. and is an item of the Internal Revenue Code, not a federal housing subsidy (Schwartz, 103). To understand the impact energy efficiency policies can have on affordable housing, it is essential to understand the role of the LIHTC.

Enacted by Congress in 1986, the LIHTC program is based on Section 42 of the Internal Revenue Code. The goal of the program is to give the private development market an incentive to invest in affordable rental housing. The program finances rental housing for low-income households through an indirect Federal subsidy. The LIHTC allows investors to reduce their federal income tax by one dollar for every dollar of tax credit received (Schwartz, 103).

The Internal Revenue Service (IRS) distributes the tax credits to designated state agencies, which are typically state housing finance agencies (HFAs). Each state is limited to a total annual tax credit allowance of $1.75 per state resident. Developers of qualified rental housing developments apply for the tax credits through HFAs. If the developer is allotted tax credits through the state application process, they sell these credits to investors to raise equity for their project. The increase in capital in turn reduces the amount of money the developer would have to borrow. Since the developer's debt is lower for this tax credit property, they will be able to offer more affordable housing units. As long as the property remains in compliance with the LIHTC program requirements, the dollar-for-dollar credit will be applied to the investor's federal income tax for 10 years.

How Projects Qualify

Federal law guides the state's LIHTC allocation process. It requires that the state's allocation plan give priority to projects that "serve the lowest income families" and "are structured to remain affordable for the longest period of time". The program also sets eligibility requirements. A proposed project must:

- Be a residential rental property;
- Commit to one of two possible low-income occupancy threshold requirements;
  - 20-50 Rule: At least 20% of the units must be rent restricted and occupied by households with incomes at or below 50% of the HUD-determined Area Median Income (AMI)
  - 40-60 Rule: At least 40% of the units must be rent restricted and occupied by households with incomes at or below 60% of the HUD determined AMI
- The AMI is adjusted for household size;

- Many applications provide for 100% of the units to be affordable and many applications provide for units to be well below the 50% of AMI;
- On average, 96% of the apartments in a tax credit project are designated affordable (Schwartz, 112);
- Restrict rents, including utility charges, in low income units;
- Operate under the rent and income restrictions for 30 years or longer, pursuant to written agreements with the agency issuing the tax credits;
- Fifteen year compliance period and subsequent 15 year extended use period.

How the Program Affects Residents

Depending on the project, residents need to be within the 50% of the AMI range to qualify to live in a LIHTC project. Payment depends on their certified annual income and the maximum rent set by the project. "Maximum rents are set for each size of unit, based upon 30% of maximum income for specified household sizes" (Guggenheim, 3). The maximum rent includes the estimated costs of utilities for a unit. New or refurbished units add a benefit of quality for residents of LIHTC projects, leading to higher standards of living and resulting in better health and increased economic opportunity. LIHTC projects are required to remain low-income for a minimum of 15 years and residents are protected for another three years beyond that period (Guggenheim, 3).

Program Limitations

The LIHTC, like all housing programs, is not without its limitations. The first limitation Schwartz notes is the housing units financed by the program are charged a flat rent depending on AMI. Therefore, if a tenant's income decreases they will be spending more than 30% on their monthly rent. This limitation means extremely low-income families can rarely afford to live in LIHTC projects unless supplemented by federal housing vouchers (Schwartz, 123). The second limitation is the lack of incentive for building mixed-income developments. The developer receives tax credits in proportion to the amount of low-income units, therefore most of the projects are completely low-income. The lack of long-term sustainability of these projects mark a third limitation. After the 15-year affordability period, some projects convert their units to market-rate. Many of the LIHTC developments lack the resources and funding to replace building systems that need repair after 15 years of wear and tear.

Resident Behavior Affecting LIHTC

Aside from mortgage and rental payments, resident behavior and utility bills affect housing affordability. Utility expenditures can make up 20% of household income for a low-income resident. The amount residents spend on water and electric bills is taken out of their monthly income, jeopardizing their economic well-being. By tracking utility usage through residents' utility bills, the efficiency of the unit can be assessed and factored into utility allowance calculations when using energy consumption models. The key factors of resident behavior revolve around heating/cooling, water and electricity. Residents also have varying preferences for air temperature, fresh air intake and humidity level. Factors that influence electric bills include all aspects of heating and cooling, from the use of a programmable thermostat, space heater, or fan, to the use of all major and minor household appliances. The assessment of resident behavior allows for implementation of policies incentivizing energy efficient building practices with the added benefit of educating residents on the most efficient use of their systems and appliances.

Qualified Allocation Plan Overview

The state agency, typically HFA, responsible for distributing LIHTC is also responsible for establishing and updating their state specific Qualified Allocation Plan (QAP). The QAP outlines priorities, selection criteria and program eligibility requirements for evaluating applications and awarding federal tax credits. Each QAP outlines a scoring system by which applicants earn points based on meeting the criteria. Awards are distributed to the projects that meet all program requirements and earn the most points. It is at the discretion of each state agency to design their program criteria to reflect the priorities of their region.

In 2008, the Housing and Economic Recovery Act (HR3221) passed congress. As one of its provisions, HR 3221 required that QAPs take energy efficiency and historic character into account for all subsidy allocations after 2008. The extent to which various states adopted energy efficiency measures into their QAP varied considerably, and in many ways, shows the prioritization of sustainability in their respective states. Global Green, the American affiliate of the nonprofit Green Cross International, has produced a report analyzing the sustainability measures in state QAPs since 2005. Their reports rank state's QAPs for inclusion of green building strategies in four main categories: Smart Growth, Energy Efficiency, Resource Conservation, and Health Protection. The resulting outcome receives a number score (out of 55) and a letter grade.

According to their 2013 QAP Analysis, Global Green cites an upward trend for inclusion of sustainability-related criteria in Qualified Allocation Plans from 2006-2013 (2013 QAP Analysis, Global Green USA). While the national trend is moving toward improved sustainability practices in LIHTC financed affordable housing projects, some of the states in the Southeast have zero or minimal green building criteria in their LIHTC Programs. Figure 1 shows the Global Green scoring of the sustainability measures in the QAPs for the states included in our study.

Georgia's QAP is consistently ranked highest in the Southeast for inclusion of green building criteria, most notably for incentivizing green building and neighborhood certification programs, such as EarthCraft, LEED® green building program and The National Green Building Standard™ (NGBS). Additionally, Georgia's QAP encourages access to transit, better-than-code air-infiltration rates, mandatory performance testing

Figure 1: Global Green QAP Analysis – AL, GA, NC and SC

	QAP Year							
	2008		2009		2010		2012***	
	Grade**	Score*	Grade**	Score*	Grade**	Score*	Grade **	Score*
Alabama	B-	26	C	35	C	27	C	25
Georgia	A	43	A	50	A	50	A-	43
N. Carolina	B	28	C	29	C	30	B-	35
S. Carolina	C	21	D	19	D	21	C	25

*Score is out of 55 possible points for 2008-2010, Score out of 50 points for 2012

**The mean and standard deviation of the scores are used to determine the grading breakdown according to a normal distribution (bell curve)

***No QAP Analysis was conducted by Global Green in 2011

Figure 2: Energy Code Adoption – AL, GA, NC and SC

	IECC 2006	IECC 2009
Alabama	N/A; no energy code adopted prior to IECC 2009	Adopted March 2012; Effective October 2012
Georgia	Effective 2009	Adopted November 2010 (with GA Amendments); Effective January 2011
North Carolina	North Carolina Energy Conservation Code (based on the 2006 IECC) Adopted March 11, 2008; Effective June 2009	Adopted March 2010 (with NC amendments); Effective January 2012
South Carolina	Effective July 2009	Adopted April 2012; Effective July 2013

and low-VOC finishes in addition to a variety of energy and resource-efficient threshold requirements. Georgia's QAP scored an average of 46.5 points in the Global Green Analysis between 2008 and 2012, consistently categorizing it among the nation's and region's most energy and resource-efficient QAPs.

North Carolina's QAP averaged a score of 30.5 between 2008-2012, showing steady improvement in their plan's incorporation of sustainability-related practices. Most notably, North Carolina incentivizes ENERGY STAR® certification in its scoring criteria along with minimum efficiency requirements for appliances, duct sealing, window and wall performance criteria and low-flow water fixture specifications.

Alabama's QAP averaged a score of 25.75 between 2008-2012 and shows minimal change during this period relating to their sustainability incentives. The Alabama QAP lacks the incentive of third-party green building certification programs, although it does offer up to 16 points under Energy Conservation and Healthy Living Environment for exceeding energy code, a 15-year maintenance-free exterior standard, ENERGY STAR refrigerators and dishwashers, R-38 attic insulation, 90% furnaces, kitchen exhaust vented to the outdoors, R-19 insulation in exterior walls and on-site solar power generation.

South Carolina's QAP averaged a score of 21.5 between 2008-2012. South Carolina's plan does not include incentives for green building certification programs, although it does require ENERGY STAR refrigerators and dishwashers, 14 SEER HVAC units (if HVAC is to be replaced or for new construction) and low-flow fixtures.

Energy Code Overview

The energy efficiency of a state's housing stock is strongly influenced by the adoption of building energy codes. Energy codes reduce energy use and carbon emissions in the residential market by instituting minimum efficiency requirements for new construction and renovation projects. Energy codes are adopted at the state or local level and are enforced by local municipalities.

The International Energy Conservation Code (IECC) is a model energy code written in enforceable language and governs both commercial and residential building types. Chapter 4 of the IECC covers residential buildings. Design criteria are classified by and vary according to climate zone.

Residential energy codes are critical to market transformation. As states adopt more progressive energy codes, the industry must raise the bar to meet increasingly stringent energy efficiency requirements. While increasing the overall efficiency of the housing stock, progressive energy codes also encourage industry professionals to expand their skill sets to design, specify and construct more efficient, higher performing buildings for the community.

Energy code adoption in the Southeastern U.S. is still a work-in-progress. Alabama adopted its first state energy code (IECC 2009) in October 2012, and Mississippi has yet to adopt a residential energy code. That said, there has been significant progress in the Southeast in the last five years, and many states continue to raise the bar. However, it is important to note that states often adopt amendments to model codes which typically lessen the requirements. Figure 2 summarizes residential energy code adoption in Alabama, Georgia, North Carolina and South Carolina for the scope of this research project.

Literature Review

The following pages reflect a literature review analysis considering existing literature on qualitative and quantitative findings of energy efficiency, green building, sustainable development, and subsequent potential financial and social benefits realized by stakeholders including contractors, developers, industry professionals, property manager's residents, and the surrounding community at large.

Energy Efficiency

The impact that energy efficient building design has on housing costs plays a key role in determining the future of energy efficiency policies in affordable housing construction standards. By studying energy efficient building practices and their effect on affordability, there will be a greater understanding of the high performance certifications and rating systems in place today.

Energy Efficiency as an Influencing Factor on Affordability

In general, housing is constructed as inexpensively as permissible for its market type by meeting the minimum requirements for current code standards. This is done in order to keep first costs low, thus ensuring clients' financial accessibility and maximum profitability for developers and homebuyers alike. In the past, little consideration was given towards energy efficiency and the additional expense of operation (primarily conditioning cost) that result from building to minimum standards. As a result, housing built to a target cost point with short-term financial motives and to minimum standards is often not energy efficient. This lack of energy efficiency creates a higher operating cost when compared to high performance construction methods and materials.

Prior works make clear the importance and impacts of energy efficiency (Gillingham, et al., 2009). Energy efficient housing is critical when considering overall energy demand and consumption, as the impacts are complex and far reaching. In addition to environmental and economic implications, the fiscal health of a household can be closely tied to the cost burden of energy expenditures. The energy cost incurred from household operation can be significant; such cost has the potential to create financial hardship for a household. While this is true for all households, irrespective of income level, it holds especially true in the case of low-income households. For these households, the cost of housing alone can require a significant portion of their gross income. It is accepted that housing cost should ideally not be more than 30% of one's gross income; it is often the case that low-income households spend more than 30% of their gross income on housing and associated operating cost (Schwartz & Wilson, 2010).

Today, higher operating cost is a major factor of affordability. Individuals finding themselves on the threshold of affordability can see their energy costs push housing expenditures beyond the normally accepted 30%. The globally trending rise in energy consumption and cost will only further exacerbate the financial burden placed on these individuals if energy costs escalate at the projected exponential rate (DOE, 2011a). As household energy demands fluctuate, dependent on climate conditions, so do monthly energy costs. This erratic monthly variance in the percentage of income allocated for housing is destabilizing to household finances.

Challenge between Household Income and Energy Costs

All households are affected by energy expenditures and the rising cost of energy. However, not all households have the financial means to simply pay more for their required energy expenditures. Therefore, those households with low incomes will be burdened the most by future inflation. Phillips (2005) noted: "as residential energy costs increase exponentially, the burden of these costs will impact all Americans – but the disproportionate negative impact of energy costs will be most severe for low-income Americans." Further, Lee, et al., (1995) noted that lower income households lack access to capital and often have difficulty meeting lenders' qualification, thus being unable or unwilling to pay for efficiency increases. Consequently, their future energy expenses only further reduce the actual affordability of their housing.

In examining the role energy expenditures play in housing affordability, Lee, et al., (1995) calculated energy cost burden accounted for 13% of housing expenditures for households above the low-income level. Comparatively, for a low-income household, 25% of their total housing expenditures are dedicated to energy. Of the total energy consumed, over 40% was consumed by space heating and air conditioning.

The percentage of income that a homeowner dedicates to housing heating and cooling is not uniformly proportional to household income and home size. "There is an inverse relationship between household income and residential energy consumption and residential energy expenditures. Lower income groups consume and expend more per square foot for residential energy than do higher income groups in the United States" (Phillips, 2005). Echoing this relationship, Lee, et al., (1995) noted that low-income households are burdened by residential energy costs more than other households. Their research states "residential energy expenditures are a key determinant of housing affordability; particularly for lower income households… household energy costs continue to place a major burden on lower income families" (Lee, et al., 1995). This burden is only increased by the fact that low-income home buyers often purchase older, smaller homes in poor condition which reflect lower energy efficiency (Collins, et al., 2002).

Studies have shown that households may be forced to forego essentials in order to cover variances in energy bills. Nord and Kantor (2006) observed that seasonal variations in home heating and cooling costs resulted in food insecurity for low-income and poor households. The cost burden of heating and cooling is distributed differently based on region and climate. In the U.S., southern states show a peak of electricity use in winter as well as in summer (DOE, 2012).

It is important to understand how energy efficiency affects the housing cost burden for low and moderately low-income households. With an overall understanding of how energy efficiency affects affordability, it is important to understand how energy efficiency can be monitored through certifications and policies. Certification, rating systems and policies cannot only create incentives but also a platform for monitoring that can shape the development and redevelopment of affordable housing. By utilizing these tools to shape design, subsidy programs like the LIHTC have the potential to lower residents' utility bills and reduce buildings' negative impact on the environment through lower energy and material consumption.

Importance of Energy Efficient Housing

When evaluating the ability to pay housing expenditures, the common measures of affordability presented in the preceding sections consider total housing expenditures inclusive of all utility expenses. "However, the cost burden of these utilities is frequently not given adequate consideration during the construction of a home" (Phillips, 2005). Lee, et al., (1995) noted the cost of energy bills is influenced so strongly by decisions made during design and construction that it necessitates taking a lifecycle perspective when evaluating housing. Lee further stated, "Investment in energy-efficiency measures may increase purchase price, yet decrease future energy bills."

The U.S. Department of Energy (DOE) estimates that the typical household spends approximately 8-14% of their income on energy expenditures. Of this, a third typically is consumed by energy demands for heating and cooling needs (DOE, 2005). This indicates that for the typical American household, heating and cooling costs consume approximately 3-5% of their gross annual income. This percentage is not insignificant when considering the rising housing cost burden. Today, more than one-in-three American homeowners and one-in-two renters are considered to be cost burdened. It is estimated that 12 million renters and homeowners dedicate more than half of their annual incomes to housing expenses.

In a study examining the housing cost burden of Section 8 voucher program recipients, housing cost burdens averaged 36%. This study further indicated that for more than a third of these households their housing cost burden exceeded 40% of their income. Structural and climate differences were attributed to be contributing burden factors. The correlation between housing typology and conditioning costs has long been recognized as a factor affecting affordability.

Green Building Overview

Energy Efficient Certification Programs Overview

Nationally and regionally, independent building contractors and tradespeople are the stakeholders primarily responsible for implementing green buildings in the residential built environment (McCoy, O'Brien, et al., 2012). These stakeholders are also primarily responsible for either veto or endorsement of innovative products, processes and systems in residential construction (Koebel, 2008; Koebel & McCoy, 2006; Koebel, Papadakis, Hudson, & Cavell, 2004; Koebel & Renneckar, 2003; Slaughter, 1993a, 1993b, 1998). According to Ng, et al., 2010, "green building means improving the way that homes and home building sites use energy, water, and materials to reduce impacts on human health and the environment." While the intent and concept are straightforward, early adopters among independent building contractors and tradesmen have recognized a need for communicating specific benchmarks of green building, similar to the "organic" label used for produce. This type of product certification helps to manage expectations, provide measurable deliverables, and establish a metric that can be tied to economic value. Similarly, high performance construction, such as green building certification, establishes expectations, measurable deliverables and metrics for professionals. Product certification and building certification are integral to green building and lend confidence to the risks in implementing a new and relatively unknown system. The industry has moved quickly to address these risks, as almost 50 local and regional green building labeling programs have emerged, many of which shaped national-level programs.

Residential Certifications and Rating Systems

The American Society of Quality defines a certification as, "a formal recognition that an individual (or firm) has demonstrated proficiency within, and comprehension of, a specific body of knowledge." It also can represent qualification of a professional set of standards, commonly related to job requirements or as an extension of education for licensure (DeBaugh, 2005; Mulkey & Naughton, 2005). Regarding the world of energy efficient construction, individuals or firms are often certified as "capable" of performing work within certain standards, but must further have the building certified by a third party observer.

Distinct differences exist between certifications and rating systems. While certifications often require the successful completion of an assessment or examination, rating systems establish a set of standards by which the certified individual or firm must adhere in the process of construction of a certified product (Mulkey & Naughton, 2005; Schoneboom, 2005). Many firms do not place as great a value on individual certification; they rarely represent an assessment of knowledge (Adams, et al., 2004) and, in residential construction, certifying the product, the home, requires an outside entity.

In contrast, rating systems "provide the option for builders, owners, and designers to establish a metric verifying the relative greenness of their homes" (Reeder, 2010). Four leading or emerging systems can currently be considered as specific to the residential construction environment in the Southeast: ENERGY STAR® Certified for Homes program; LEED® for Building Design and Construction: Homes and Multifamily Lowrise/LEED® for Building Design and Construction: Multifamily Midrise (LEED® BD+C: Homes/LEED® BD+C: Multifamily Midrise); The National Green Building Standard™ (NGBS); and the EarthCraft program.

ENERGY STAR® Certified Homes program, established in 1996 as a joint effort of the U.S. Environmental Protection Agency (EPA) and DOE, provides both a rating certification program and energy efficiency training for its 8,400 high-performance builder partners (as of 2010). As a result of program rigor, national brand recognition, and established training quality and qualifications of third party Home Energy Raters (HERS), ENERGY STAR certification has become a core component of many green building programs. The ENERGY STAR program maintains a focus on building science and the analysis of the building as an integrated energy system. It is worth noting that ENERGY STAR for Homes has implemented a 'version 3' update, not considered here, which expands the scope of the program's focus, currently on thermal envelope and HVAC systems, to encompass indoor air quality, water distribution and renewable energy. ENERGY STAR is a U.S. EPA voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency. Learn more at energystar.gov.

Other green building rating certification programs include LEED® BD+C: Homes/LEED® BD+C: Multifamily Midrise, and The National Green Building Standard (NGBS). The U.S. Green Building Council's LEED® green building program is a leading program for the design, construction, maintenance and operations of high-performance green buildings. Learn more at usgbc.org/LEED. While both programs incorporate similar criteria for green building practices, they differ in the emphasis and accountability for these practices, mostly due to the differences in their origination and user base: AIA architects for

LEED and NAHB Contractors for the NGBS. The NGBS is the only residential green building program that has been approved by the American National Standards Institute (ANSI) process as a standard, which is an important first step of the process to building code adoption.

The EarthCraft program, created in 1999 by a partnership between Southface Energy Institute, the Greater Atlanta Homebuilders Association and the homebuilding industry, is regionally-specific to the Southeast United States. According to the program's website, it "introduces green building to the construction industry in a way that could be easily integrated into the building process," making it quite accessible to builders. Since 1999, EarthCraft has become one of the largest regional systems in the country.

Defining High-Performance

Green Building is gaining acceptance as a sign of excellence in the trade, limiting the options in the market for firms who cannot bring these skills to a building project (McCoy, O'Brien, et al., 2012). Energy prices, regulation and health or safety concerns are all factors that increase the need for the adoption of energy efficient and 'green' practices in the building construction field. A powerful and vital tool for achieving the adoption of these practices is to increase the ability for complete analysis, rather than isolated analysis, in building trades and related firms. Such a summary measure would enable stakeholders responsible for the creation and maintenance of the built environment to make informed decisions regarding energy efficiency and green building options, and to communicate these new options effectively across the supply chain.

In contrast, others have realized the importance of defining tools of performance for their industry. Metrics such as the Home Energy Rating System Index (HERS) have become central to customers' ability to comfortably make purchasing decisions and trust in these decisions (for example, imagine buying an automobile without the miles per gallon, or mpg, calculation). While the U.S. Department of Energy (DOE) is currently making strides in this area through its Home Energy Score (www1.eere.energy.gov/buildings/residential/hes_index.html), no mpg exists for the homebuilding industry - let alone a Corporate Average Fuel Economy (CAFE) standard to drive future behavior.

By exploring concepts of performance within the realm of residential construction, this research can better inform energy efficiency policies for affordable housing development. According to Adomatis (2010), "the concept of ensuring performance in housing contains roots in the business concepts of quality and customer satisfaction" (Adomatis, 2010). Performance is integral to the assurance of quality in housing, which might in turn lead to satisfaction. Quality is subjective, though, and may be understood differently by consumers within and across markets. Summary measures of performance reduce speculation of quality for a product/service, a major barrier in the adoption and diffusion of green technology.

High-Performance Housing

Many have attempted to define high-performance housing, often contributing to confusion for the market. While designers and builders might define high performance buildings as ones that use innovative appliances and technologies, Turner and Vaughn (2012) warns a high performance house is not necessarily a "high tech" one (sensors and programmable appliances and equipment are likely to be common features in the near future). The current

building sustainability literature considers consensus-based metrics (i.e., LEED, NGBS) to evaluate features in a green building project related to specific key indicators (i.e. energy efficiency, IAQ, site use, and others). Building performance is another focus area in the sustainable building literature that examines energy consumption, utilities, operations and maintenance, and occupant health (Fowler, et al., 2005), making it critical to evaluate the designed building's performance after construction.

It seems necessary given the array of rating systems and their differing emphases to define terms for performance in buildings and, as a subset, homes. Lewis, et al., (2010) defined a green building as one "that is designed, constructed and operated to minimize environmental impacts and maximize resource efficiency while also balancing cultural and community sensitivity" (Lewis, et al., 2010). In the same article, sustainability is defined as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. As some may argue that these definitions are more theoretical than practical, within industry these definitions have often been applied while considering the triple bottom line: balancing environmental, economic, and social goals (Hodges, 2005; Lewis, et al., 2010).

The fifth edition of The Dictionary of Real Estate Appraisal (2010) describes green design and construction as the "practice of developing new structures and renovating existing structures using equipment, materials, and techniques that help achieve long-term balance between extraction and renewal and between environmental inputs and outputs, causing no overall net environmental burden or deficit" (Appraisal Institute, 2010). The United States Energy Independence and Security Act (2007), defined a high performance building as "a building that integrates and optimizes on a lifecycle basis all major high performance attributes, including energy [and water] conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations."

Just as in commercial building, a high performance home might be a certified home but every certified home is not necessarily a high performing one. According to Korkmaz, et al., (2010), green, sustainable, and high-performance homes are designed and constructed to maximize the energy efficiency of the envelope, mechanical and lighting systems to provide superior quality in the indoor environment for enhancing occupant well-being (Korkmaz, et al., 2010). Such buildings are being widely adopted for their potential to reduce energy costs and improve the health and productivity of occupants. For example, Talbot (2012) and Turner and Vaugh (2012) pointed out high performance housing characteristics for low to middle-income households as requiring planning, creative and innovative design, and efficient implementation. A high-performance house may also need to fit into federal and state goals, local law or others' needs (the home buyer, architect, builder or manufacturer).

High-performance houses are not necessarily easy to embrace, either. One of the primary barriers in the market is the owner's perception of higher first costs associated with these homes due to added personnel hours and use of innovative materials and technologies (Konchar & Sanvido, 1998). Again, the process used to deliver green building projects can be a remedy

to this problem (Beheiry, Chong, & Haas, 2006; Lapinski, Horman, & Riley, 2006). Defining green building systems and performance could alleviate risks and remedy concerns for stakeholders involved.

An inclusive and comprehensive definition is first needed for high performance in housing. Literature suggests that there is not a standard definition; all emphasize energy efficiency, sustainability, and environmentally friendly products (Adomatis, 2010, 2012). In general, homes that can be described as high-performance are: 1) safer and healthier; 2) more energy and resource efficient; 3) more durable; and 4) more comfortable. Recent literature suggests that many professionals are now defining their practices as green without utilizing the prescriptive systems that avow these methods, though (Quirk, 2012; Tucker, et al., 2012)). Understanding the gap between prescribed methods and those that might be considered green best practice is a necessary step.

Sustainable Development Trends

There is momentum towards sustainable development within various industries: construction and development, real estate, and regulatory organizations. According to a general survey representing several industries, 94% of all survey respondents felt trends in sustainable building were growing (Jackson, 2009). Additionally, many representatives within the construction and building industry have been exposed to green building projects. Approximately 67% have completed a LEED or EarthCraft project and 21% plan to pursue a green building certification (Ahn, et al., 2007). Furthermore, sources of green building knowledge are expanding; the majority of industry stakeholders have been exposed to green building knowledge through conferences, trade publications, internal research, consultants, and new employees (Ahn, et al., 2007).

From a statistical perspective, ENERGY STAR® Certified Homes program dominates the rating certification program market, with more than 126,000 new homes certified in 2010 alone, bringing the total number of ENERGY STAR qualified homes to nearly 1.2 million to date. By comparison, LEED® BD+C: Homes/LEED® BD+C: Multifamily Midrise has a total of 79,665 certified units (total since 2005 pilot program, count updated 8/26/2015) and Home Innovation NGBS Green Certified™ has certified a total of 36,466 units (since ICC 700 Standard in 2007). Among the top three, McCoy, et al., (2012) found several barriers specific to green building rating systems: Training is typically geared toward a specific rating certification and the tendency is to focus on earning "points," rather than the implementation of broader sustainability concepts. Categorization of points is by trade, which reinforces a "silo" approach to construction rather than the integrated approach to sustainability issues; green building training does not cover production management, or building systems approaches; Building science training is well developed in ENERGY STAR certification, but limited in most green building training (McCoy, et al., 2012). The EarthCraft program does provide building science-based training and educational resources specific to the Southeast climate. EarthCraft has certified over 35,000 homes (single family homes and multifamily units) across the Southeast.

Utilization of green building certification programs is growing. According to the U.S. Green Building Council's (USGBC) 2014 3rd Quarter report, the number of LEED® BD+C: Homes and

Figure 3: Number of LEED® BD+C: Homes/LEED® BD+C: Multifamily Midrise Certified and Registered Projects 2004 to 2014 (USGBC, 2015)

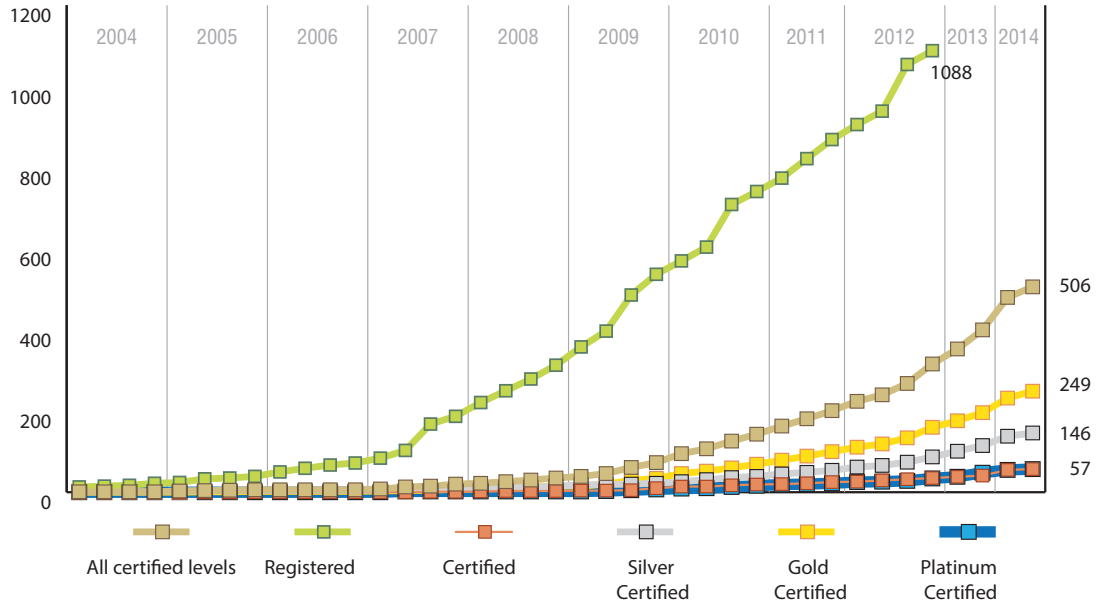
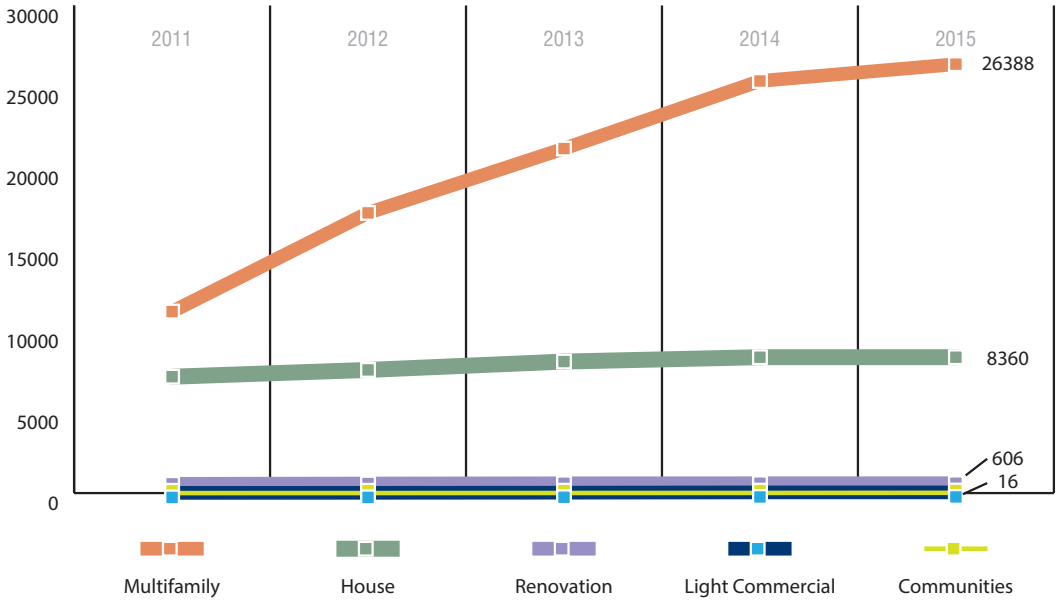


Figure 4: Number of EarthCraft Certified Projects 2011 to March 2015 (Southface, 2015)



BD+C: Multifamily Midrise-Certified projects totaled 506 and the number of registered projects totaled 1,088 (Figure 3) (USGBC, 2014). EarthCraft, a Southeast regional green building program, is also growing, most notably in the multifamily, low-income housing market. As of March 2015, 35,412 total projects are certified (Figure 4) (Southface, 2015).

A large portion of the growth in green building is due to legislative movements towards subsidized housing within the affordable, low-income housing sector. Green building has become a fundamental component to QAPs (Fuhry, 2013). In 2013, approximately three quarters of all state agencies incorporated smart growth and responsible property investing into their QAPs. These principles place emphasis on transit-oriented development, energy efficiency standards, and urban regeneration and redevelopment. More than half of state agencies have also included resource conservation and health protection policies into their QAPs (Fuhry, 2013). To qualify a project for LIHTC, a builder or developer must meet the state's QAP requirements. By 2013, QAP funding for affordable housing projects were allocated the most to smart growth principles and energy efficiency (Figure 5).

Green Premiums and Return on Investments

Perceptions of upfront costs on green services and products have clouded the hard facts of investing in green building elements due to the lack of data, particularly long-term data. Perceptions have led to the belief that green premiums tend to be 11% greater for LEED and ENERGY STAR® projects (Jackson, 2009). However, hard facts have driven conclusion that with experienced developers and builders, LEED construction

premiums can be as low as 1%, and ENERGY STAR can be as low as 0.5% (Figure 6) (Jackson, 2009).

Looking more closely at LEED certification-levels and their average green premium costs, merely 1.84% of construction costs have a premium associated with installation of green elements (Figure 7) (Ahn, et al., 2007).

Initial upfront costs for green construction projects are indeed greater than traditional construction projects, but cost-benefits are achievable on the operational side. For example, LEED and ENERGY STAR buildings often command higher rental rates, have lower vacancy rates, and have higher resale values (Choi, 2009). Rent premiums can range from 4.4% to 51% and occupancy premiums can range from 4.2% to 17.9% (Jackson, 2009).

Figure 6: Incremental Costs of Sustainability Certification as a Percentage of Construction Cost (Jackson, 2009)

	Low	Mean	High
LEED	1.0	3.0	5.0
ENERGY STAR	0.5	1.5	2.5

Experienced green developers have found ways to incorporate green elements into their affordable housing projects in cost effective ways. Many experienced developers carefully select sites to benefit costs, by choosing a site that is walkable to transit and services. Also, some developers have been able to invest in water conservation elements for each affordable housing unit with as little as $83 per unit. In general, projects with higher return on investments and shorter payback periods are achieved through efficient systems and thus lower utility costs (Enterprise, 2012).

Figure 5: QAP Trends (2006 – 2013) (Global Green QAP Analysis, Fuhry, 2013)

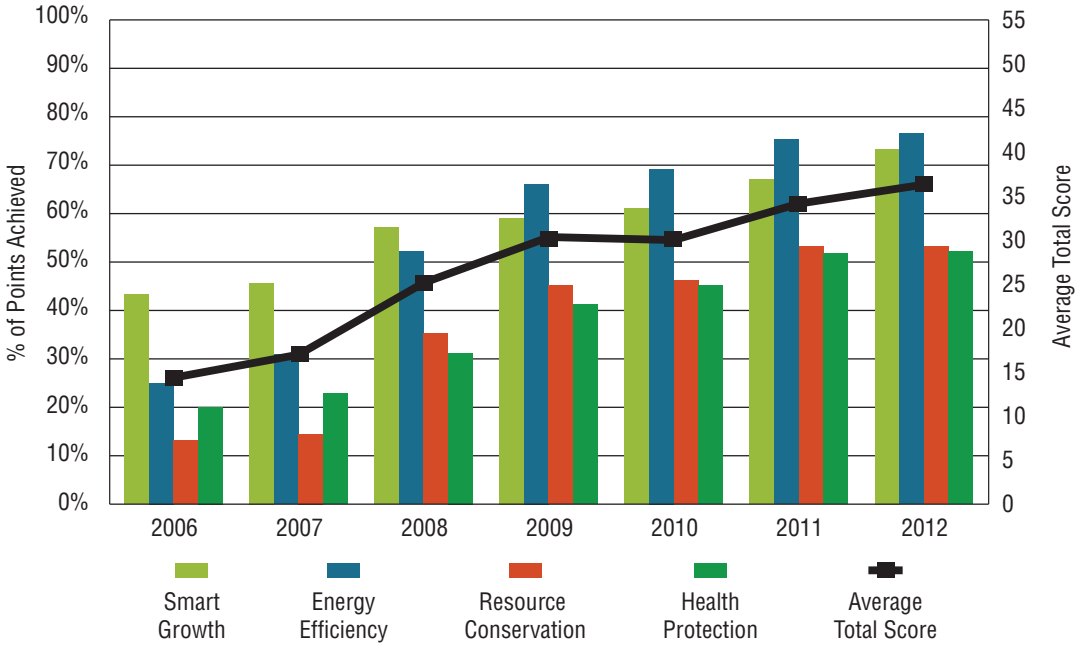


Figure 7: Level of Green Standard and Average Green Cost Premium (USGBC, 2003; Ahn, et al., 2007)

Level of Green Standard	Average Green Cost Premium	Number of Study
LEED 1 - Certified	0.66%	8
LEED 2 - Silver	2.11%	18
LEED 3 - Gold	1.82%	6
LEED 4 - Platinum	6.50%	1
Average of 33 Buidings	1.84%	Total: 33 studies

Source: USGBC, Capital E Analysis (Kats 2003a)

Reduction of Operations and Maintenance Costs

One of the greatest benefits of integrating sustainability features into multifamily housing is the reduced operating and maintenance costs. Operation and maintenance expenses include utilities (electricity, gas, water, and waste removal), cleaning practices, any type of energy-saving device usage, and anything else that is required to run the building and procedures (Miller, et al., 2010). Including all sustainability measures during the design and construction phases reduces both maintenance and operating costs. Incorporating efficiency in infrastructure, downsizing mechanical and electrical equipment, taking advantage of as much natural light as possible, installing low flow and no flow plumbing fixtures, using reclaimed and recycled materials, and much more can all positively impact the operating and maintenance expenses (Nalewaik, 2009).

Buildings implementing green building measures such as intentional site design and solar orientation can reduce their energy use by 10-40% (Wollos, 2011). The benefits of reduced operating costs found in green affordable housing reach beyond energy efficiency. Affordable housing developments implementing green design and construction measures show an increase in resident retention (Campbell, 2014). Retaining high quality residents not only improves the overall quality of the community, but can save building owners substantial amounts of money, time and stress.

When comparing ENERGY STAR® and LEED buildings, the operating costs are evaluated differently because of the program differences. ENERGY STAR focuses on energy performance, whereas LEED addresses a breadth of sustainability aspects including: energy performance, community integration, site planning, etc. (Miller, et al., 2010). A variety of studies between ENERGY STAR and non-ENERGY STAR buildings have shown that operating expenses are lower for ENERGY STAR buildings (Figure 8). These numbers reflect all energy efficient aspects installed in each building.

This reduction in costs increases cash flow for property management. The lower the operating costs, the stronger the cash flow becomes (Pivo, 2013). In one case study, a building retrofit when compared to conventional buildings of similar size, used 42% less energy and 34% less water (Nalewaik, 2009), thereby reducing their operating costs. In the same case study, sustainable landscaping and water conservation reduced the amount of time and money spent maintaining the property, which further reduced costs and increased savings.

Figure 8: Comparison of Operating Expenses (price per square foot) between ENERGY STAR and Non-ENERGY STAR Buildings

Operating Expense	Electricity	Gas	Water	Waste Removal
The Subject Group: ENERGY STAR Buildings	1.84	0.14	0.13	0.07
The Peer Group: Non-ENERGY STAR Buildings	2.19*	0.22*	0.15	0.07

*Note: The number is significantly different from the Subject Group at the 10% level. (Miller, et al., 2010)

Reduction of Tenant Turnover and Crime Rates

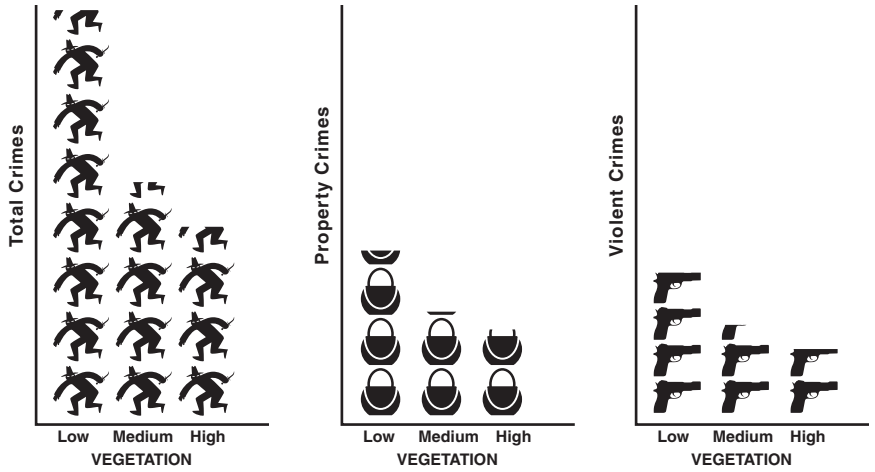
In addition to a reduction in individual and business operating costs, access to intentional greenspace, such as tree-canopied courtyards and community gardens, in multifamily housing developments has been correlated with a reduction in crime and an improvement of individual and community connectivity. For example, intentional vegetation draws people outside, creates a space for interaction and can increase residents' informal surveillance of the area (Kuo, 2001; APA, 2003).

An extensive study shows that levels of aggression and violence were systematically lower for individuals living in properties with intentionally landscaped surroundings than individuals living in barren surroundings; moreover, lack of nature significantly predicted levels of mental fatigue, which in turn significantly predicted aggression (Kuo, 2001).Total crime in complexes with high vegetation (mature trees and grass) was more than 55% lower on average, than when compared to complexes with low vegetation, or barren courtyards (Figure 9) (Kuo, 2001).

Even slight reductions in violent and property crime rates can have substantial impacts on resident, property and civic costs. In 2010, violent crime (murder, rape, assault and robbery) cost Americans more than $42 billion in direct costs (Shapiro, et al., 2012).

From the above, it is easy to recognize the quantitative benefits linked with access to natural settings. Numerous studies report the extensive positive impacts of access to natural settings and daylight such as: promoting neurological health, improving moods, reduction of attention deficit hyperactivity disorder

Figure 9: Mean Number of Crimes Reported per Building for Apartment Buildings with Different Amounts of Vegetation (each icon represents one reported crime)



(ADHD), increased healing, increased alertness and reducing stress (Beatley, 2011; Heerwagen, 2009).

The qualitative impacts of green building reach far beyond the site. Occupants living in multifamily residences having undergone recent green standard renovations have reported improvements in their quality of life such as enhanced comfort, quietness and operating performance (Bradshaw, et al., 2005). These benefits have been linked to a tighter building envelope, increased ventilation and better HVAC requirements found in green design and construction (Breysse, et al., 2011). In addition, enhanced material standards in green buildings, reduced exposure to overall toxins (Bradshaw, et al., 2005), further improves the quality of life for residents. When evaluating the actual monetary-impact of green building, it is important to realize that the seemingly qualitative benefits associated with building improvements have dramatic quantitative monetary benefits as well.

Other Challenges

A significant barrier to quantify upfront green development costs and payback periods can be attributed to the lack of knowledge and information. These knowledge gaps are outcomes from unreliable performance metrics and inadequate data collection. In order to justify initial investments for green projects, the industry stakeholders and consumers need to be more informed with such hard facts and data (Choi, 2009). A second challenge the industry faces is ensuring an effective strategy to educate residents on the importance of how to appropriately operate the less visible features of a home, such as HVAC systems, and not the immediate, visible and more aesthetic features of the home. Since many uninformed consumers and residents are responsible for operating building systems, operating and maintenance costs can be costly when the systems are not used as designed (Choi, 2009; Watson, 2009).

In addition to having educated contractors, managers and residents, relationships between these groups need to be strong and allow for information to pass through communication channels. For example, during the green affordable housing development process, many players are involved, including third parties; therefore roles and responsibilities are dispersed, especially if the project is new construction with multiple phases. Due to the amount of players involved, number of phases within the project, and experience levels with green building practices, there is a large amount of disparity within stakeholder relationships (Watson, 2009). Despite this common challenge, it is important to highlight the potential financial and qualitative benefits that an integrated design and participatory process can have on green affordable housing development. Collaboration with developers, operators, design, construction and public health professionals as well as residents throughout the design and construction process continues to hold promise for improved health, quality of life and optimized energy conservation (Breysse, et al., 2011).

Another challenge green affordable housing developers, builders and contractors face includes federal, state, and local regulations. Developers and builders planning to attain LIHTC are subject to more stringent requirements. Developments that are publicly funded are subject to more stringent requirements under regulations when compared to conventionally financed developments (Watson, 2009). Complexities increase due to variation in regulations on a state level due to a lack of consistency between each state's regulations, goals and incentives (Watson, 2009).

Lastly, investment recovery issues can arise throughout a green affordable housing development's lifespan. The initial upfront costs to implement sustainability features are higher than conventional affordable housing developments (Watson, 2009), although the literature shows it as marginal. Furthermore, return on investment for developers who install more expensive and efficient HVAC systems can be absent if they are not paying the utility costs after occupancy, but the proportion of rent vs. utility allowance can be increased with more efficient units and lower utility costs.

Methodology

The research team considered existing peer-reviewed literature, research papers, reports, policies and planning documents related to: affordable housing, sustainable development, green building, operations and maintenance, energy and water efficiency, construction and development costs, green premiums, and return on investment. The literature review and stakeholder engagement with industry professionals and associations shaped the research methods, scope, goals and assumptions. A project advisory committee consisting of 7 members with professional backgrounds in multifamily affordable housing development, construction, property management, housing finance administration, academia/research, and consulting was formed to provide insight and feedback into the project scope, methods and research outcomes. The background research and discussions with advisory committee members and other stakeholders determined that additional investigation and research is necessary to enhance our understanding on the efficacy of sustainable development and green building to produce triple bottom line benefits for developers, managers, administrators and residents of multifamily affordable housing in the Southeast U. S., specifically Alabama, Georgia, North Carolina and South Carolina. These states are selected due to their adjacent geographic locations, variation in efficiency and sustainability incentives or requirements in their respective Qualified Allocation Plans (QAPs), consistency in building energy code adoption and climate zones, similar population demographics, organizational experience and network, and mission-based values to conduct research and impact policy in the Southeast region.

Research participants or multifamily affordable developments and their associated owners and managers are identified by reviewing recent QAP and Low-Income Housing Tax Credit (LIHTC) awards during the years of 2009-2012, and outreach to the housing finance agencies (HFAs), to ensure that participating properties are: subsidized as affordable with resident income and rent-restrictions, recently constructed, have at least 12 months of occupancy and utility consumption history, consistency with regard to adopted building energy code and period of economic pricing for goods and services related to construction materials and contract labor. Participants are also identified by development activity across state lines in an attempt to have consistency with regard to construction and development in the sample. Additionally, developments are identified based upon their holding of a green building certification, specifically EarthCraft, ENERGY STAR® Certified Homes program and LEED green building program. For the purposes of this study, green building certification systems are defined as a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements that go above and beyond the respective jurisdictions' adopted energy code and any related amendments.

Achieving a desired level of certification is dependent upon third party verification and testing of installed measures selected in the particular certification program. These green building certification programs are selected due to prevalence in the selected states and respective QAPs as credit scoring incentives or requirements. As Southface is a provider and administrator for the aforementioned green building programs, an organizational project database and network has been reviewed for eligible participants. For comparative purposes, developments that do not have a green building certification, classified in this study as non-green, have been identified.

A specified resident type (senior vs. family), geographic area (urban vs. rural) and construction type (new construction vs. rehab) are not included as initial eligibility requirements due to the impending difficulties to identify, recruit and select the desired number of developments.

Nearly two dozen eligible development companies were identified according to the qualifications above. Eligible developers were contacted via phone and email to determine if they have developments in their portfolio that meet the project qualifications, interest in evaluating the performance of their properties and the capacity to support the project data collection efforts. A total of 16 development companies were contacted directly, although numerous others were indirectly contacted through industry and association outreach assistance. Seven development companies agreed to participate in the study. The research team did not provide a budget to support the staff hours necessary for collection and distribution of data resources by the development and property management companies. The research team guaranteed that all data and personal information collected would be kept private and anonymized in the report.

The research team set a goal of having at least four developments per state and an even distribution of green and non-green developments, for a total of 16 developments. Eighteen multifamily affordable developments participated in the study, two more than anticipated, and 16 were included in the cost analysis. The two rehab developments that were included in the total sample – Green 1 and Green HR, are excluded from the cost analysis on development/construction, operations and maintenance and energy consumption. Totalling nine green developments and 16 overall developments undergoing cost analysis. The rehab developments have been removed from the full cost analysis due to significant differences in building characteristics and cost. However, survey data includes responses from all 11 green developments, including the two rehab developments.

The research team was not able to recruit an even number of green and non-green developments and not all states have the same number of developments, as seen in development summary Figures 15 and 16. The variability in developments is a result of respective state QAP incentives, requirements for green building certification, and both successful and unsuccessful recruitment efforts with development companies in particular states. For instance, the state with the most robust incentives and requirements for green building, Georgia, has the most representation of green building certifications, whereas Alabama, a state with no incentives for green building certification has only non-green developments.

The data presented in this report is collected directly from the developers, contractors, property managers and residents of the sample developments, and adjusted minimally for comparative purposes. The sample data varies with development characteristics, but is more apparent in some than others. Variability is particularly evident when comparing gross square footage and number of units amongst individual developments and across states for green and non-green developments. Consistency of the sample is reasonable with regard to placed-in-service year, QAP award year, urban/rural, building type, construction type, resident type and state electricity averages. Differences related to geography and location such as labor costs and materials have been accounted for by the research team as best as possible. For instance, site development varies significantly when comparing green to non-green developments and is excluded from the cost analysis. In order to maintain consistency of the sample and analysis, location modifiers,

regional and state averages are applied to the development characteristics and analysis as appropriate.

Participating developers and associated property management companies provided the following information and data resources:

- Development & Construction Costs
  - HFA Cost Certifications
  - AIA G702
- Surveys (SurveyGizmo)
  - Development & Construction
  - Construction & Specifications
  - Property Management
  - Resident - HUD Standard
- Operations & Maintenance Costs
  - Budget Reports
  - Financial Statements
  - Account Audits
- Utility Account Tracking (WegoWise)
  - WegoWise Building Template
  - Resident-Paid Accounts - HUD Standard
    - » Utility Account Release Form
  - Owner-Paid Accounts (common areas and master meters)

In order to assess perceptions and administrative impact, multifamily finance and development directors of the state HFAs applicable to the study completed an HFA-specific survey.

The U.S. "HUD standard" multifamily sampling rate[1] is used in data collection efforts related to surveying and collecting utility data from residents.

WegoWise, or Wego (for Water, Electric, Gas and Oil) is an online tool that tracks, monitors and analyzes water and energy use for single buildings and entire portfolios.[2] WegoWise is used to track and analyze at least 12 months of utility data on cost and consumption for in-unit (resident) and common area (owner) accounts.

Developers, property managers and residents received detailed instructions on how to best complete the collection and delivery of the data resources. Materials such as online and print versions of surveys, WegoWise Building Template, utility account release forms, on-site flyers and record keeping sheets were provided to property managers. Once developer-owners provided consent to participate in the study, the majority of interactions on data collection efforts involved the regional and site managers for the properties. Property managers were provided gift cards to award to residents who participated in the sample by completing a survey and utility account release form.

For soft costs described below and analyzed in this study, the team relied heavily on the breakdowns listed in the cost certification document, as no other standard set of soft costs was available. The cost certifications itemize costs for each

1 portal.hud.gov/hudportal/documents/huddoc?id=lbph-39.pdf

2 blog.wegowise.com/2011-06-03-what-is-wegowise

development outside of the hard costs attributed to the direct construction process which are contained within AIA G702s. These soft costs are delineated in the study as:

1) Contractor Services (includes overhead, profit, and general requirements);
2) Professional Services (includes architectural and engineering subcontracts, for example);
3) Pre-Development (includes market studies, environmental reports, site surveys, property/site appraisal and inspections);
4) Site Development (includes site improvements and preparations);
5) Construction Financing (includes construction period financing such as the loan fee, loan interest, legal fee, insurance, and real estate tax);
6) Permits and Fees (local government fees, permanent financing fees);
7) Developer Fees; and
8) Start-up and Reserve Fees (marketing, rent-up reserves, operating deficit reserve, replacement reserve, third party certification) for the development.

Regarding detailed secondary costs for the operation and maintenance (O&M) of properties, the research team divided costs into basic areas that we considered important, but that could also be reported reasonably by managers of buildings. These areas include:

1) Total Annual O&M Cost;
2) Total Maintenance Cost;
3) Total Utilities Cost; and
4) Total Administrative Cost.

All soft and hard hosts are compared as totals and normalized by gross square footage (sf) in the development.

When comparing hard and soft costs across projects, the project team elected to use the Construction Specifications Institute (CSI) Master Format system. CSI Master Format organizes buildings into "divisions of work" as separate components of a complete construction scope of work and the direct costs involved. These divisions allow our work to also compare locally or nationally on average.

For multifamily projects, RS Means costs data organizes the CSI Master Format as six major areas of construction work or hard costs:

1) Substructure;
2) Shell;
3) Interiors;
4) Services;
5) Equipment and Furnishings;
6) Special Construction; and
7) Other.

All hard costs that do not fit within these areas of work are listed as "other" (#7) hard costs for our research. Figure 10 provides some examples of each area of the divisions of work related to hard construction costs.

Researchers used RS Means to compare regional data from green-certified and non-green buildings to national averages. RS Means contains non-green and green costs for various project types, of which the costs provided correspond with the CSI Master Format divisions of work. Non-green costs are available for both low-rise (typical size 22,500 sf) and mid-rise

(typical size 60,000 sf) multifamily apartment buildings; however, RS Means does not provide such costs for green low-rise and mid-rise multifamily apartment buildings. In order to provide a comparison of the sample development costs to green national averages as well as non-green national averages, a "green modifier" has been created by identifying the increase or decrease in typical costs across green vs. non-green projects reported by RS Means. More specifically, the green and non-green development costs included in RS Means and considered to represent multifamily apartment buildings most accurately out of the green and non-green costs available from RS Means are used to create the modifier, with that being a low-rise and mid-rise college dormitory. This modifier is then applied to the non-green low-rise and mid-rise apartment building costs given by RS Means in order to estimate the green costs for each type of development by CSI division. In summary, non-green national average costs are reported directly from RS Means, while the green national average costs are estimated using the "green modifier" developed by the project team.

It was also necessary to adjust national averages accordingly for location as well as size to ensure a more accurate comparison was being made. RS Means provides a location cost modifier that adjusts the national average cost given to a specific city. If a city being included in the study is not reported by RS Means, the closest location available is used instead. For example, the location of Green 7, does not have a location cost modifier reported in RS Means to appropriately adjust the cost. In this case, the closest city available with a location cost modifier was used, that being Raleigh, NC. When adjusting for size, a size cost modifier provided by RS Means is similarly used and applied to the costs to gain a more accurate national average estimate. To attain this modifier, first, each development's total square footage is divided by the typical size for each development type, either low-rise (22,500 sf) or mid-rise (60,000 sf). This provides a size factor that is then used to identify the appropriate size cost modifier.

Figure 10: RS Means Division of Work

DIVISION OF WORK	EXAMPLE
Substructure	Foundations, Basements, Walls and Slab-on-grade.
Shell	Floor and Roof construction, Exterior Walls, Windows, Doors, and Roof Openings/Coverings.
Interiors	Partitions, Doors, Stairs, Finishes, Flooring and Ceilings.
Services	Elevators and Escalators, Plumbing, HVAC, Electrical and Fire Protection.
Equipment and Furnishings	Commercial, Institutional, Vehicular and Other Equipment.
Special Construction	Integrated or Prefabricated Construction and Special Facilities.
Other	Features outside of typical specifications and code for standard, new construction.

Figures 11 and 12 depict the values used to calculate national average costs that are used to compare each development. The RS Means Cost is multiplied by the size cost modifier and location cost modifier to obtain the final adjusted RS Means cost. The final non-green development costs vs. final adjusted RS Means non-green development costs, and the final adjusted RS Means green costs vs. each green development cost is reported in the findings section.

Utility consumption and cost data for energy, water and natural gas (one building meter) is collected via the WegoWise Building Template and utility account release forms for owner and resident-paid accounts respectively. Additionally, the template is used to sync online utility accounts with WegoWise and to track entire building meters for owner-paid water and common

Figure 11: RS Means Green Average Cost

Development Name	RSMeans Green Modified Hard Cost / sf	Typical Size Gross sf	Size Factor	Size Cost Modifier	Location Cost Modifier
Green 2	$139.21	22,500	3.37	0.91	0.80
Green 3	$139.21	22,500	8.99	0.90	0.87
Green 4	$139.21	22,500	3.07	0.915	0.80
Green 5	$140.34	60,000	1.85	0.95	0.86
Green 6	$140.34	60,000	1.72	0.96	0.86
Green 7	$139.21	22,500	3.31	0.91	0.86
Green 8	$139.21	22,500	1.81	0.95	0.80
Green 9	$139.21	22,500	2.12	0.935	0.80
Green 10	$139.21	22,500	3.79	0.90	0.85

Figure 12: RS Means Non-Green Average Cost

Development Name	RSMeans Non-Green Cost / sf	Typical Gross sf	Size Factor	Size Cost Modifier	Location Cost Modifier
Non-Green 1	$128.98	22,500	1.79	0.96	0.75
Non-Green 2	$128.98	22,500	2.66	0.92	0.72
Non-Green 3	$128.98	22,500	2.56	0.92	0.81
Non-Green 4	$128.98	22,500	2.07	0.94	0.75
Non-Green 5	$128.98	22,500	4.85	0.90	0.76
Non-Green 6	$128.98	22,500	2.79	0.915	0.94
Non-Green 7	$128.98	22,500	2.65	0.92	0.79

area (community space, corridors and maintenance) meters for electricity. However, it should be noted that water data is excluded from our data analysis due to missing information and unverified data across the sample. Our team obtained in-unit data from resident-paid electric accounts through the utility account release form. In the absence of an online utility account, the research team registered dummy accounts with the utility service provider when online access to utility data history is available, typically unavailable in rural locations. When online utility account history was unavailable, the property management companies provided detailed usage reports in order to manually upload 12 months of data. Once the researchers collected and registered all utility accounts from the owner-manager and residents, the team uploaded the accounts to WegoWise for tracking and benchmarking.

The research team developed surveys for all affordable housing stakeholder groups in order to solicit both qualitative data with regard to experience and perception, as well as quantitative data related to development and construction, administration, and operations and maintenance. Online and print versions of the surveys were made available. Respondents to the Developer/Builder, Construction and Specifications, Property Management and HFA surveys completed online versions via Survey Gizmo. More than half of the 648 resident surveys collected were completed in print and scanned for entry into the online system by the research team, nearly all senior and elderly residents completed print versions. In terms of respondent distribution, each property owner and manager for participating developments completed an applicable survey and surveys were also distributed to a larger pool of unaffiliated multifamily affordable property owners and managers to increase the sample size and response rate. The number of resident surveys to be completed per development is determined by the total number

of units and the "HUD standard" (ex. 100 total units = 45 units to be sampled). It should be noted that not all developments achieved the desired sampling rate and some developments exceeded the requested sample size. The various surveys used in the study are described in the findings section. Sample versions of the survey instruments can be found in the Appendix.

Accessing and collecting data was the most time consumptive process of the project, particularly with regard to resident surveys and utility accounts. In the absence of mandatory property management requirements for residents to complete surveys and utility account release forms as requested, it was exceedingly difficult for some properties to complete the necessary sample size, even with a gift card incentive and privacy guarantee to not share any personal information and anonymous results. Difficulty in collecting data was not exclusive to residents. Property owners (developers) and managers had difficulty gathering and completing utility account information and building characteristics that are necessary to upload data and information to WegoWise in order to track utility data. The majority of owners and managers are not familiar with utility tracking and benchmarking software, and some technical assistance was necessary.

Figure 13 displays the project timeline for completing the research project tasks as described.

The map on the next page (Figure 14) shows the geographic distribution of participating developments, green and non-green status, and a base layer displaying median household income.

The research team evaluated data on development, construction and operational costs for both green-certified and non-green

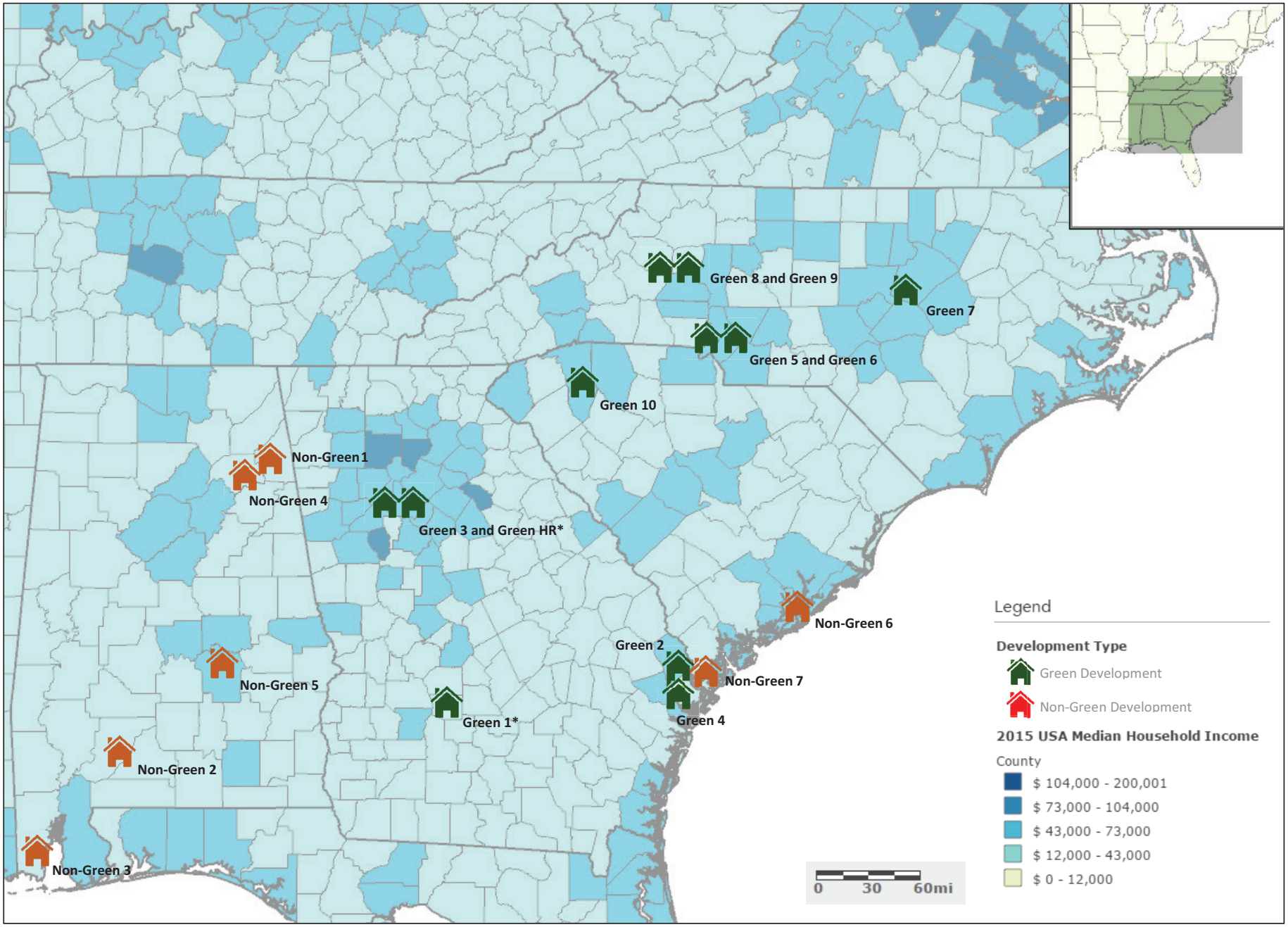
Figure 13: Project Task Timeline

Description	Timeframe
Preliminary Analysis	July 2014 - September 2014
Partner Recruitment & Engagement	July 2014 - February 2015
Research Design	September 2014 - February 2015
Development Identification & Data Access	October 2014 - August 2015
Data Collection & Research Analysis	January 2015 - August 2015
Final Report	July 2015 - August 2015
Stakeholder / Industry Communications	July 2014 - August 2015

developments in four Southeastern states: Alabama, Georgia, North Carolina and South Carolina. As seen in Figures 15 and 16, a total of 18 developments participated in the research project. We excluded two of the 11 green-certified developments. These two green developments are the only renovation properties represented in the sample; therefore, the research team determined that the work scope and performance differences between new and rehabilitated properties offered too many variables to directly compare construction and utility data. However, survey responses from developers, property managers and residents of the two green renovation properties have not been excluded from the survey results. A total of 16 developments, nine green building program certified and seven non-green are included in the full study analysis.

These 16 developments undergoing full analysis are characterized by a range of square footages between 40,000 sf and 200,000+ sf, apartment units range between 40 and more than 150, urban/rural locations, family/senior resident types, low-rise and mid-rise building types and state electricity averages (U.S. EIA). The study sample contains a high amount of variability from dissimilarities of building characteristics and geographic location, and as such, there are limitations to the

Figure 14: Green and Non-Green Developments Map



*Green 1 and Green HR are excluded from the cost (construction, O&M and utility) analysis

Figure 15: Green Developments Characteristics

Name	Certification	Placed in Service	QAP Award Year	State	Urban/ Rural[3]	Gross sf	Number of Units	Building Type	Construction Type	Resident Type	State Electricity Avg.[4]
Green 1*	EarthCraft & ENERGY STAR	2012	2009	GA	Rural	32,830	46	Low-Rise	Acquisition Rehab	Elderly	1,088 kWh/mo. $0.1146/kWh $124.67/mo.
Green 2	EarthCraft	2012	2010	GA	Rural	75,803	60	Low-Rise	New Construction	Family	1,088 kWh/mo. $0.1146/kWh $124.67/mo.
Green 3	LEED	2011	2009	GA	Urban	202,343	156	Low-Rise	New Construction	Family	1,088 kWh/mo. $0.1146/kWh $124.67/mo.
Green HR*	LEED	2014	2011	GA	Urban	59,368	90	High-Rise	Historic Rehab	Supportive Housing	1,088 kWh/mo. $0.1146/kWh $124.67/mo.
Green 4	EarthCraft & LEED	2012	2010	GA	Rural	69,075	50	Low-Rise	New Construction	Family	1,088 kWh/mo. $0.1146/kWh $124.67/mo.
Green 5	EarthCraft	2013	2011	NC	Urban	111,000	110	Mid-Rise	New Construction	Senior	1,098 kWh/mo. $0.1097/kWh $120.52/mo.
Green 6	EarthCraft	2014	2012	NC	Urban	103,300	74	Mid-Rise	New Construction	Family	1,098 kWh/mo. $0.1097/kWh $120.52/mo.
Green 7	ENERGY STAR	2012	2010	NC	Rural	74,444	64	Low-Rise	New Construction	Senior	1,098 kWh/mo. $0.1097/kWh $120.52/mo.
Green 8	EarthCraft	2012	2010	NC	Rural	40,720	40	Low-Rise	New Construction	Senior	1,098 kWh/mo. $0.1097/kWh $120.52/mo.
Green 9	ENERGY STAR	2011	2009	NC	Rural	47,784	40	Low-Rise	New Construction	Family	1,098 kWh/mo. $0.1097/kWh $120.52/mo.
Green 10	ENERGY STAR	2012	2011	SC	Urban	85,327	60	Low-Rise	New Construction	Family	1,124 kWh/mo. $0.1199/kWh $134.86/mo.

*Green 1 and Green HR are excluded from the cost (construction, O&M and utility) analysis

3 www.census.gov/geo/reference/ua/urban-rural-2010.html

4 www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls

Figure 16: Non-Green Developments Characteristic

Name	Placed in Service	QAP Award Year	State	Urban/ Rural	Gross sf	Number of Units	Building Type	Construction Type	Resident Type	State Electricity Avg.
Non-Green 1	2012	2011	AL	Rural	40,367	40	Low-Rise	New Construction	Elderly	1,211 kWh/mo. $0.1126/kWh $136.36/mo
Non-Green 2	2010	2009	AL	Rural	59,806	56	Low-Rise	New Construction	Elderly	1,211 kWh/mo. $0.1126/kWh $136.36/mo.
Non-Green 3	2012	2010	AL	Urban	57,613	51	Low-Rise	New Construction	Elderly	1,211 kWh/mo. $0.1126/kWh $136.36/mo.
Non-Green 4	2011	2009	AL	Rural	46,630	40	Low-Rise	New Construction	Elderly	1,211 kWh/mo. $0.1126/kWh $136.36/mo.
Non-Green 5	2011	2009	AL	Urban	109,232	96	Low-Rise	New Construction	Family	1,211 kWh/mo. $0.1126/kWh $136.36/mo.
Non-Green 6	2011	2009	SC	Urban	62,873	46	Low-Rise	New Construction	Family	1,124 kWh/mo. $0.1199/kWh $134.86/mo.
Non-Green 7	2010	2009	SC	Rural	59,543	50	Low-Rise	New Construction	Family	1,124 kWh/mo. $0.1199/kWh $134.86/mo.

analytical process and data findings. All properties are privately owned, operated and subsidized as affordable with income and rent restrictions, utilizing the Low-Income Housing Tax Credit (LIHTC) and other local, state (HFA) and federal (HUD) subsidy programs. All developments are recently constructed and placed in service (occupied) from 2010-2014 to maintain consistency with QAP policies, energy code adoption and to ensure at least 12 months of utility data history is available.

Findings

The research findings in this section are categorized into three subsections. The first section reviews the results of several stakeholder surveys intended to gauge participants' experiences with and perceptions of green-certified developments. The second section compares construction, operations and maintenance costs across our sample to determine the true cost of green in the Southeastern affordable housing market. The third section compares one year of utility data (electricity) for low-income residences in these developments to analyze the energy performance of the green-certified and non-green developments.

Stakeholder Surveys

In an effort to understand the perspective of those involved in the affordable housing process, the research team surveyed residents, developers, property managers, and housing finance agency representatives via online and print surveys. The populations surveyed represent the lifecycle of the affordable housing process, from financing through design, construction, operations, maintenance and the daily use of these developments. The research team developed surveys to gain an understanding of each group's experience with green and non-green buildings as well as their perceptions related to cost, value and quality of green building certifications in the affordable housing sector.

Resident Survey – Resident Behavior and Perceptions on Comfort and Affordability

Determining the perception of residents is a key variable in understanding affordable housing innovation. Resident behavior and experience provides valuable feedback and context to this study, helping to identify how the end-user operates in and perceives their home. To determine the impact of green building, we polled 416 residents living in green-certified developments and 232 residents living in non-green developments. The following section presents findings from this survey.

In order to obtain data related to resident experience, the survey polled residents regarding their experience with their current and previous housing related to cost, comfort, operations and satisfaction. A majority of the current residents living in green-certified affordable housing responding to our survey did not live in affordable housing previously. When asked if their previous home was an affordable development, 29% of residents replied yes, 57% replied no and 14% answered I do not know (Figure 17).

Similarly, a majority of the residents living in conventional or non-green affordable housing reported not living previously in affordable housing. When asked if their previous home was an affordable development, 21% of residents replied yes, 57% replied no, and 22% answered I do not know (Figure 18). The similarity of responses for residents of green and non-green developments indicates that the overall sample did not previously live in an affordable development and establishes a comparative baseline for questions regarding previous and current affordability.

In order to determine the performance and characteristics of their previous home in relation to their current home, the survey showed that a majority of the residents currently living in green affordable housing did not previously live in green housing.

When asked if their previous home was a green development, 5% of residents replied yes, 62% replied no and 33% answered I do not know (Figure 19).

Similarly, a majority of residents currently living in non-green affordable housing also reported not previously living in green housing. When asked if their previous home was a green development, 5% of residents replied yes, 71% replied no and 24% answered I do not know (Figure 20).

Survey findings also suggest that a majority of residents currently living in green affordable housing consider their green housing to be much more affordable than their previous home. When asked about current overall affordability (rent + utilities) compared to previous home, 62% of residents replied much more affordable, 31% replied about the same and 7% answered much less affordable (Figure 21).

A similar, but smaller majority of residents living in conventional or non-green homes considered their current home to be much more affordable than their previous. When asked about current

Figure 17: Is Your *Previous* Home an Affordable Development?

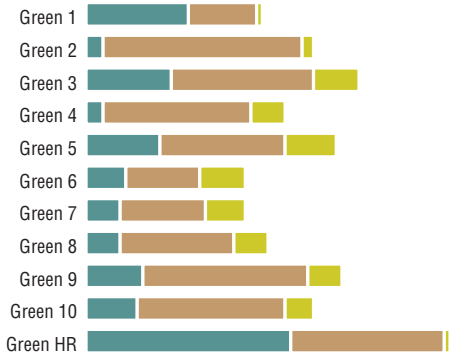


Figure 18: Is Your *Previous* Home an Affordable Development?

Figure 19: Is Your *Previous* Home a Green Development?

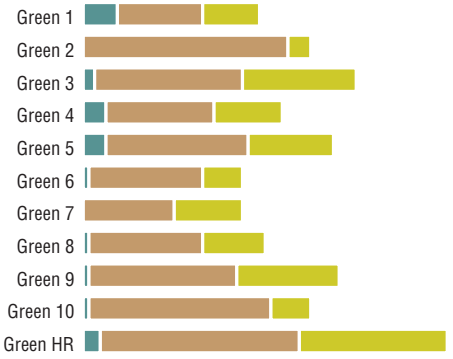


Figure 20: Is Your *Previous* Home a Green Development?

overall affordability (rent + utilities) compared to previous home, 51% of residents replied much more affordable, 40% replied about the same and 9% answered much less affordable (Figure 22).

The majority of residents currently living in green affordable housing set their personal thermostat between 69 degrees and 72 degrees in the summer. When asked about personal thermostat temperature setting (range in degrees Fahrenheit) in their current home during the summer, 19% of residents replied 68 degrees and below, 43% replied between 69 degrees and 72 degrees, 30% replied between 73 degrees and 75 degrees, 5% replied 76 degrees and above and 3% answered not applicable, indicating that they did not live in their current home during the summer (Figure 23).

The majority of residents currently living in conventional or non-green affordable housing also set their personal thermostat between 69 degrees and 72 degrees in the summer. When asked about personal thermostat temperature setting (range in degrees Fahrenheit) in their current home during the summer, 4% of residents replied 68 degrees and below, 47% percent replied

Figure 21: *Current* Overall Affordability (Rent + Utilities) Compared to Previous Home

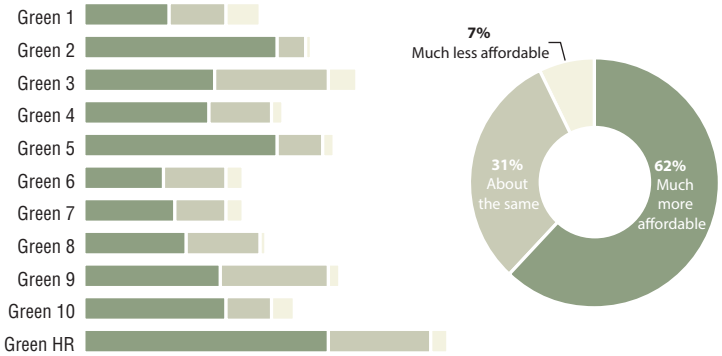


Figure 22: *Current* Overall Affordability (Rent + Utilities) Compared to Previous Home

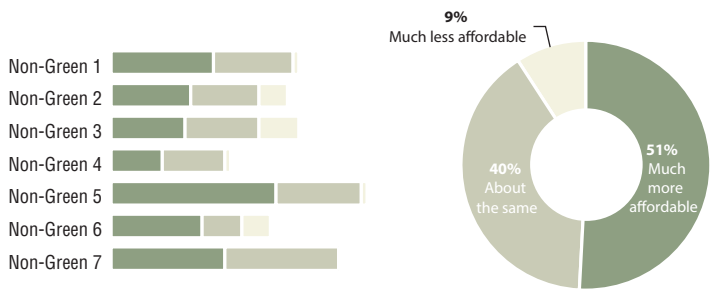


Figure 23: Thermostat Temperature Setting in *Current* Home During *Summer* (°F)

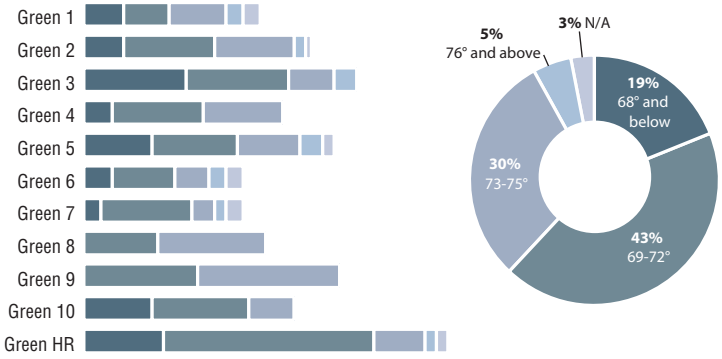
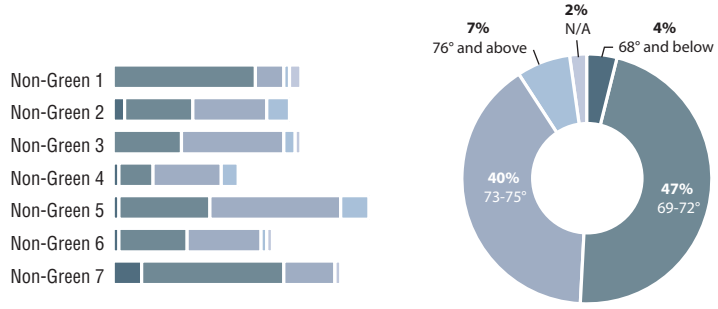


Figure 24: Thermostat Temperature Setting in *Current* Home During *Summer* (°F)



between 69 degrees and 72 degrees, 40% replied between 73 degrees and 75 degrees, 7% replied 76 degrees and above and 2% answered not applicable (Figure 24).

The majority of residents currently living in green affordable housing set their personal thermostat between 73 degrees and 75 degrees in the winter. When asked about the temperature (range in degrees Fahrenheit) they set the personal thermostat in their current home during the winter, 6% of residents replied 68 degrees and below, 32% replied between 69 degrees and 72 degrees, 41% replied between 73 degrees and 75 degrees, 19% replied 76 degrees and above and 2% answered not applicable (Figure 25).

The majority of residents currently living in conventional or non-green affordable housing also set their personal thermostat between 73 degrees and 75 degrees in the winter. When asked about the temperature (range in degrees Fahrenheit) they set the personal thermostat in their current home during the winter, 7% of residents replied 68 degrees and below, 29% replied between

Figure 25: Thermostat Temperature Setting in *Current* Home During *Winter* (°F)

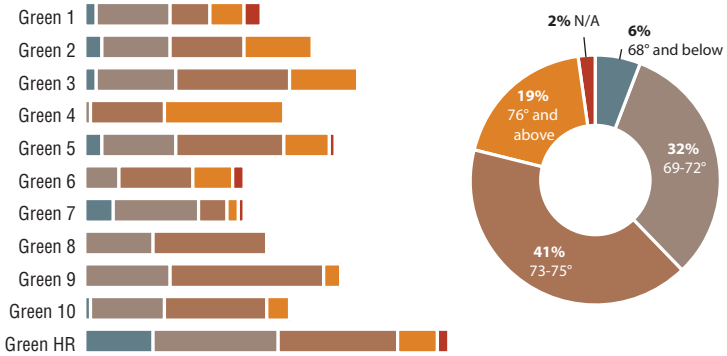


Figure 26: Thermostat Temperature Setting in *Current* Home During *Winter* (°F)

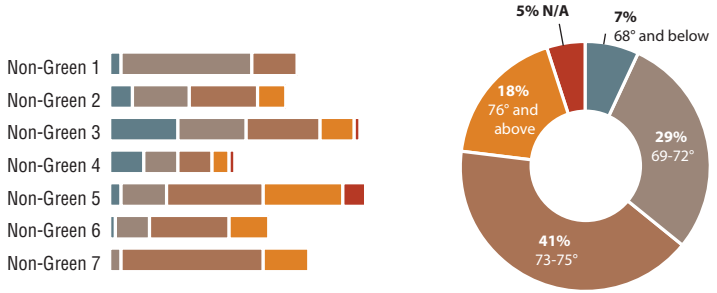


Figure 27: Satisfaction with *Current* Home (Comfort+Affordability) Compared to Previous Home

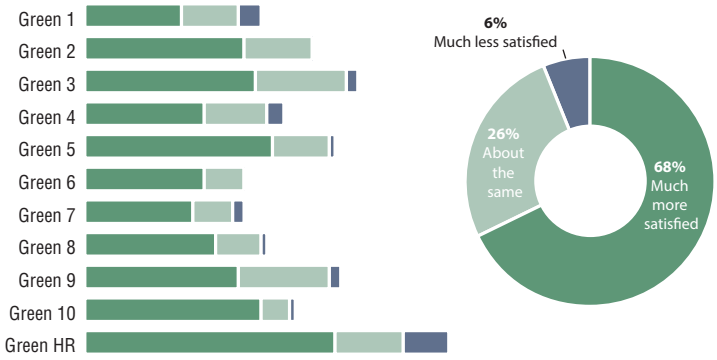
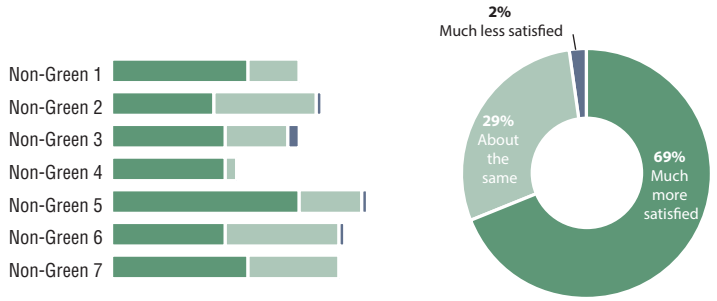


Figure 28: Satisfaction with *Current* Home (Comfort+Affordability) Compared to Previous Home



69 degrees and 72 degrees, 41% replied between 73 degrees and 75 degrees, 18% replied 76 degrees and above and 5% answered not applicable meaning they did not live in their current home during the winter (Figure 26).

The majority of residents currently living in green affordable housing are much more satisfied (in terms of comfort and affordability) with their green housing. When asked about current satisfaction (comfort + affordability) compared to previous home, 68% of residents replied much more satisfied, 26% replied about the same and 6% answered much less satisfied (Figure 27).

A similar majority of residents currently living in conventional or non-green affordable housing also reported being much more satisfied (in terms of comfort and affordability). When asked about current satisfaction (comfort + affordability) compared to previous home, 69% of residents replied much more satisfied, 29% percent replied about the same and 2% answered much less satisfied (Figure 28).

Resident Survey Discussion

From the resident surveys, we observe that the majority of residents' previous homes are not affordable and that they are, on average, much more satisfied in their current units, whether green or non-green. Fifty percent of the residents reported that their current non-green units are more affordable in terms of rent and utilities, and 63% of the residents in green-certified units reported the same. This shows that while both populations are living more affordably, a larger proportion of green-building residents reported cost savings in relation to their previous homes. This may suggest that residents in the green-certified units are realizing greater cost savings and a positive impact to their budget.

Occupant behavior appears to be consistent with regards to summer thermostat temperatures across all properties, with a majority of the residents setting their thermostat at or below 72 degrees in the summer months. Additionally, winter thermostat settings for both groups showed similar results with 41% of all participants, both green and non-green, setting their thermostats between 73 and 75 degrees.

As a whole, this demonstrates that resident behavior is relatively uniform across the sample with regard to baseline temperature preferences and resulting energy usage, indicating consistency in the sample. Furthermore, it highlights the need for occupant education of all residents of multifamily affordable housing to help further reduce the burden of energy costs associated with heating and cooling as utility costs can comprise 20% of a low-income household's income. For example, nearly half of the residents surveyed of green and non-green developments indicate that they open windows during fall and spring and also indicate that they use additional appliances such as fans, space heaters, dehumidifiers and humidifiers to increase the comfort of their homes.

What they might not realize is that by properly programming their personal thermostats and thus their HVAC systems, they could maintain the desired comfort without spending additional finances on energy costs and other devices and keep their homes and buildings operating as designed and constructed. Assuming that the HVAC system is appropriately sized and installed, personal thermostats are seasonally programmed and residents have been educated on how to best use the systems in their homes; indoor environmental quality concerns, energy costs and comfort issues such as temperature, moisture, humidity and allergens should be reasonably mitigated.

Developer/Builder Survey – Property Characteristics and Green Building Perceptions

Developers and builders involved in LIHTC developments have differences of opinion relating to the affordability and viability of green building certifications for affordable housing. The research team proposed to capture these varying perspectives along with some industry-specific knowledge to help inform this study.

There are two sections of the developer/builder survey. The first section characterizes the building types and specification trends for this sample and an understanding of the industry's perceptions relating to green building certifications. The second part of the survey collects information associated with typical direct and indirect costs for LIHTC developments for context and comparison to the data collected in this study.

Characteristics of the Developer/Builder Survey Respondents

The survey of developer/builders contains 29 total participants: nine respondents represent the partner companies that coincide with the developments used in the study and the remaining 20 are general participants not affiliated with the developments. Based on the company type of these respondents, 48% are developers, 24% are general contractors, 21% are other and 7% are consultants. Company type "other" as completed by survey respondents includes: health care parent company with housing division, green building consultant, owner/developer/manager, developer and general contractor, electric utility and non-profit developer.

Of the 29 total respondents, 14% list their company role as design professional, 3% as estimator, 34% as owner/principal, 21% as project manager and 28% as other. When asked to explain, "other" includes asset manager, development in the Southeast, project developer, vice president, director of construction, energy efficiency/sales/project management, director and analyst.

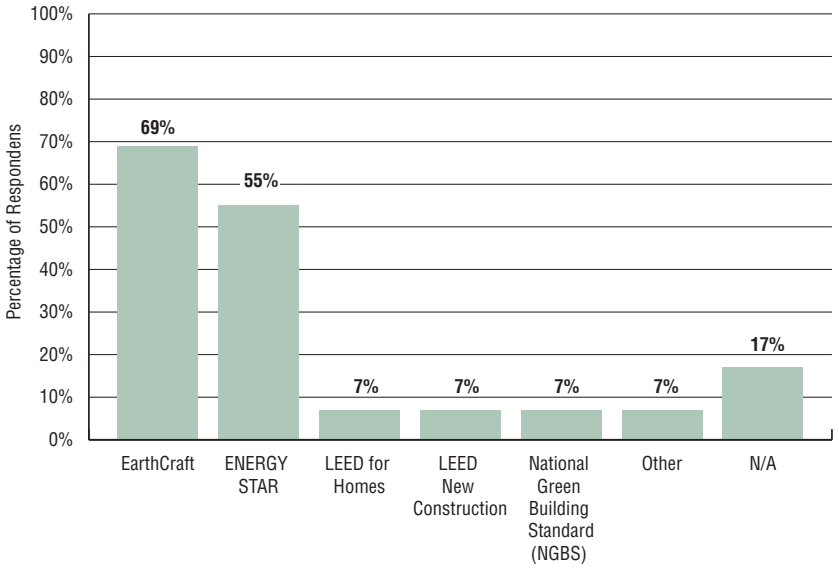
When asked about years of experience with affordable housing development, the options available are 0-3, 4-7, 8-10 and 11+ years. Of the 25 respondents, 16% list 0-3 years, 72% list 11+ years and 12% list N/A, possibly meaning they do not work directly in affordable housing development. Of developer/builder survey respondents, 17% have developed 0-100 units to date, 3% developed 101-500, 28% developed 501-1000 units, 38% developed 1001+ units and 14% listed "N/A." Across the sample, most respondents have developed a large amount of units and have many years of experience in affordable housing.

When asked about the types of housing they develop, 69% listed single family detached, 86% mention low-rise multifamily, 52% mention mid-rise multifamily, and 21% mention high-rise multifamily. Seventeen percent list other, which includes adaptive re-use and historic buildings for single family detached and single family using Georgia Department of Community Affairs multifamily tax credits. Seventeen percent have built affordable housing in Alabama, 72% in Georgia, 38% in North Carolina, 38% in South Carolina and 38% listed other. Responses using the "other" category include: Louisiana, Virginia, Texas, Tennessee and Florida.

Finally, our developer/builder survey asks respondents to report which green building certification programs they have used. The question is answered by all 29 respondents, and results are out of

100% for each category as represented in Figure 29. Regarding those results, 69% use EarthCraft, 55% use ENERGY STAR®, 7% use LEED® BD+C: Homes/LEED® BD+C: Multifamily Midrise, 7% use LEED for New Construction, 7% use the National Green Building Standard and 7% use other. Other includes LEED for Neighborhood Development and Georgia Power EarthCents. As before, 17% answer N/A to indicate that their company does not use green building certification programs.

Figure 29: Green Building Certification Programs Used by Developer/Builders



Non-Green Developer/Builder Property Characteristics

Whether or not developers are opting to use green building certification programs for their developments, another indicator of the industry's diffusion of green building practices is the trend of installing energy efficient technologies across affordable homes in their portfolio. The following paragraph categorizes the frequency with which our participants install green technologies and equipment in their conventional or non-green properties.

For those developments built to code, out of 27 respondents (nine study participants and 18 general) 7% indicate that they sometimes install ENERGY STAR® appliances in their units, and 93% always install. Eleven percent never install insulation to above-code levels, while 59% report sometimes and 30% report always. Regarding high-efficiency mechanical equipment, 4% never install to above-code levels, 67% sometimes install and 30% report always. Approximately 8% never install high-efficiency lighting to above-code levels, approximately 44% sometimes install and 48% report always. Renewable energy systems are indicated as never being installed 74% of the time, sometimes they install 26% of the time and zero report as they always install. On the contrary, to developers/builders installing renewable energy systems, 19% of above-code windows are never installed, 44% are sometimes installed and 37% report always installing above-code windows. The responses to frequency of use for energy efficiency measures such as high-efficiency mechanical equipment and above-code windows indicates that developers, builders and contractors have substantial experience implementing high efficiency technologies in their developments as a result of section 42 of the Internal Revenue Code (low-income housing credit) and thus consistent energy efficiency policies in QAPs. If the same policies are applied to the implementation of renewable energy systems, then a similar result of increased implementation and experience should be expected.

Green Developer/Builder Motivations and Characteristics

Another way to measure the industry's diffusion of green building is to understand the motivations of companies that adopt green building certification programs. The following section reports on survey responses regarding motivations for going green, with 27 respondents, nine of which are study participants and 18 are general respondents.

Regarding motivations for implementing green technologies (each answer out of 100% possible), 63% report reduced tenant utility bills, 59% report reduced operations and maintenance costs, 48% report building durability (lifecycle), 67% report commitment to sustainability and 22% report other. "Other" responses include: "many of these items are required by either GA/SC [QAP] scoring; rebates and incentives to offset cost; owner-driven; and financial program requirements."

Regarding financial incentive motivations for implementing green technologies, 8% report municipal incentives, 50% state-based, 46% federal, 46% percent utility provider, 23% report not applicable and 8% state other.

Respondents are then asked about whether they recognize capital premiums for implementing green technologies when using green building certifications compared to conventional or non-green building. In response, 31% indicate yes, 20% indicate no, 31% I do not know and 12% respond as N/A.

Regarding average payback period (in years) on initial capital investment for green technologies, 12% say 0-5 years, 15% say 6-10 years, 4% say 11-15 years, 4% say 16+ years. Surprisingly, 46% respond I do not know and 19% indicate N/A. A majority of our respondents do not evaluate payback periods for green technologies in their properties.

Next, we ask survey respondents about realizing a return on investment (ROI) when using green building certification programs or implementing green technologies. Nineteen percent of respondents indicate yes, 8% indicate no, 50% indicate I do not know and 23% indicate N/A. Similarly to payback period, a majority of respondents also do not know ROI for green technologies in their properties.

We also asked about average ROI, if any, for all projects that implement green building certification programs or green technologies. Twelve percent of respondents indicate 1-10%, 4% indicate 11-20%, 0% indicate 21-30% and likewise for more than 31%. Furthermore, 8% indicate no average ROI, 54% indicate I do not know and 23% indicate N/A, similar to previous questions regarding payback and individual development ROI. Again, respondents indicate that they do not know the level of payback or return on their investment for green building certification programs or technologies.

We ask respondents whether resident utility allowances should be reduced for developments with a green building certification. On a scale of 1-5, with 1 being strongly disagree and 5 being strongly agree, 4% strongly disagreed, 4% disagreed, 20% are neutral, 32% agree and 40% strongly agree. Most respondents agree or strongly agree that utility allowance obligations should be reduced for developments with a green building certification, which from a developer/builder perspective, is not surprising. Since total rent for LIHTC properties equals rent plus utility allowance, a developer or property owner may elect to perform an energy consumption model utility allowance calculation using actual utility data history to account for the energy and water efficiencies provided by a

green building certification program. This has the potential to reduce their utility allowance obligation to residents and increase the amount of rent collected. While this model could prove more profitable for a developer, it could be adverse for a low-income resident who could be left with a reduced utility allowance contribution and an increased rent obligation.

Green Developer and Builder Benefits

Understanding the perceived benefits of building green is an essential aspect of understanding why developers and builders choose to pursue a green building certification. Therefore, the research team asks green builders about these perceived benefits, based on a scale of 1-5, with 1 being strongly disagree and 5 being strongly agree.

When asked if green buildings provide benefits when compared to non-green buildings in terms of total cost: 4% strongly disagree, 28% disagree, 28% are neutral, 32% agree and 8% strongly agree.

Similarly, when asked if green buildings provide benefits when compared to non-green buildings in terms of scope of work (construction contract of goods and services to be provided): 4% strongly disagree, 28% disagree, 32% are neutral, 32% agree and 4% strongly agree.

Next, the survey asks respondents whether green buildings provide benefits in comparison to non-green buildings in terms of quality of end product: 0% strongly disagree, 8% disagree, 20% are neutral, 48% agree and 24% strongly agree.

Finally, when asked if green buildings help (my) firm achieve its objectives and mission: 0% strongly disagree, 8% disagree, 12% are neutral, 52% agree and 28% strongly agree.

The majority of survey respondents indicate that green buildings, in comparison to non-green buildings, provide benefits in terms of quality of end product and achieving their firm's objectives and mission. Responses are more neutral on whether green buildings provide benefits in terms of total cost and scope of work, although more than a third of respondents indicate that green buildings provide benefits in terms of total cost and scope of work.

Green Construction Costs - Developers and Builders

Developer and builder comments on green construction costs have also been collected. Below is a summary of survey comments that coincide with hard construction cost comparisons and focus on differences between green and non-green construction.

For direct and hard costs, respondents have the following comments:

- One hundred percent of the participants believe that typical direct construction cost for a green-certified low-rise (1-3 story) apartment building compared to that for non-green construction is more expensive; and

- On average, participants believe that green low-rise construction hard cost is 10% more expensive than typical code or non-green construction.

For indirect and soft costs, respondents have the following comments:

- Thirty-three percent of the participants believe that typical indirect or soft construction costs (site development, hardscape, permits and fees, and other) for a green low-rise apartment building is more expensive, 67% believe it is about the same;

- On average, participants believe that green building indirect costs are 3% more expensive than typical code construction; and

- On average, participants believe that soft costs (builder's overhead & development allowance, financing placement fee allowance, legal and closing allowance, marketing/sales commission, green certification costs and consulting fees, and other soft costs) are 7% more expensive than non-green construction.

Developer/Builder Survey Discussion

Non-Green Developer and Builder Property Characteristics

When it comes to new standard construction, developer/builder survey responses tell a story of diffusion of green technology without using a green building certification program. According to responses, 93% of the participants report that they always install ENERGY STAR® appliances. A majority of builders sometimes or always install above-code insulation, high-efficiency mechanical equipment, high-efficiency lighting and above-code windows. On the contrary, a majority of developer/builders report never installing renewable energy systems. These survey results show progress toward industry standards for the incorporation of above-code building practices and energy efficient high-performance systems and technologies, however there is still significant room for developers to incorporate renewable energy in affordable housing. Federal, state and local policies that advance energy efficiency and have led to significant market diffusion, could also be applied to the implementation of renewable energy for affordable housing development.

Green Developer/Builder Motivations and Characteristics

Participants report reduced tenant utility bills, reduced operations and maintenance costs and commitment to sustainability as the most common motivations for pursuing green building certifications.

State and federal incentives, and utility-based rebate programs are the most common among financial incentives for implementing green technologies.

A majority of respondents did not recognize capital premiums for implementing green technologies or did not know what those premiums would be. This lack of knowledge and evaluation also applied to payback and return on investment for green building certification programs and technologies. Such findings support previous results of this research suggesting that more data and analysis is necessary on the part of developers/builders and program administrators (HFAs) for evaluating the cost-benefit of green building and affordable housing; as Yudelson (2008) said, "clearly the focus needs to be on results. A lack of understanding and analysis of the long term financial benefits of investing in energy efficient and renewable energy technologies suggests a need for increased education on ROI and evaluation of project costs from construction through operations to better assess the feasibility and profitability of this upfront investment."

Also, a large majority of respondents agree that a reduction in utility allowances should be considered for green buildings, but as discussed in the green developer/builder motivations and characteristics section, while green building certifications and the associated green and energy efficient technologies may allow for a utility allowance that accounts for these energy and water saving improvements, the impact to developer profit and resident affordability should be strongly considered.

Green Developer and Builder Benefits

When asked if green buildings provide benefits when compared to non-green buildings in terms of total cost and scope of work, the responses are split, showing a wide variation in answers from strongly disagree to strongly agree. Survey findings suggest that work associated with green building is often perceived as adding to a building's scope of work and total costs.

On the other hand, respondents clearly perceive quality as a result of working with green building certification programs. Seventy-two percent of developer/builders surveyed agree or strongly agree that green buildings provide a higher quality end product.

Finally, 80% of the participants report that green building certification programs help their company achieve its objectives and mission. These findings are similar to Yudelson's survey (2008), as executives perceive green building as important to the goals of the firm but did not grasp its current effect. Many of Yudelson's executives therefore report a perception that the market is not comfortable with new ideas and technologies and that green building is a market barrier, contrary to our findings in this study.

Property Manager Survey

Perceptions and behaviors of property managers can also make a difference in evaluating the effectiveness of green building programs over the lifecycle of a property. Property managers have a unique perspective on the long-term durability and maintenance challenges of a development, adding valuable context to this study. We asked property managers about these perceptions based on a scale of 1-5, with 1 being strongly disagree and 5 being strongly agree.

Characteristics of the Property Manager Survey Respondents

There are 20 total survey participants, 10 represent the partner companies that coincide with the developments used in the study and the remaining 10 are general respondents. Respondents are a 50/50 mix of green and non-green developers. Of partner companies, respondents hold the following titles: President of Property Management, Property Manager, Regional Asset Manager, Director of Maintenance, Vice President, Regional Property Manager, Director of Property Management, Regional Manager and Director. Of non-research participants, respondents hold titles, including: Property Manager, Operations Manager, Community Manager, Senior Project Manager, Executive Director, Asset Manager, and Regional Vice President.

Green vs. Non-Green Property Characteristics

When asked whether green buildings are more energy efficient than non-green buildings, 6% strongly disagree, 0% disagree, 56% are neutral, 25% agree and 13% strongly agree. Neutral comments include: "because of rising utility costs, I cannot tell

any difference; and we don't have green building certifications, so I'm not sure what the O&M variances would be."

When asked whether green buildings are more water efficient than non-green buildings, 6% strongly disagreed, 0% disagreed, 75% are neutral, 13% agree and 6% strongly agree. Neutral comments include: "if a low-flow toilet takes two or three flushes, and a normal toilet took one, did you save any water?"

We asked property managers if green buildings have lower utility costs than non-green buildings. 6% strongly disagree, 6% disagree, 56% are neutral, 6% agree and 25% strongly agree. Neutral comments include: "we do see some savings on the systems but it's hard to determine if it's simply because they're newer units (and by default more efficient) or if it's because it's the specifically high efficient units." Disagree comments for this question include: "it is difficult to ascertain this, but my opinion is that money can be better spent in other areas once the buildings are energy code compliant."

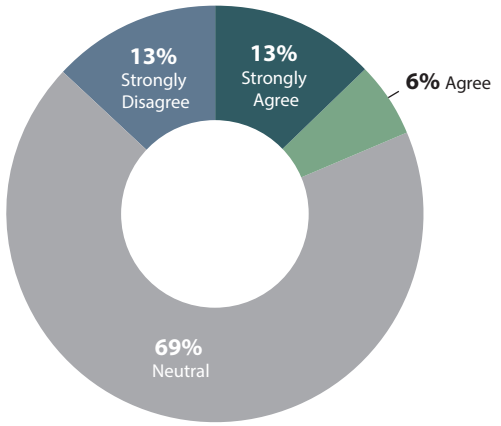
When asked if green buildings have lower utility costs than non-green buildings and allow for a reduced utility allowance, 13% strongly disagree, 0% disagree, 69% percent are neutral, 6% agree and 13% strongly agree. Figure 30 illustrates the trend with many of the property management respondents showing neutrality about green building and its benefits with regard to lower utility costs. A neutral comment is "I have not been able to see that" and a strongly disagree comment is "we use PHA allowances which do not account for this."

When asked if green buildings have lower overall operations and maintenance costs than non-green buildings, there is, again, a tendency toward neutrality: 19% strongly disagree, 13% disagree, 44% are neutral, 13% agree and 13% strongly agree. Strongly disagree comments include: "we are a new build, but cheaply made items break just as quickly whether they are rated as green or not." When disagreeing, the one comment was "staff must be qualified and systems serviced."

When asked whether green buildings require less frequent maintenance than non-green buildings, 19% strongly disagree, 19% disagree, 50% are neutral, 6% agree and 6% strongly agree. Respondents seem to agree with operations and maintenance cost findings that green buildings do not require less financial and staff resources. Among "strongly disagree" comments are: "when buildings are wrapped too tightly and cannot 'breathe', it causes moisture issues. Then you have to purchase additional HVAC units to remove the moisture from the home and cost of qualified staff and repair of equipment is higher."

When asked if green buildings require less staff time and resources for in-unit maintenance requests than non-green buildings: 25% strongly disagree, 25% disagree, 44% are neutral,

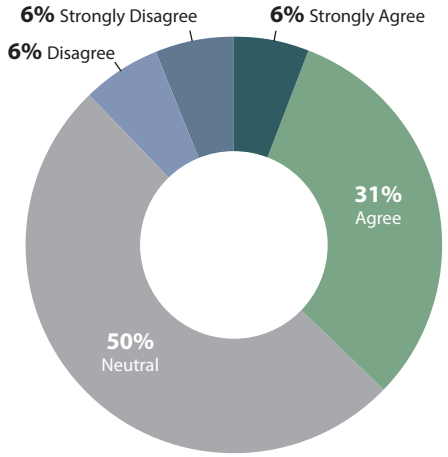
Figure 30: Green Buildings Have Lower Utility Costs



0% agree and 6% strongly agree. In this case, the tendency moved significantly towards the side of disagreement with the statement. "Strongly disagree" comments include: "I can only see that statement being true if the appliances and hardware in the home were of a better quality than builder low-grade. Bulk pricing deals; and the time spent trying to train residents on how to maintain the desired temperatures alone eats up more time."

On the contrary, when asked if green buildings require a greater level of resident education to operate units properly than non-green buildings, 6% strongly disagree, 6% disagree, 50% are neutral, 31% agree and 6% strongly agree. The tendency moved considerably towards the other side – in agreement with the statement, as displayed in figure 31. An "agree" comment: "for older residents, it is harder to use the thermostats" and a "strongly agree" comment is the "inability of users to operate their unit's system is one of the most notable headaches of an initial lease up with a high-efficiency system."

Figure 31: Green Buildings Require a Greater Level of Resident Education



Responses are more neutral when asked if green buildings provide residents with enhanced indoor environmental quality (IEQ) in comparison to non-green buildings: 13% strongly disagree, 19% disagree, 50% are neutral, 19% agree and 0% strongly agree. One "strongly disagree" comment includes, "may even have the opposite effect - as buildings are tighter and HVAC systems don't run as much, mold grows." "Disagree" comments are: "not when the buildings can't breathe," "too much moisture causes mold to grow on the residents shoes, clothes and furniture," and "many of the residents will not run HVAC which leads to humidity issues and possible mold issues."

While feedback in our report from actual residents about their comfort is important, the perception of property managers regarding residents' comfort is also informative. We asked if "green buildings provide residents with enhanced comfort (i.e. temperature, air quality, ventilation, humidity and lighting) in comparison to non-green buildings." Responses have an emphasis on the "disagree" side of the scale, 13% strongly disagree, 25% disagree, 44% are neutral, 19% agree and 0% strongly agree. One "strongly disagree" comment is: "not with heat pumps. The air doesn't flow evenly throughout the apartment. Some rooms are warmer than others. There is also no comfort in having too much moisture in the air."

Green Property Management Perceptions and Benefits

The research team also asked the managers of green properties about their perceptions concerning green building management. The following section describes how this group of 14 property managers perceive their green properties.

We asked the respondents whether green building certification programs provide an enhanced level of quality assurance and compliance monitoring than non-green buildings. Seven percent strongly disagree, 0% disagree, 57% are neutral, 29% agree and 7% strongly agree, demonstrating a tendency towards neutrality and agreement with the statement.

Responding to whether green building certification programs have less overall administrative and management costs than non-green buildings, 23% strongly disagree, 15% disagree, 46% are neutral, 15% agree and 0% strongly agree. The tendency again swings back to disagreement with the statement. Strongly disagree comments are: "not that I can tell," "I'm sure most do have to replace cheap items," and "no difference is seen related to certification."

Property Manager Survey Discussion

A majority of respondents agree that green buildings are more energy efficient than non-green buildings. A large majority of respondents are neutral when asked if green buildings are more water efficient than non-green buildings, with comments such as "if a low-flow toilet takes two or three flushes, and a normal toilet took one, did you save any water?" A majority are also neutral about green buildings having lower utility costs than non-green buildings, commenting that "it's hard to determine if it's simply because they're newer units (and by default more efficient) or if it's because it's the specifically high efficient units." Other respondent comments disagree, saying that "money can be better spent in other areas once the buildings are energy code compliant." Contrary to the respondents' comments, WegoWise data indicates that green buildings have lower energy usage. Green developments compared to non-green developments use almost 13% kWh/sf less energy and spend nearly 12% less per month on utilities.

Continuing the central tendency that seems to be consistent with many of the property management respondents, the following statements receive a "neutral" response: construction and its benefits; green buildings have lower overall operations and maintenance costs than non-green buildings; green buildings require less frequent maintenance than non-green buildings; green buildings require less staff time and resources for in-unit maintenance requests than non-green buildings and green buildings provide residents with enhanced indoor environmental quality (IEQ).

On the contrary, when asked if green buildings require a greater level of resident education to operate units properly than non-green buildings, the tendency strongly moved towards agreement with the statement. Comments concentrate on residents' "inability to operate their unit's high-efficiency system." Several comments suggest that residents do not turn on their air conditioning or do not understand how to program their thermostats, which reiterates the need for an increased level of occupant education and supervision.

Property managers disagree that green buildings provide residents with enhanced comfort (i.e. temperature, air quality, ventilation, humidity and lighting) than non-green buildings. Comments indicate issues with: air flow, temperature and moisture – "many of the residents will not run HVAC, which leads to humidity issues and possible mold issues," "the air doesn't flow evenly throughout the apartment. Some rooms are warmer than others. There is also no comfort in having too much moisture in the air" and "the more efficient and technology based systems (generating) much more negative feedback than our more basic systems."

Overall, the majority of property managers seemed to show consistent neutrality regarding the perceived differences between green and non-green properties. Many commented that operations and maintenance costs are equivalent or higher; one participant commented that replacement costs are not correlated to efficiency but rather to quality, citing that "cheaply made items break just as quickly whether they are rated as green or not." In order to reduce the operations, maintenance and administrative costs associated with green buildings included in this study, property managers, maintenance staff, contractors and residents must be trained and made aware of best practices. The following comments by property managers are representative of the training and technical assistance need, "staff must be qualified and systems serviced" and "cheaply made items break just as quickly whether they are rated as green or not."

Comments by property managers that relate to "letting the building breathe" and other moisture issues suggests a lack of understanding of the building science principles which drive green building program standards, a fundamental aspect of maintaining a green-certified residence. This also indicates a need for both property manager and resident education related to high-performance buildings and ventilation, a common theme noted throughout this study. According to the survey results, property managers seem to recognize this education gap – nearly a third of respondents agree that green buildings require more education and nearly two-thirds agree that education and information increases staff knowledge and their ability to verify specifications. Additional education of property management staff and residents will translate to greater O&M cost savings related to procurement, administration and utilities associated with green buildings.

Housing Finance Agency (HFA) Survey

Housing Finance Agencies (HFAs) from Georgia, North Carolina, Alabama, and South Carolina provide their perspectives regarding green building certification programs, efficiency and administration by completing a HFA survey. There are four participants to this survey, and respondents equally represent Alabama, Georgia, South Carolina and North Carolina and have more than 10 years of experience in affordable housing administration.

When asked if "green-certified buildings and green technologies are more energy efficient in comparison to non-green buildings," 50% are neutral, 25% agree and 25% strongly agree. Regarding if "green buildings have lower utility costs than non-green buildings," 25% are neutral and 75% agree. When asked if "green buildings have lower overall operations and maintenance costs than non-green buildings," 75% are neutral and 25% agree. So, while HFAs mostly agree that green-certified buildings save money on utility costs, they are unsure whether green buildings offer reduced maintenance costs. For example, one respondent cites that "management companies have reported increased maintenance costs which they attribute to some of the green building requirements."

When asked if "green buildings require a greater level of resident education to operate units properly than non-green buildings," 25% are neutral and 75% agree. The need for increased occupant education related to operating green units appears as a theme throughout the surveys conducted as part of this research project.

When asked if the "administration of developments with green building certifications require less staff time and resources in comparison to non-green buildings," 25% strongly disagree, 25% disagree, 25% are neutral and 25% agree. Similarly, when asked if "overall, developments with a green building certification have lower administrative costs to the HFA (application review, quality assurance and compliance monitoring) in comparison to non-green buildings," 25% strongly disagree, 25% disagree, 25% are neutral and 25% agree.

HFA responses to these questions regarding the benefits of green building programs on HFA administration are highly variable and limited due to the small sample size. This inconsistency could be due to variations in respective QAP incentives for green building certification programs and their resulting overall lack of familiarity with certification programs. It may also suggest that HFA administrators and staff require some additional technical assistance when incorporating green building as an incentive in their Qualified Allocation Plans (QAP). While the HFA staff surveyed have many years of experience and their state programs develop thousands of units of affordable housing, the majority do not have much experience working with green building certification programs as a result of limited incentives and requirements for green building and technologies, with Georgia being the exception. Due to a lack of professional and agency experience with green building, the survey responses should be viewed as perceptions, but limited in their competency. In summary, however, the HFA survey participants expressed concerns related to the perceived administrative burden that these programs place on the QAP application process. One respondent suggested that "more time is required as our construction staff reviews the third party certification and is looking at installation as part of our construction reviews." While surveyed HFAs are unsure about an administrative benefit provided by green building certification programs, the majority do agree that green buildings are more energy efficient and have lower utility costs, which provides low-income residents with enhanced affordability.

Development and Construction Costs Comparison

As noted in the survey sections, the perception that green-certified buildings cost more to construct is predominant in the affordable housing industry. One of the primary objectives of this research is to compare construction and operations costs of green and non-green developments to assess whether the total costs are in line with perceived costs for green-certified buildings. The following sections compare construction costs to evaluate how much developers are actually paying to earn green building certifications. For reference, we discuss the characteristics of these developments and our analytical methods in the methodology section of this report.

The following section benchmarks costs across three broad areas of design, construction and operations: soft costs, hard costs, and operations and maintenance costs. We then compare our sample to objective third party data for each development's location and the region. RS Means national cost averages are used to check and compare the reliability of our data.

Development Cost Analysis

This section of the report discusses and analyzes costs for green and non-green developments in our sample. We begin with analysis of the broad, total costs for these developments and then we dive deeper into itemized costs.

The researchers have removed all development names and addresses to ensure confidentiality of the sample. The research team solicited construction cost information in two forms: 1) cost certifications required by HFAs and AIA G702s, and 2) a survey of participating developers on costs and experience. We solicited 18 developments from four states in the Southeastern United States: Alabama (AL), Georgia (GA), South Carolina (SC) and North Carolina (NC). As discussed, Green 1 and Green HR, both renovations, have been removed from the full cost analysis due to significant differences in construction type, scope and performance. A total of 16 developments - nine green and seven non-green are included in the cost analysis sections.

The development sizes in this section range from 40,367 sf to 202,343 sf. It is important to note that costs of the developments can be highly affected when comparing on a square-foot basis between large and small buildings in urban and rural localities. As a result, the authors will attempt to delineate findings in many ways including size, density and location.

Figure 32. Green Developments Building Characteristics and Total Cost

Green Development	Certification	Placed in Service	State	Urban/ Rural	Gross sf	Number of Units	Building Type	Resident Type	Total Cost / sf	Total Cost
Green 2	EarthCraft	2012	GA	Rural	75,803	60	Low-Rise	Family	$98.50	$7,466,449.43
Green 3	LEED	2011	GA	Urban	202,343	156	Low-Rise	Family	$50.00	$10,116,910.00
Green 4	EarthCraft & LEED	2012	GA	Rural	69,075	50	Low-Rise	Family	$113.08	$7,810,687.00
Green 5	EarthCraft	2013	NC	Urban	111,000	110	Mid-Rise	Senior	$122.39	$13,585,098.46
Green 6	EarthCraft	2014	NC	Urban	103,300	74	Mid-Rise	Family	$85.53	$8,835,426.00
Green 7	ENERGY STAR	2012	NC	Rural	74,444	64	Low-Rise	Senior	$97.05	$7,224,840.00
Green 8	EarthCraft	2012	NC	Rural	40,720	40	Low-Rise	Senior	$91.28	$3,716,762.00
Green 9	ENERGY STAR	2011	NC	Rural	47,784	40	Low-Rise	Family	$88.53	$4,230,170.00
Green 10	ENERGY STAR	2012	SC	Urban	85,327	60	Low-Rise	Family	$80.30	$6,851,961.00

Building type is also an important factor in the development cost. For example, high-rise construction requires more stringent codes and types of materials (steel or reinforced concrete) in its design and construction than low-rise (wood or steel composite), alluding to why Green HR is excluded. Seven out of the nine green developments in this analysis are low-rise and two are mid-rise. All of the green developments included in the cost analysis sections are new construction built between 2009 and 2014. All of the non-green developments in this study are low-rise new construction. As with development size, we will account for these characteristics when reporting our findings.

Figure 32 summarizes the total construction costs for the nine green developments. Three of these nine developments are located in Georgia, five in North Carolina and one in South Carolina. Green building certification programs used

Figure 33. Non-Green Developments Building Characteristics and Total Cost

Non-Green Development	Placed in Service	State	Urban/Rural	Gross sf	Number of Units	Building Type	Resident Type	Total Cost / sf	Total Cost
Non-Green 1	2012	AL	Rural	40,367	40	Low-Rise	Elderly	$116.44	$4,700,464.00
Non-Green 2	2010	AL	Rural	59,806	56	Low-Rise	Elderly	$99.74	$5,964,794.00
Non-Green 3	2012	AL	Urban	57,613	51	Low-Rise	Elderly	$105.60	$6,084,128.00
Non-Green 4	2011	AL	Rural	46,630	40	Low-Rise	Elderly	$87.54	$4,082,091.00
Non-Green 5	2011	AL	Urban	109,232	96	Low-Rise	Family	$79.54	$8,688,521.00
Non-Green 6	2011	SC	Urban	62,873	46	Low-Rise	Family	$98.14	$6,170,577.00
Non-Green 7	2010	SC	Rural	59,543	50	Low-Rise	Family	$85.64	$5,099,018.00

Figure 34. Green vs. Non-Green Average Development SF Costs Summary

Development Type	Total Cost / sf	Hard Cost / sf	Soft Cost / sf
Green Developments	$91.85	$55.43	$36.42
Non-Green Developments	$96.09	$54.54	$41.55
% Difference	**-4.51%**	**1.62%**	**-13.16%**

by the sample include EarthCraft, ENERGY STAR® and LEED, with EarthCraft being the most commonly used among the developers.

Figure 33 summarizes the total construction costs and characteristics of the seven non-green developments. Five of these developments are located in Alabama and two are in South Carolina. These developments also have a wide range in size, from 40,367 sf to 109,232 sf.

Green-certified buildings have been anecdotally considered more expensive to design, construct and operate. Comparing these data sets, the green developments are almost 5% less expensive per square foot to construct on a total cost basis than the non-green developments (Figure 34). Figure 34 presents the average cost per square foot for all green and non-green buildings represented in the cost analysis. Breaking down the total costs into hard (materials, labor and equipment used directly in the building construction) and soft (design and construction fees associated with management of the development process) costs paints a more complex picture. Green development hard costs are 1.6% higher, while soft costs are more than 13% lower than non-green developments. More specifically, our analysis indicates that green-certified developments in GA, NC and SC cost less to design and build than non-green alternatives in AL and SC. Such a finding could suggest that green building

Figure 35. Green Development Total Hard Costs

Green Development	Gross sf	Building Type	State	Certification	Hard Cost / sf	Total Hard Cost
Green 2	75,803	Low-Rise	GA	EarthCraft	$55.63	$4,217,042.43
Green 3	202,343	Low-Rise	GA	LEED	$41.94	$8,485,665.00
Green 4	69,075	Low-Rise	GA	EarthCraft & LEED	$65.67	$4,536,495.00
Green 5	111,000	Mid-Rise	NC	EarthCraft	$72.50	$8,047,566.46
Green 6	103,300	Mid-Rise	NC	EarthCraft	$56.47	$5,833,077.00
Green 7	74,444	Low-Rise	NC	ENERGY STAR	$52.07	$3,876,205.00
Green 8	40,720	Low-Rise	NC	EarthCraft	$56.82	$2,313,654.00
Green 9	47,784	Low-Rise	NC	ENERGY STAR	$52.58	$2,512,434.00
Green 10	85,327	Low-Rise	SC	ENERGY STAR	$45.23	$3,859,128.00

Average Green Total Hard Cost / sf: $55.43. Standard Deviation: $9.39

practices are diffusing into the industry and do not exhibit a price premium in markets where funding mechanisms have incentivized green building certifications for several years.

Please note that site development and land acquisition costs were excluded from soft cost analysis data. Through an advisory committee input process, the researchers learned that costs for site development and land acquisition are often reported differently by development companies and can vary widely based on development type and location.

Soft costs calculated excluding site development and land acquisition costs are $36.42/sf for green developments and $41.55/sf for non-green developments on average. Green-certified buildings in our sample reported an average of 12% lower soft costs.

Direct or "hard" costs of green developments are listed in Figure 35. Hard costs include materials, labor and equipment directly used in the construction of the building. For green developments sampled in this work, hard costs vary from $72.50/sf at the high end to $41.94/sf at the low end. Such a wide variability is due to the economy of scale - the lowest cost/sf results from the largest development and can also be subject to the scope of work. Scope of work differences may include relative density of units, amenities and common spaces, unit layout and building height, construction type, location and specifications. Again, many characteristics of the developments can limit the application of these findings, yet few other studies have been able to look into this level of depth regarding cost and green building, particularly with a focus on the Southeast.

The variability of hard costs on the low-rise green developments below 50,000 sf ranges between $52.58/sf and $56.82/sf and has an average of $54.70/sf. Low-rise green developments between 50,000 sf and 100,000 sf contain a wider hard cost range between $45.23 and $65.67 and an average of $54.65/sf. This cost variability in the low-rise green developments between 50,000 sf and 100,000 sf could be due to green developments #2 and #4 (the two highest hard cost/sf) both having more than one green building certification. These developments contained EarthCraft Communities Certification in addition to a building-level certification (EarthCraft Multifamily and LEED® BD+C: Homes respectively) which might indicate that there was more substantial cost investment in the design and construction of site infrastructure and a larger project scope. Further, the difference could be partially due to the differences in construction costs between rural and urban sites. Large mid-rise projects above 100,000 sf would also contain heavier structural members and therefore a higher cost average of $56.97.

An average of $55.43/sf across all green developments is reasonable for hard construction costs on new construction projects. One indicator of reliability of costs is the deviation in the type of development from the average for the entire sample. Based on the sample average green development hard cost, the medium-sized developments contain the largest deviation from the average and those deviate by approximately 2%.

Hard costs for non-green developments sampled in this study contain lower variability than green developments (Figure 36), exhibited by a standard deviation of $6.84 for non-green compared to $9.39 for green developments. This finding suggests that non-green builders could have fewer options and rely on path dependency - doing what they know best at a consistent

cost. The lower variability could also be an indication of the scope of work for these projects.

Hard costs for low-rise, non-green developments below 50,000 sf range between $45.86/sf and $64.72/sf, resulting in a larger range than hard costs for similar sized green developments in the sample, and an average hard cost for smaller low-rise non-green projects of $55.29/sf. Hard costs for low-rise non-green developments between 50,000 sf and 100,000 sf range from $47.73 to $58.31, which is a smaller variability than the hard costs of similar sized green developments in the sample, and an average hard cost for medium low-rise non-green developments of $55.32.

Figure 37 reports on the indirect or "soft" costs of green developments in the study. Soft costs are those pertaining to design and construction fees associated with the management of the development process, including contractor and professional services, pre-development, permits/fees, developer fee, debt, equity and start-up/reserves. As mentioned, site development and land acquisition costs have been removed from these calculations. For green developments sampled in this work, soft costs vary from $49.89/sf at the high end to $8.06/sf at the low end. Such a wide variability is likely due to the size (sf) of the developments, as these costs align with size.

If we focus on the smaller low-rise green developments below 50,000 sf, the range of soft cost is between $35.07/sf and $34.46/sf, with an average of $34.76/sf. Medium-sized low-rise green developments between 50,000 and 100,000 sf contain a lower soft cost range between $47.40/sf and $35.07/sf, with an average

Figure 36. Non-Green Development Total Hard Costs

Non-Green Development	Gross sf	Building Type	State	Hard Cost / sf	Total Hard Cost
Non-Green 1	40,367	Low-Rise	AL	$64.72	$2,612,400.00
Non-Green 2	59,806	Low-Rise	AL	$57.12	$3,416,140.00
Non-Green 3	57,613	Low-Rise	AL	$58.31	$3,359,245.00
Non-Green 4	46,630	Low-Rise	AL	$45.86	$2,138,625.00
Non-Green 5	109,232	Low-Rise	AL	$49.91	$5,451,580.00
Non-Green 6	62,873	Low-Rise	SC	$58.13	$3,655,004.00
Non-Green 7	59,543	Low-Rise	SC	$47.73	$2,842,029.00

Average Non-Green Total Hard Cost / sf: $54.54. Standard Deviation: $6.84

Figure 37. Green Development Total Soft Costs

Green Development	Gross sf	Building Type	State	Urban/Rural	Certification	Soft Cost / sf	Total Soft Cost
Green 2	75,803	Low-Rise	GA	Rural	EarthCraft	$42.87	$3,249,407.00
Green 3	202,343	Low-Rise	GA	Urban	LEED	$8.06	$1,631,245.00
Green 4	69,075	Low-Rise	GA	Rural	EarthCraft & LEED	$47.40	$3,274,192.00
Green 5	111,000	Mid-Rise	NC	Urban	EarthCraft	$49.89	$5,537,532.00
Green 6	103,300	Mid-Rise	NC	Urban	EarthCraft	$29.06	$3,002,349.00
Green 7	74,444	Low-Rise	NC	Rural	ENERGY STAR	$44.98	$3,348,635.00
Green 8	40,720	Low-Rise	NC	Rural	EarthCraft	$34.46	$1,403,108.00
Green 9	47,784	Low-Rise	NC	Rural	ENERGY STAR	$35.95	$1,717,736.00
Green 10	85,327	Low-Rise	SC	Urban	ENERGY STAR	$35.07	$2,992,833.00

Average Green Total Soft Cost / sf: $36.42

of $42.58/sf. Large mid-rise projects above 100,000 sf range from $49.89/sf down to $8.06/sf, with an average of $29/sf.

Figure 38 reports on the indirect or "soft" costs of non-green developments in the study. Soft costs for smaller low-rise non-green developments below 50,000 sf range between $51.73/sf and $41.68/sf, with an average of $46.71/sf. Medium-sized low-rise non-green developments between 50,000 and 100,000 sf range between $47.30 and $37.91, with an average of $41.96/sf.

Figure 39 lists the direct or "hard" costs in detail for both green and non-green developments in the study, summarizing and comparing average costs per square foot by "divisions of work." As detailed in our methodology section, each column represents these divisions as separate components of a complete construction scope of work and the direct costs involved.

On average, the green developments are characterized by: lower substructure costs, lower shell costs, lower costs for equipment and furnishings. Non-green developments are characterized by: lower interiors costs, lower services and lower special construction costs. "Other" direct construction costs are higher for green developments (non-green = $0.00), possibly due to additional technologies or processes involved

Figure 38. Non-Green Development Total Soft Costs

Non-Green Development	Gross sf	Building Type	State	Total Soft Cost / sf	Total Soft Cost
Non-Green 1	40,367	Low-Rise	AL	$51.73	$2,088,064.00
Non-Green 2	59,806	Low-Rise	AL	$42.62	$2,548,654.00
Non-Green 3	57,613	Low-Rise	AL	$47.30	$2,724,883.00
Non-Green 4	46,630	Low-Rise	AL	$41.68	$1,943,466.00
Non-Green 5	109,232	Low-Rise	AL	$29.63	$3,236,941.00
Non-Green 6	62,873	Low-Rise	SC	$40.01	$2,515,573.00
Non-Green 7	59,543	Low-Rise	SC	$37.91	$2,256,989.00

Average Non-Green Total Soft Cost / sf: $41.55

Figure 39. Green and Non-Green Average Detailed Hard Costs/sf Summary

Development Type	Substructure / sf	Shell / sf	Interiors / sf	Services / sf	Equipment & Furnishings / sf	Special Construction / sf	Other / sf
Green	$4.34	$21.08	$9.16	$15.18	$2.51	$2.15	$2.59
Non-Green	$4.50	$23.21	$8.08	$14.30	$3.66	$1.09	$0.00

Figure 40. Green vs. Non-Green Detailed Average Soft Costs/sf Summary

Development Type	*Contractor Services	Prof. Services	Pre-Development	Construction Financing	Permits and Fees	Developer Fee	Start-Up and Reserves
Green	$8.56	$3.75	$3.06	$3.17	$2.38	$10.97	$5.70
Non-Green	$9.21	$3.85	$1.43	$3.57	$3.55	$14.78	$4.74

* Contractor Services includes overhead, profit, and general requirements

in green construction, all of which would be outside new standard construction and building code for the locality and thus requiring additional training and experience for contractors.

Figure 40 reports indirect or "soft" costs of green and non-green developments in the study summarized by division of work as well. Each column breaks down elements indirectly part of the construction process as reported in the QAP document for the project. On average, the green developments are characterized by lower: Contractor Services (includes overhead, profit, and general requirements); Construction Financing; Permits and Fees; Developer Fees. Non-green developments are characterized by lower: Professional Services (includes architectural and engineering subcontracts, for example); and Start-up and Reserve Fees for the development. These findings equate to the added costs often discussed in terms of green certification, where additional Professional Services, Pre-development and Start-up processes are required. It is somewhat surprising that Permits and Fees are being reported as less for green construction, as green fees regarding certification should add to costs/sf, however, they may be reported under a different category.

Please note that not all soft costs are represented in detailed costs as summarized in 'Total Soft Cost' averages (Figure 40). Excluded for comparison here (but calculated) are Site Development, Land Acquisition, Division of Cost Allocation (DCA), Equity, Performance Bond and Other due to limited information for other categories.

Figure 41 details the operations and maintenance (O&M) costs for the sample of green developments included in the study. Each column represents components of O&M costs as reported by property owners and managers for the development. Findings indicate that non-green developments are 15% less expensive to operate and maintain, which is surprising and contradicts the literature reviewed by the research team and many goals of green building, but supports the survey results from property managers. Green buildings are often designed to reduce O&M, assuming that the residents are trained by the property management staff to properly use the systems. It is also important to note that O&M costs exclude taxes, insurance, benefits, payroll fees, security and elevator costs as these will vary widely by geographic location, building type and size. When broken down into detailed areas of O&M, maintenance

Figure 41. Green vs. Non-Green Average Annual Development O&M Costs/sf Summary

Development Type	Total O&M Cost / sf	Maintenance / sf	Utilities / sf	Administration / sf
Green Developments	$2.81	$0.90	$0.49	$1.42
Non-Green Developments	$2.42	$0.67	$0.55	$1.20
% Difference	14.91%	29.30%	-11.54%	16.80%

is 29% more expensive, utilities are approximately 12% less expensive and administration is nearly 17% more expensive for green developments.

Recent work by McCoy, et al., (2015) regarding affordability for residents of multifamily buildings in Virginia found that education of property management, maintenance staff and residents on technology of green buildings is needed. Findings in this study suggest that the gap between green and non-green developments is wider than simply education of managers, staff and residents, but includes cost budgeting and procurement for O&M as well.

National Average Data Comparison

Next, it is important to compare our sample to objective, third party data for each development's location and the region for reliability of data. The following section lists local costs of green construction based on RS Means. Anecdotally, RS Means is considered by developers and contractors as inflated in its average costs by approximately 5-10%, yet it is still based on over 11,000 projects nationally, which are averaged. Once nationally averaged, these costs are increased or reduced depending on location and project size as provided by RS Means. These changes

Figure 42. National Average (RS Means) vs. Actual Green Development Hard Costs

Green Development	Actual Hard Cost / sf	Adjusted RSMeans Green Hard Cost / sf	% Difference
Green 2	$55.63	$101.34	-45.11%
Green 3	$41.94	$109.00	-61.53%
Green 4	$65.67	$101.90	-35.55%
Green 5	$72.50	$114.66	-36.77%
Green 6	$56.47	$115.86	-51.26%
Green 7	$52.07	$108.95	-52.21%
Green 8	$56.82	$105.80	-46.30%
Green 9	$52.58	$104.13	-49.51%
Green 10	$45.23	$106.50	-57.53%
Average Cost / sf:	$55.43	$107.54	-48.38%

Table notes: Adjusted RS Means Green Total Hard Cost/SF = RS Means Green Modified Cost/SF x Size Cost Modifier x Location Cost Modifier
Size factor = Actual Gross SF / Typical Size Gross SF
Hard Costs excludes Contractor and Architect Fees

are applied through location factors that account for local market variances from the national average.

Figure 42 below lists hard costs for green construction projects reported in the previous section. For comparison, the research team referenced RS Mean's national average hard costs and added green features to the specifications of these buildings (see methodology section for details). Essentially, we attempted to create a green "standard" (or normalize green features by building) to which we could compare any building type in the sample.

We also adjusted the green building cost standard for location and typical sizing (a "size modifier") on which the costs were based in the national average. As a result, nationally averaged green costs are typically 48% higher than the green hard costs being reported in this study. While such a large inflation could be due to inaccurate national averages (or possibly inaccuracies in creating a green equivalent for this work), a limitation of this approach, the green and non-green costs being reported in this work are considerably lower than the national average.

Figure 43 performs a similar comparison as Figure 42, except this time using non-green developments in our sample. The non-green sample averages 42% below the national average of our normalized green costs (RS Means costs with green features added as used in Figure 43). Again, assuming the limits of this approach, analysis suggests that non-green developments contain costs considerably below the national average.

Over time, establishing green cost trends from national averages is important. The difference between green, national averages

Figure 43. National Average (RS Means) vs. Actual Non-Green Development Hard Costs

Non-Green Deveopent	Actual Hard Cost / sf	Adjusted RSMeans Green Hard Cost / sf	% Difference
Non-Green 1	$64.72	$92.87	-30.31%
Non-Green 2	$57.12	$85.44	-33.14%
Non-Green 3	$58.31	$96.12	-39.34%
Non-Green 4	$45.86	$90.93	-49.56%
Non-Green 5	$49.91	$88.22	-43.43%
Non-Green 6	$58.13	$110.94	-47.60%
Non-Green 7	$47.73	$93.74	-49.08%
Average Cost / sf:	$54.54	$94.04	-42.00%

and local costs is greater for green developments in our sample than non-green. Recall that green development hard costs in our sample are 1.6% higher than non-green hard costs ($55.43/sf versus $54.54/sf respectively). Therefore, the green developments contain higher cost savings from the national average. This finding could represent a tendency toward lower costs for the green sample over time and possibly innovative practices in terms of hard costs.

Figures 44 and 45 detail the hard costs for the green and non-green costs as well. For these tables, the "% of Total Cost" rows are where much of the comparison is taking place. These rows report 100% of the construction costs.

According to Figure 44, the green developments in our sample deviate considerably from the national average in all detailed cost categories of the buildings. For example, Shell and Services is especially large in their deviation from our sample. Equipment and Furnishings, Special Construction and Other are not even reported nationally. Such findings support the accuracy of our numbers, especially in light of the limitations mentioned earlier when using national numbers. These findings also suggest a need for more accurate national data of green construction costs. The use of accurate national data could assist local and regional green building movements considerably when understanding the distribution of costs in developments.

Figure 45 compares the non-green sample to our national green costs standard. As before, green and non-green data in our sample do not vary widely in their deviation from national data. As a benchmark to national data, the low variability suggests consistency across the sample.

Figure 44. Detailed National Average (RS Means) vs. Actual Green Development Hard Costs

	Substructure / sf	Shell / sf	Interiors / sf	Services / sf	Equipment & Furnishings / sf	Special Construction / sf	Other / sf
Actual SF Cost:	$4.34	$21.08	$9.16	$15.18	$2.51	$2.15	$2.59
Actual % of Total:	7.61%	36.97%	16.07%	26.63%	4.40%	3.77%	4.54%
RSMeans SF Cost:	$3.83	$27.90	$24.96	$50.88	N/A	N/A	N/A
RSMeans % of Total:	3.56%	25.94%	23.20%	47.30%	N/A	N/A	N/A

(RS Means Costs have been adjusted for location)

Figure 45. Detailed National Average (RS Means) vs. Actual Non-Green Development Hard Costs

	Substructure / sf	Shell / sf	Interiors / sf	Services / sf	Equip. & Furnish / sf	Special Const. / sf	Other / sf
Actual Non-Green Cost:	$4.50	$23.21	$8.08	$14.30	$3.66	$1.09	$0.00
% of Total Cost:	8.21%	42.32%	14.73%	26.08%	6.67%	1.98%	0.00%
RSMeans Non-Green Cost:	$4.01	$23.91	$22.96	$43.16	N/A	N/A	N/A
% of Total Cost:	4.26%	25.42%	24.41%	45.90%	N/A	N/A	N/A

(RS Means Costs have been adjusted for location)

Developer/Builder Cost and Specifications Survey Analysis

In order to further triangulate typical hard costs of construction we polled a panel of industry professionals. Our poll is based on similar levels of detail as reported above for hard costs and this same detailed breakdown was not available for typical soft or O&M costs, as respondents were not able to provide the same level of detail.

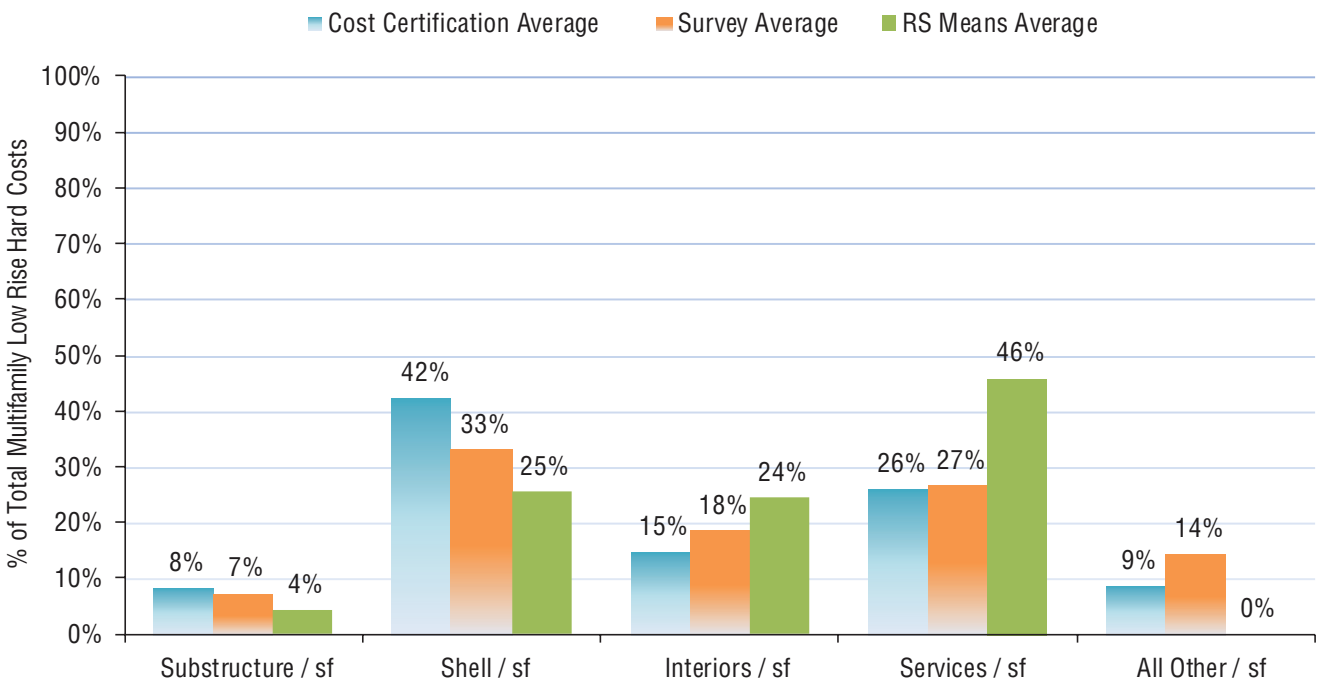
When hard costs are compared across data sources as seen in Figure 46, the substructure of developments does not vary widely across the developments. Nationally, substructure costs contain the lowest average, which could be a result of the type of foundations used outside of the Southeastern United States. Cost certification-reported hard costs for the development's shell vary considerable from national costs with a median close to the survey average. Similar to shell costs, yet reversed, cost certification-reported interior costs vary considerably from national averages with a median close to the survey average. Cost certification and survey responses are mostly aligned in regard to services costs, yet both are far from the national average. Finally, "other" reported costs range from 9-14%, while no national costs are averaged for this category.

Interestingly, the survey reinforces our findings that hard costs are not tracking the national average, according to RS Means data. Comments from the survey suggest that RS Means specifications of materials behind the cost are not always in line with industry practice, including the following:

> *"Rarely use steel in a low-rise code, wouldn't allow aluminum windows in the south, we are not using oil fired chilled water, rarely have elevators in low-rise and no gas water heater"*

> *"Super Structure above Grade is wood-framed construction with some steel structural support, but mostly wood. Floor and attic trusses are wood trusses not steel. Exterior walls are*

Figure 46. Developer/Builder Cost and Specifications Survey



40% brick and 60 % "cementitious siding." Stairs are steel and stringers with prefabricated concrete treads. Water heater is all electric. Roof covering is asphalt shingle in sloped roof condition and TPO or modified Bituminous in flat roof conditions. Partitions are wood-framed, not steel stud, with two layers of 5/8" gypsum."

"Our specifications differ as follows: 1) wood frame construction for exterior walls, interior walls, decking and roof system (pre-engineered trusses); 2) 30 and 35 year shingles for roofing; 3) exterior doors are metal clad insulated doors; 4) windows are single hung vinyl; 5) electric water heaters; 6) roof drainage is via aluminum gutter system; 7) electrical service is 400 ampere service; 8) we typically do not include an emergency generator."

"I do not agree with several of the material selections for the building, a hydraulic passenger elevator, or emergency generator for this low-rise apartment building."

Analysis suggests, as before, when comparing national data to hard, soft and O&M costs; that green costs are progressively being implemented across the country and are not yet normalized. In other words, the industry does not have a good grasp on a central tendency of green costs across the country. Our study begins to make a case for green construction average costs in the Southeast United States only.

The results of our pilot survey indicate industry commonalities since 2006 at the executive level as well (Yudelson, 2008). Executives are still reporting a lack of knowledge for justifying additional costs on the project. Yet, green projects are being reported as less expensive according to cost certification and accounting documents. Survey results show areas where they believe costs to be different - namely "shell" and "other" categories. These areas provide opportunity for improvement in the hard costs of a development.

Hard and Soft Costs Section Discussion

In summary, the green developments averaged a total development cost that is approximately 5% lower than non-green developments. However, when broken down into hard costs (materials, labor and equipment directly used in the construction of the building) versus soft costs (design and construction fees associated with the management of the development process), the green development hard costs are approximately 2% higher and soft costs are more than 13% lower than non-green developments. These findings contradict the industry perception captured in our survey. Survey respondents generally agree that hard costs for green-certified buildings represent a 10% cost increase and soft costs represent a 3% cost increase over typical construction.

Non-green buildings are nearly 15% less expensive to operate and maintain and present an opportunity for future study and analysis regarding the lifecycle costs of green building. This finding also suggests the need for additional education and technical assistance of property managers, maintenance staff and residents on green building operations and maintenance. Education and training should drastically reduce costs and increase savings as evident in the literature review and anecdotally by the developers, contractors and managers. These findings are in line with the survey responses from property managers who largely relay that green buildings require more tenant education and maintenance than non-green construction. As noted in the survey discussion, this may also correlate with a need for property manager training on building science and green building systems, especially moisture management and ventilation systems, which are very important building design and construction considerations for the Southeast climate.

Cost variability among green projects could be due to additional certification requirements and the technologies selected by the developers to meet a certification. Based on the sample average green development hard cost, the medium-sized developments contained the largest deviation from the average while only deviating by approximately 2%.

Findings suggest that smaller developments using a green certification can experience soft costs in the development process that grow well above 50% of total development costs and can deviate significantly away from this balance. Non-green soft costs account for 55% of total costs. Similar to green developments, this percentage grew considerably for smaller projects and was closer to a 50% split with large projects, where soft costs can be distributed by the size of the project.

Among detailed hard costs, green developments are characterized by: lower substructure costs, lower shell costs, lower costs for equipment and furnishings. Non-green developments are characterized by: lower interiors costs, lower services and lower special construction costs. Other direct construction costs are higher for green developments, possibly due to additional technologies or processes involved in green

construction, all of which would be outside new standard construction and code for the locality.

Among detailed soft costs, green developments are characterized by lower: contractor services (includes overhead, profit, and general requirements); construction financing; permits and fees; developer fees. Non-green developments are characterized by lower: professional services (includes architectural and engineering subcontracts, for example); and start-up and reserve fees for the development. These findings equate to the added costs often discussed in terms of green certification, where additional professional services, pre-development and start-up processes are required.

Among detailed O&M costs, maintenance is 29% more expensive, utilities are almost 12% less expensive and administration is nearly 17% more expensive for green buildings. Green-certified buildings save an average of $0.06 per square foot on owner-paid utilities when compared to non-green buildings in this study. This finding supports the perception that green-certified buildings are more energy and resource efficient than their non-green counterparts, saving the green building owners represented in this study an estimated $4,892 on utility costs per year. Owner-paid utility cost savings are calculated by applying the utility cost averages per square foot (green = $0.49/sf and non-green = $0.55/sf) to the square foot average for the entire research sample, green and non-green developments square footage (77,866 sf), and then subtracting the average utility costs per square foot for green and non-green to generate the amount of savings. The average square footage for green and non-green developments is used in this calculation to account for the variability of square feet in the sample.

Objective Data Section

In 2006, executives interviewed by Yudelson (2008) reported a high-return on investment by 75% of respondents, although "hard" data for measuring this return on investment (ROI) was difficult to explain and produce. Our survey and reporting of data expand on previously-reported industry characteristics. While designing and building to a green-certified standard is now standard practice, "the differentiating point is clearly now on results" (Yudelson, 2008).

Nationally averaged green costs are typically 48% higher than the green hard costs reported in this study. The green costs reported in this work are considerably below the national average and are considered reliable for this report. Furthermore, green construction costs are also not unreasonably higher than non-green costs and are moving closer to standard practice in terms of hard costs. These findings suggest that affordable housing developers in the Southeast can, and are building green-certified affordable housing at or below the price of comparable non-green affordable housing in the region.

The non-green sample average is 42% below the national average of green, RS Means costs. Of interest, the difference between green, national averages and localized real costs are greater for green developments in our sample than non-green, suggesting that the green buildings in our sample are providing solutions with larger cost savings from a national green average. This finding also suggests a tendency toward lower costs for the green sample and possibly innovative practices in terms of hard costs.

The green buildings in our sample deviate considerably from the national average in all detailed cost categories of the buildings and some data are not reported nationally. Such findings support

the accuracy of our numbers and a need for more accurate national data on green construction costs. The use of accurate national data could assist local green building movements considerably when understanding and justifying the distribution of costs in projects.

Utility Tracking and Energy Consumption

Finally, this study tracked and analyzed utility data with at least 12 months historical data for seasonal variation to determine cost-benefits to residents of green versus non-green developments related to resource and energy efficiency.

Water Utility Data

Water utility data has been collected from developers and property managers, but due to the limited number of developments providing total building water data, lack of data quality, variability of metering strategies, and inconsistent reporting across the sample, the research team was unable to assert that this data is comprehensive and accurate; therefore, the research team determined that it would be misleading to include in the report. This does present an opportunity for additional research, particularly as water consumption and conservation is becoming an exceedingly important policy and planning issue in the Southeast.

Electrical Utility Data

The following section presents an analysis of WegoWise electrical utility data across the various types of projects in our study. Data includes utility readings from the period of January 2014 to December 2014. It is important to note that not all units have complete data for that year, occasionally missing one month due to unit turnover. Such inconsistencies in the data, albeit common and difficult to control for these types of studies, mean that certain developments cannot be compared uniformly with the remaining sample and are not shown in the following findings and analysis (Green 8 and 9).

Based on electricity usage, green-certified developments in Georgia, North Carolina and South Carolina used 13.61% kWh/sf and 6.84% kWh/unit less electricity (on average) than non-green developments in Alabama and South Carolina. Two low-rise buildings below 50,000 sf were excluded from this analysis due to incomplete utility history (Green 8 and 9). Four low-rise green projects between 50,000 sf and 100,000 sf contained an electricity usage range between 0.588 kWh/sf and 0.422 kWh/sf with an average of 0.505 kWh/sf. Three buildings above 100,000 sf range from 0.503 kWh/sf to 0.475 kWh/sf.

The monthly record of utility usage for the two low-rise non-green projects below 50,000 sf was available between 0.691 and 0.626kWh/sf. Four low-rise non-green projects between 50,000 sf and 100,000 sf have an electricity usage range between 0.617 kWh/sf and 0.484 kWh/sf with an average of 0.528 kWh/sf, which is 4.3% less efficient than the green sample of the same size. One building above 100,000 sf used 0.582 kWh/sf monthly.

Beginning with Figure 49, we present a large amount of electricity consumption information in one chart that contains data on individual apartments or units within green developments. Plotted as usage per development (Green 2, Green 3…), individual dots represent a unit's average annual electricity usage. Lines represent energy usage averages for either the overall sample or separate groups of units. As is evident in Figure 49, individual units contain a large range in

use of electricity. However, when looking at units in aggregate as an average annual electricity use by development, the green developments are relatively close to each other with a range of approximately 0.40 kWh/sf – 0.60 kWh/sf annually. Also, dots indicating zero electricity usage are actually those with very low usage due to vacancy. In these cases, 0.0012 kWh is displayed as zero in the chart.

In addition to the green developments' monthly annual apartment-level electric usage (kWh/sf) described in Figure 47 and Figure 49, Figure 50 includes state average residential electricity consumption and cost, and an energy efficiency (electric) benchmark comparison to buildings of the same climate zone and building type in the WegoWise portfolio. The green developments' range in efficiency from the median is 76% more efficient for Green 3 to a low of 41% more efficient for Green 2. Green developments have an average efficiency benchmark of 59%. Please see Figure 51 for the number of comparative WegoWise buildings.

With regard to non-green developments, all developments contain units with large amounts of variability in electricity

Figure 47. Green Development Avg. Monthly kWh/sf

Green Development	Gross sf	Number of Units	Building Type	State	Certification	Average Monthly kWh/sf	Average Monthly kWh/unit
Green 2	75,803	60	Low-Rise New Construction	GA	EarthCraft	0.550	607.6
Green 3	202,343	156	Low-Rise New Construction	GA	LEED	0.475	506.9
Green 4	69,075	50	Low-Rise New Construction	GA	EarthCraft & LEED	0.460	621.4
Green 5	111,000	110	Mid-Rise New Construction	NC	EarthCraft	0.503	436.5
Green 6	103,300	74	Mid-Rise New Construction	NC	EarthCraft	0.500	658.5
Green 7	74,444	64	Low-Rise New Construction	NC	ENERGY STAR	0.422	490.3
Green 8	40,720	40	Low-Rise New Construction	NC	EarthCraft	-	-
Green 9	47,784	40	Low-Rise New Construction	NC	ENERGY STAR	-	-
Green 10	85,327	60	Low-Rise New Construction	SC	ENERGY STAR	0.588	662.9

***Average Green Monthly kWh/sf = 0.500**

Average Green Monthly kWh/unit = 569.2

*Note: this is a representative sample of utility usage per HUD's MF sample of unit-level data requirements

usage. Non-Green 1, Non-Green 5 and Non-Green 6 contain some of the highest use of electricity, and a majority of the developments have energy usage above the "total green monthly average." The non-green sample contains units with a monthly average and range that is not clustered as closely to the "total non-green monthly average" as compared to the green sample. The variability in unit performance, in direct comparison to the more closely aligned green sample, may represent a correlation to variability in construction and performance quality.

In addition to the non-green developments' monthly apartment-level electric usage (kWh/sf) described in Figure 48 and Figure 52, Figure 53 includes state average residential electricity consumption and cost, and an energy efficiency (electric) benchmark comparison to buildings of the same climate zone and size in the WegoWise portfolio. The non-green developments range in efficiency from a median of 61% more efficient for Non-Green 3 to a low of 25% more efficient for Non-Green 1. The relatively low efficiency of Non-Green 1, as indicated by the benchmark of median electricity consumption per square foot, can be attributed to the resident density of the development, which has a relatively high proportion of units and bedrooms, and thus residents, compared to its square feet. Whereas, Non-Green 3 has a lower number of residents per square feet and a higher efficiency benchmark, non-green developments have a median efficiency benchmark of 49%.

When comparing the efficiency benchmarks for green and non-green developments, both are performing at a higher efficiency than the median, suggesting that all properties in this study

Figure 48. Non-Green Development Avg. Monthly kWh/sf

Non-Green Development	Gross sf	Units	Type	State	Average Monthly kWh/sf	Average Monthly kWh/unit
Non-Green 1	40,367	40	Low-Rise New Construction	AL	0.691	663.7
Non-Green 2	59,806	56	Low-Rise New Construction	AL	0.484	494.9
Non-Green 3	57,613	51	Low-Rise New Construction	AL	0.485	443.7
Non-Green 4	46,630	40	Low-Rise New Construction	AL	0.626	650.8
Non-Green 5	109,232	96	Low-Rise New Construction	AL	0.582	613.2
Non-Green 6	62,873	46	Low-Rise New Construction	SC	0.526	688.4
Non-Green 7	59,543	50	Low-Rise New Construction	SC	0.617	712.2

Average Non-Green Monthly kWh/sf = 0.573

Average Non-Green Monthly kWh/unit = 609.6

are performing considerably better than national averages. However, the variability in building efficiencies for green is less than non-green. Even with a larger sample and variability in building characteristics such as square feet, units, bedrooms and residents, the efficiencies of the green developments show more consistent performance metrics than non-green buildings. This may suggest quality and consistency of end product provided by green building certification program's quality assurance and performance testing, which verifies that all certified buildings meet the same performance metrics.

On average, the green developments are performing at a higher efficiency, when benchmarked to the median building, compared to the non-green developments. Green developments have an average efficiency benchmark of 59% whereas non-green average 49%, a difference of 10%. According to the WegoWise efficiency benchmark and resident provided utility data, the green developments are performing at a higher efficiency.

Electrical Utility Data Discussion

Confirming the expectations and perceptions of most stakeholder surveys, apartment-level utility data indicates that green-certified buildings save energy and money. On a state-by-state level, green developments in Georgia, North Carolina and South Carolina used 12.81% kWh/sf and 6.63% kWh/unit less electricity (on average) than non-green developments in Alabama and South Carolina.

Figure 49. Green Developments Average Monthly kWh/sf (Jan '14 - Dec '14)

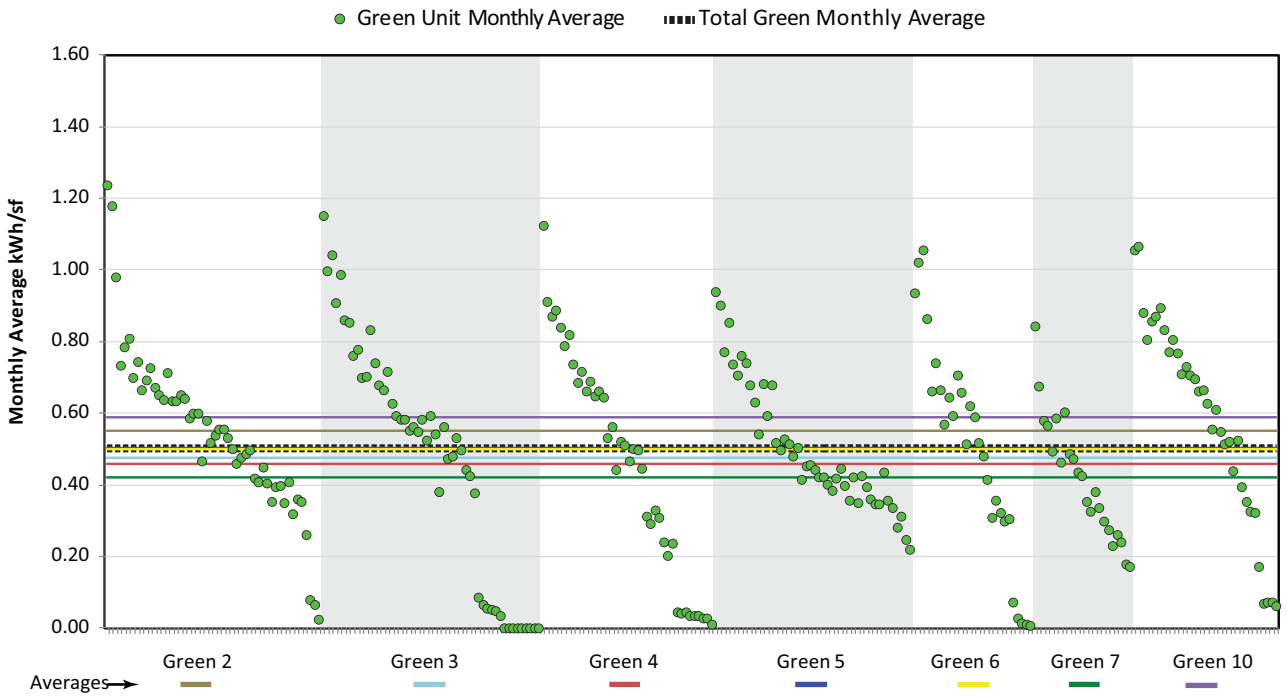


Figure 50: Green Developments Energy Efficiency Benchmark (Electric) kWh/sf

Development	State	State Electricity Average*	2014 WegoWise Efficiency Benchmark kWh/sf
Green 2	GA	1,088 kWh/mo. | $0.1146/kWh | $124.67/mo.	41% more efficient than median
Green 3	GA	1,088 kWh/mo. | $0.1146/kWh | $124.67/mo.	76% more efficient than median
Green 4	GA	1,088 kWh/mo. | $0.1146/kWh | $124.67/mo.	49% more efficient than median
Green 5	NC	1,098 kWh/mo. | $0.1097/kWh | $120.52/mo.	51% more efficient than median
Green 6**	NC	1,098 kWh/mo. | $0.1097/kWh | $120.52/mo.	73% more efficient than median
Green 7	NC	1,098 kWh/mo. | $0.1097/kWh | $120.52/mo.	65% more efficient than median
Green 8	NC	1,098 kWh/mo. | $0.1097/kWh | $120.52/mo.	No data
Green 9	NC	1,098 kWh/mo. | $0.1097/kWh | $120.52/mo.	No data
Green 10	SC	1,124 kWh/mo. | 0.1199/kWh | $134.86/mo.	55% more efficient than median

*http://www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls

**10 months of data in 2014

Figure 51: WegoWise Building Type Frequency by Climate Zone and Fuel Source

Climate Zone	Building Type & Fuel Source	
	Low-Rise - Elec Heat, Elec HW	Mid-Rise - Elec Heat, Elec HW
Mixed Humid - Elec	545	103
Hot Humid - Elec	217	N/A

Despite the significant variation in building type, size and location across the sample, green developments outperform the non-green developments in terms of energy efficiency, and lower consumption translates into dollars saved by low-income residents and building owners.

Figure 54 and Figure 55 estimate monthly utility bills for properties represented in this study based on average kWh usage and the state average cost of electricity in 2014. On average, green units are saving residents $5.48 a month or $65.77 per year in comparison to the non-green sample shown in Figure 55. When you divide the samples according to resident type, properties serving families are saving an average of $7.97 per month in comparison to non-green family properties. This equates to an annual savings of $95.58 for low-income families.

While construction costs relating to green building show an increase in variability in comparison to non-green, the opposite is true for utility data. New construction green buildings show less variability from the average kWh per square foot, as shown by the clustering in Figures 49 and 52. This may suggest that green building certifications are providing a more consistent product. Field verification, mandatory infiltration and duct testing are required elements of green building certification programs, providing a greater level of quality assurance in construction details related to energy efficiency and performance. This study suggests that green building certifications may lead to a more consistent end product and more predictable energy bills for low-income residents across a state's portfolio of affordable housing developments.

Figure 52. Non-Green Developments Monthly kWh/sf (Jan '14 - Dec '14)

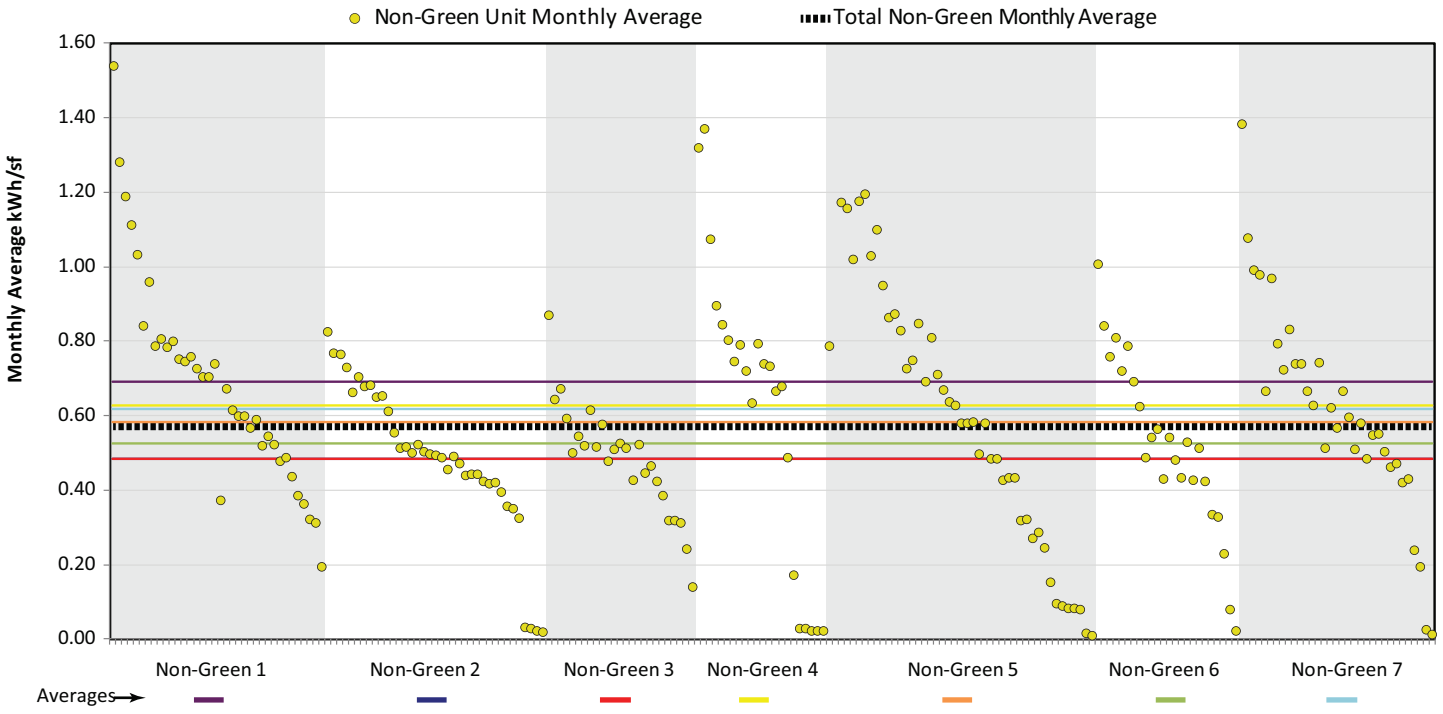


Figure 53: Non-Green Developments Energy Efficiency Benchmark (Electric)

Non-Green Development	State	State Electricity Average*	2014 WegoWise Efficiency Benchmark
Non-Green 1	AL	1,211 kWh/mo. | $0.1126/kWh | $136.36/mo.	25% more efficient than median
Non-Green 2	AL	1,211 kWh/mo. | $0.1126/kWh | $136.36/mo.	45% more efficient than median
Non-Green 3	AL	1,211 kWh/mo. | $0.1126/kWh | $136.36/mo.	61% more efficient than median
Non-Green 4**	AL	1,211 kWh/mo. | $0.1126/kWh | $136.36/mo.	55% more efficient than median
Non-Green 5***	AL	1,211 kWh/mo. | $0.1126/kWh | $136.36/mo.	58% more efficient than median
Non-Green 6	SC	1,124 kWh/mo. | $0.1199/kWh | $134.86/mo.	58% more efficient than median
Non-Green 7	SC	1,124 kWh/mo. | $0.1199/kWh | $134.86/mo.	44% more efficient than median

*http://www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls

**2014 usage data is not available. 2015 data (7 months) is displayed.

***2014 usage data is not available. 2015 data (9 months) is displayed.

Figure 54: Green Developments Monthly Cost of Electricity

	State	Resident Type	Monthly kWh per Unit	Cost of Electricity $/ kWh	Monthly Average Cost of Electricity per Unit
Green 2	GA	family	607.6	$0.1146	$69.63
Green 3	GA	senior	506.9	$0.1146	$58.09
Green 4	GA	family	621.4	$0.1146	$71.21
Green 5	NC	senior	436.6	$0.1097	$47.89
Green 6	NC	family	658.6	$0.1097	$72.24
Green 7	NC	senior	490.3	$0.1097	$53.79
Green 8	NC	-	-	-	-
Green 9	NC	-	-	-	-
Green 10	SC	family	662.9	$0.1199	$79.48
Average			**569.2**		**$64.61**

Figure 55: Non-Green Developments Monthly Cost of Electricity

	State	Resident Type	Monthly kWh per Unit	Cost of Electricity $/ kWh	Monthly Average Cost of Electricity per Unit
Non-Green 1	AL	senior	663.7	$0.1126	$74.73
Non-Green 2	AL	senior	494.9	$0.1126	$55.72
Non-Green 3	AL	senior	443.7	$0.1126	$49.96
Non-Green 4	AL	senior	650.8	$0.1126	$73.28
Non-Green 5	AL	family	613.2	$0.1126	$69.04
Non-Green 6	SC	family	688.4	$0.1199	$82.54
Non-Green 7	SC	family	712.2	$0.1199	$85.40
Average			**609.6**		**$70.10**

Conclusions

One hundred percent of the builders and developers responding to the survey on development and construction costs believe that green-certified buildings cost more to construct than conventional non-green construction. Conversely, this research reveals that the price premium for green building certification for these developers is approximately 2% of hard costs; furthermore, on average, green buildings in this study are about 5% less expensive to construct in terms of overall development and construction costs, and soft construction costs are more than 13% less expensive. This suggests that we are making significant strides towards diffusion of green building best practices as industry standards, and it appears that the affordable housing industry in the Southeast has overcome the learning curve and cost-premiums associated with achieving green building certifications.

Green building certification programs contribute value to affordable housing by providing a more consistent quality of construction and higher performing housing stock for vulnerable low-income communities. Incentivizing green building certifications in state Qualified Allocation Plans provides additional quality assurance and more consistent performance results for federal tax credit developments, saving resident's money while reducing resource consumption and ensuring that taxpayer contributions are worthwhile.

While the construction industry in Georgia and North Carolina appear to have overcome some of the perceived cost-implications of the green building learning curve, our surveys suggest that more education and technical assistance is required to help property management staff and residents understand and integrate green building best practices for operations and maintenance of these units. While the owner-paid utility costs are 12% less, on average, for green-certified properties, the overall maintenance and operations costs are 15% higher than non-green buildings.

While the data collected and analyzed in this report are substantial, they do have their limitations. The data and findings are based on a relatively small sample set with significant variability among the developments. There are also limitations with regard to the accuracy of the data collected from developers, contractors, property managers and residents, which is an issue in conducting this type of research and indirect data collection.

The research team identified areas that require additional investigation in order to continue to make the case that green affordable housing provides significant triple bottom line benefits. Survey results indicate that developers and builders are not aware of the economic performance in terms of return on investment and payback period of their properties with a green building certification. In order to have a clear understanding of economic impact, it is recommended that additional analysis is performed. Non-energy benefits of green building, including health impacts, are not well understood and limited research exists on green building and its influence on improving health outcomes for residents of affordable housing in the Southeast United States. Limited datasets for comparative purposes continue to be a shortcoming for this type of research. More regional and national datasets on development, construction and operation of green and non-green building is necessary to have a complete understanding of performance and best practices.

As this research demonstrates, green building programs and technologies are an effective way to enable residents of affordable housing to save money on utilities, increase household budgets for items such as food, healthcare and transportation, and live more comfortably. Correspondingly, the utility savings afforded by green building programs provide property owner-managers with an enhanced level of assurance that residents will not default on rent, and has the potential for property owners to more accurately determine appropriate utility allowances. Additionally, affordable housing that is certified by a green building certification program costs less in terms of overall development and construction costs, and soft construction costs when compared to non-green or conventional construction. The research presented in this report adds weight to the industry convention that green buildings save money and energy and disputes the perception that upfront costs for green building are prohibitive to the development of affordable housing. Empirical data indicate that green-certified buildings are providing an array of benefits to affordable housing stakeholders, encouraging the diffusion of green building policies and incentives for affordable housing development across the Southeast and nation.

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Appendix

Section I. Definitions

Affordable Housing

In general, housing for which the occupant(s) is/are paying no more than 30 percent of household income for gross housing costs, including utilities. Please note that some jurisdictions may define affordable housing based on other, locally determined criteria, and that this definition is intended solely as an approximate guideline. Also referred to as low-income rental housing. http://www.huduser.org/portal/glossary/glossary_a.html

Area median income (AMI)

This variable compiles median incomes in a geographic area, usually at the MSA level, and finds the median number that separates the values into two equal parts. "For households and families, the median income is based on the distribution of the total number of households and families including those with no income" (American Community Survey, 80). HUD annually releases AMI data for the purpose of determining income limits and qualifications for housing subsidy programs. Under current laws and standards a household earning no more than the eighty percent of the AMI is classified as a low-income household. Households earning between thirty and fifty percent of the AMI are considered very low-income. Those households earning thirty percent or less of the AMI are deemed extremely low-income households. Income limits are adjusted dependent on family size. A family of four is considered the base; larger families are permitted higher income limits, smaller families are subject to lower income limits (HUD 2012a). Overall, HUD's assistance programs target families who fall under 60% of their AMI.

Building Energy Code

Refers to a law or regulation used by state or local governments that establishes specifications for the design and construction of residential or commercial buildings. Building codes help ensure that new and existing residential and commercial structures meet minimum health, safety, and performance standards. In addition, building codes offer a baseline to which structures can be compared. https://www.energycodes.gov/resource-center/ace/definitions

ENERGY STAR® Appliances

ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency. ENERGY STAR qualified appliances incorporate advanced technologies and use 10 to 50 percent less energy than standard appliances. ENERGY STAR appliances include: air purifiers, clothes dryers/washers, dehumidifiers, dishwashers, freezers and refrigerators. http://www.energystar.gov/ia/new_homes/features/Appliances_062906.pdf

Financial Incentives

A monetary benefit offered to developers, owners or residents to encourage behavior or actions which otherwise would not take place. In the context of affordable housing, example incentives would be the low-income housing tax credit allocated by the U.S. Department of Housing and Urban Development (HUD) and administered by the State Housing Finance Agency (HFA), and utility company rebates.

Green Building Certification (Green)

Building certification systems are a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements that go above and beyond the respective jurisdictions adopted energy code and any related amendments. Achieving a desired level of certification is dependent upon third party verification and testing of installed measures selected in the particular certification program. http://www.wbdg.org/resources/gbs.php

Green Technologies

Any product or services that improves operational performance, productivity, or efficiency while reducing costs, inputs, energy consumption, waste or environmental pollution.

High-Efficiency Lighting

Compact fluorescent lamps (CFLs), T8 or T5 linear fluorescent lamps and light emitting diodes (LEDs). http://www.buildingwell.org/Energy+Efficiency+-+Lighting

High-Efficiency Mechanical Equipment

Heating - Federal regulations require boilers burning fossil fuels have minimum annual fuel utilization efficiency (AFUE) of 80%. AFUE is the thermal efficiency measure of combustion equipment. It represents the actual, season-long, average efficiency of the piece of equipment, including the operating transients. ENERGY STAR® requires a boiler to have an AFUE of 85% or greater. Federal regulations require furnaces burning fossil fuels have a minimum AFUE of 78%. ENERGY STAR requires a gas furnace to have an AFUE of 90% or greater and an oil furnace 85% or greater. http://www.buildingwell.org/Energy+Efficiency+-+Mechanical+Systems+-+Equipment+-+Central+Heating+System

Cooling - Seasonal energy efficiency ratio (SEER) of at least 14.5 or energy efficiency ratio (EER) of at least 12. http://www.aceee.org/node/3066

High-Performance Windows

Properties in the South-Central climate zone with U-Factor of <0.35 and Solar Heat Gain Coefficient (SHGC) of <0.40. Properties in the North-Central climate zone with a U-factor of <0.32 and SHGC <0.40. Properties in the Southern climate zone with a U-Factor of <0.60 and SHGC of <0.27. See Climate zone map

Household type (family v. non-family)

This breaks down the total number of households into two categories: family and non-family. "A family consists of a householder and one or more other people living in the same household who are related to the householder by birth, marriage, or adoption" (American Community Survey, 75). A nonfamily household consists of individuals living alone or with non-relatives. Household type is important when considering geographic location. In some cities, non-family households may be higher due to younger, single residents or college students living together to afford housing closer to transportation or campus.

Housing tenure (renter v. owner)

This measures homeownership rates of occupied housing units. The rate of homeownership is important because in the U.S. it has come to serve as an indication of personal wealth and therefore a gauge of the nation's economy. The data can serve to aid planners in evaluating the stability and viability of housing markets. It can "also serve in understanding the characteristics of owner-occupied and renter-occupied units to aid builders, mortgage lenders, planning officials, government agencies, etc., in the planning of housing programs and services" (American Community Survey, 35). For this study, the information is essential in understanding the affordable housing market and therefore the potential impact EE policies can have on the LIHTC program. "A housing unit is owner-occupied if the owner or co-owner lives in the unit, even if it mortgaged or not fully paid for." Mobile homes are considered in the owner category if occupied by owners paying a loan on leased land. "All occupied housing units which are not owner-occupied, whether they are rented or occupied without payment of rent, are classified as renter-occupied" (American Community Survey, 35).

Indoor Environmental Quality (IEQ)

IEQ encompasses indoor air quality (IAQ), which focuses on airborne contaminants, as well as other health, safety, and comfort issues such as aesthetics, potable water surveillance, ergonomics, acoustics, lighting, and electromagnetic frequency levels. http://www.wbdg.org/design/ieq.php

Insulation

As it relates to the geographic location of participating developments and associated climate zones (CZ) required by the 2009 IECC. In CZ 2 and 3, insulation values must be greater than the following respective minimums: ceiling R-Value of 30, wood frame wall R-Value of 13, mass wall R-Value 4/6 and 5/8, floor R-Value of 13 and 19, basement wall R-Value of 0 and 5/13, slab R-Value and depth of 0, and crawl space wall R-Value of 0 and 5/13. In CZ 4, ceiling R-Value of 38, wood frame R-Value of 13, mass wall R-Value of 5/10, floor R-Value of 19, basement wall R-Value of 10/13, slab wall R-Value and depth of 10/2 ft., crawl space R-Value of 10/13. https://www.energycodes.gov/sites/default/files/becu/2009_iecc_residential.pdf (pg.16)

Internal Rate of Return (IRR)

Percentage return on initial capital investment in energy and water saving technologies or measures, represented by the estimated future utility cost savings over the life of the property.

Low-Flow Water Fixtures

U.S. EPA WaterSense labeled fixtures. Bathroom faucets = 0.5/1.0 gallons per minute (gpm), kitchen faucet = 1.5 gpm, showerheads = 1.5-2.0 gpm and toilets = 1.28 gallons per flush (gpf). http://www.buildingwell.org/Water+Conservation+-+Low-Flow+Water+Fixtures

Median family income

This refers to the summed incomes of all individuals, 15 years and over, related to the householder. See household type for a more detailed definition of family. Looking across geographic regions, important comparisons can be drawn by studying the various median family incomes.

Median household income (owner occupied v. renter occupied)

"This includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not. Because many households consist of only one person, average household income is usually less than average family income" (American Community Survey, 80). This can create important comparisons between the income of homeowners and the income of renters. A wide gap between the two indicates a problem with affordability in an area.

Non-Green Building (Conventional)

A building meets the requirements of the applicable jurisdictions adopted residential energy code as determined by the code official or third-party verifier. Energy code compliance and verification are performed from different perspectives, but share the same end goal. Architects, designers, engineers, contractors, builders, and other construction industry stakeholders have a professional responsibility to design and comply with the energy code on behalf of the building owner/developer. https://www.energycodes.gov/compliance/basics

Payback Period

The length of time, typically in years, for a capital investment to recover its initial expense in terms of profits or savings.

Poverty status

This variable identifies the percentage of population below the poverty threshold. Family or individual income determines the poverty threshold. If a person is within a family, their income for the last 12 months is compared to the appropriate poverty threshold for a person within a family of that size and composition. "If the total income of that person's family is less than the threshold appropriate for that family, then the person is considered 'below the poverty level,' together with every member of his or her family. If a person is not living with anyone related by birth, marriage, or adoption, then the person's own income is compared with his or her poverty threshold. The total number of people below the poverty level is the sum of people in families and the number of unrelated individuals with incomes in the last 12 months below the poverty threshold" (American Community Survey, 102). Knowing what areas have a high percentage of the population below poverty can help direct redevelopment and LIHTC projects. Areas with high poverty rates may need economic redevelopment and more low-income housing options. Poverty status serves as an indicator for areas for LIHTC development along with EE construction standards.

Renewable Energy

Unlike fossil fuels, which are exhaustible, renewable energy sources regenerate and can be sustained indefinitely. The five renewable sources used most often are: biomass, hydropower, geothermal, wind and solar. http://www.eia.gov/energyexplained/index.cfm?page=renewable_home

Return on Investment (ROI)

Performance measure used to evaluate the efficiency of an energy or water saving investment or compare the efficiency of a multiple investments. Return on investment (%) = Net profit or savings ($) / Investment ($) × 100, or Return on investment = (gain from investment - cost of investment) / cost of investment.

Total population

This refers to the total number of residents determined by the American Community Survey data in the corresponding town/city, county, or MSA. When studying affordable housing projects, population is an important factor because it gives a sense of the size of the community. When this value is compared to the size of the renter occupied housing units, more information on the vitality of the housing market can be assessed.

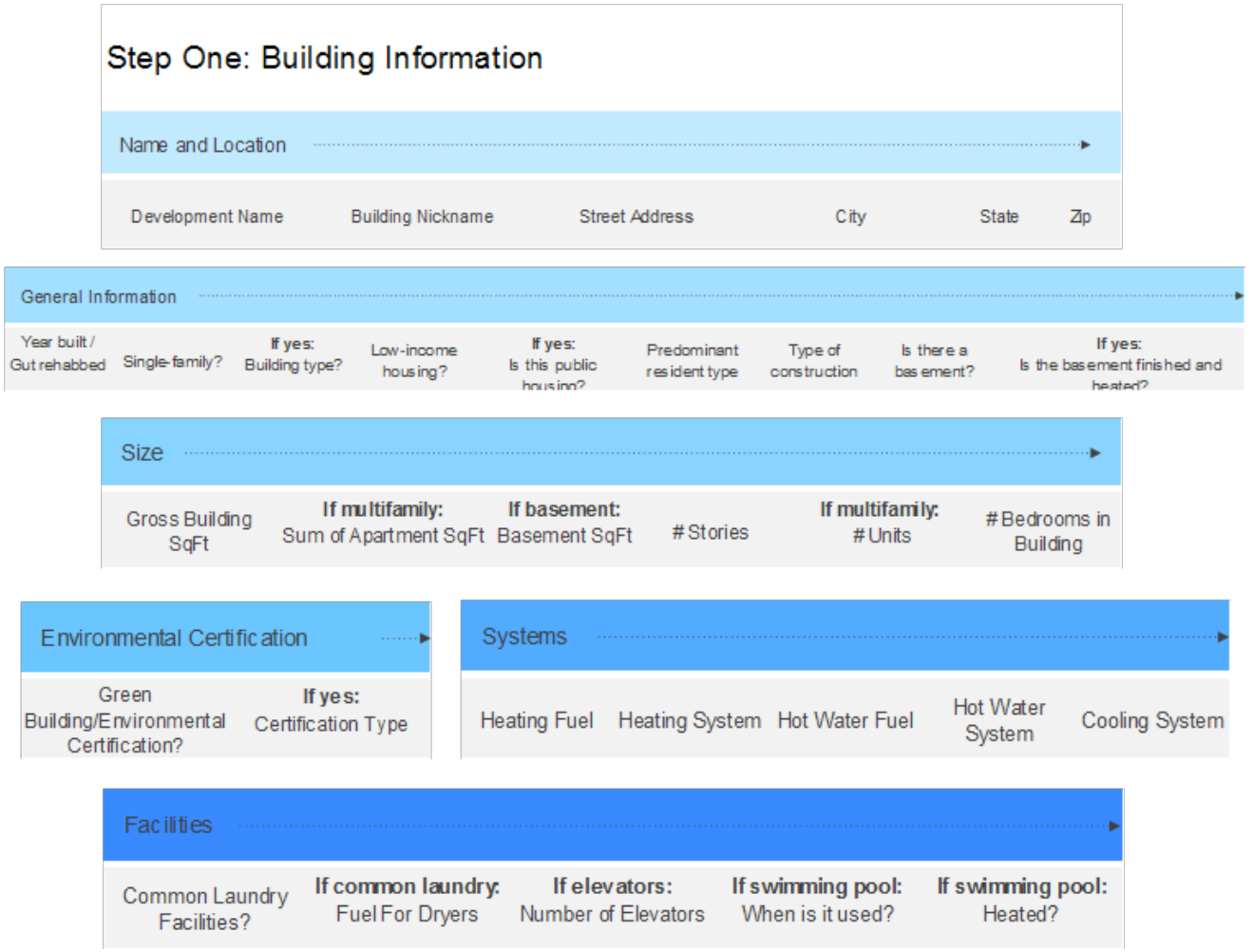
Unit-Rollover

The act of preparing a multifamily rental unit or home for a new tenant when the previous tenant has foregone lease.

Utility Allowance

Total Resident Payment for "rent" to include both shelter and the costs for reasonable amounts of utilities. The amount that a PHA determines is necessary to cover the resident's reasonable utility costs is the utility allowance. Such allowances are estimates of the expenses associated with different types of utilities and their uses. The utilities for which allowances may be provided include electricity, natural gas, propane, fuel oil, wood or coal, and water and sewage service, as well as garbage collection.

Section II. WegoWise Building Templates



Step Two: Utility Accounts

Location and Coverage					
Development Name	Primary Building Address	Is this account shared between multiple buildings?	**If yes:** How many?	**If yes:** Other addresses associated with this account:	What spaces does this account cover?

Apartment Characteristics (If Relevant)		
Unit Number	# Bedrooms in Unit	Unit SqFt

Account Information		
Utility Provider	Utility Type	Account Number

Login Credentials	
Online Account Username	Online Account Password

Online Set Up Requirements (If online account is not already registered)						
Full Tax ID Number	Last 4 Digits of Bill Payer's SSN	Customer Number	Online Access/Web Access Code	Bill Payer's Date of Birth	Service Provided to Name	Billing Address Zipcode

Section III. Resident Utility Account Release Form

Authorization to Receive Customer Utility Data

To Whom It May Concern:

By signing this release form, (First, Last Name) grants <RESEARCHER> permission to create an online utility account at <SERVICE PROVIDER> for the purpose of accessing utility data information and creating automatic import into WegoWise, Inc., an energy tracking software. Utility data includes energy/water consumption, energy demand, energy/water costs as well as associated fees and taxes for each billing period. This information will be used to track energy and water efficiency and consumption for <DEVELOPMENT NAME> for the express purpose of measuring the success of past energy upgrades, comparing building performance to similar building types and determining need for future energy efficiency improvements.

I am an authorized representative for the unit and account(s) listed below and represent and warrant that I have authority to execute this release. Tenant understands that the information obtained as part of this initiative may be released by <RESEARCHER> to other participating developments upon request for comparison purposes. Comparison reports compiled by <RESEARCHER> will not include tenant's personal information.

Tenant authorizes the use of the requested information to <RESEARCHER>. Tenant hereby releases, holds harmless, and indemnifies <RESEARCHER> from any liability, claims, demands, causes of action, damages, or expenses as a result of, but not limited to: 1) any release of information to <RESEARCHER> pursuant to this Utility Release; or 2) the unauthorized use of this information by <RESEARCHER>. Tenant understands that he/she may cancel this authorization at any time by submitting a written request to <RESEARCHER>.

Sincerely,

Account Holder (Signature)

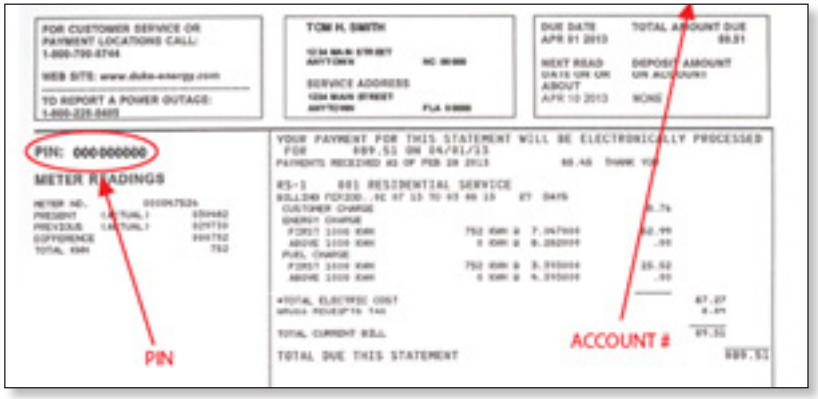
Account Holder Name (First, Last):

Date:

Building Address: (Street) (City), (State)

Unit Number:

Electric Account # (See your bill):



If you don't have an online account setup with <SERVICE PROVIDER>,

provide: <ACCESS CODE OR PIN> (See your bill):

Last four digits of Social Security Number (SSN):

If you have an online account setup with <SERVICE PROVIDER>, provide:

Username:

Password:

Section IV. Resident Survey Flyer

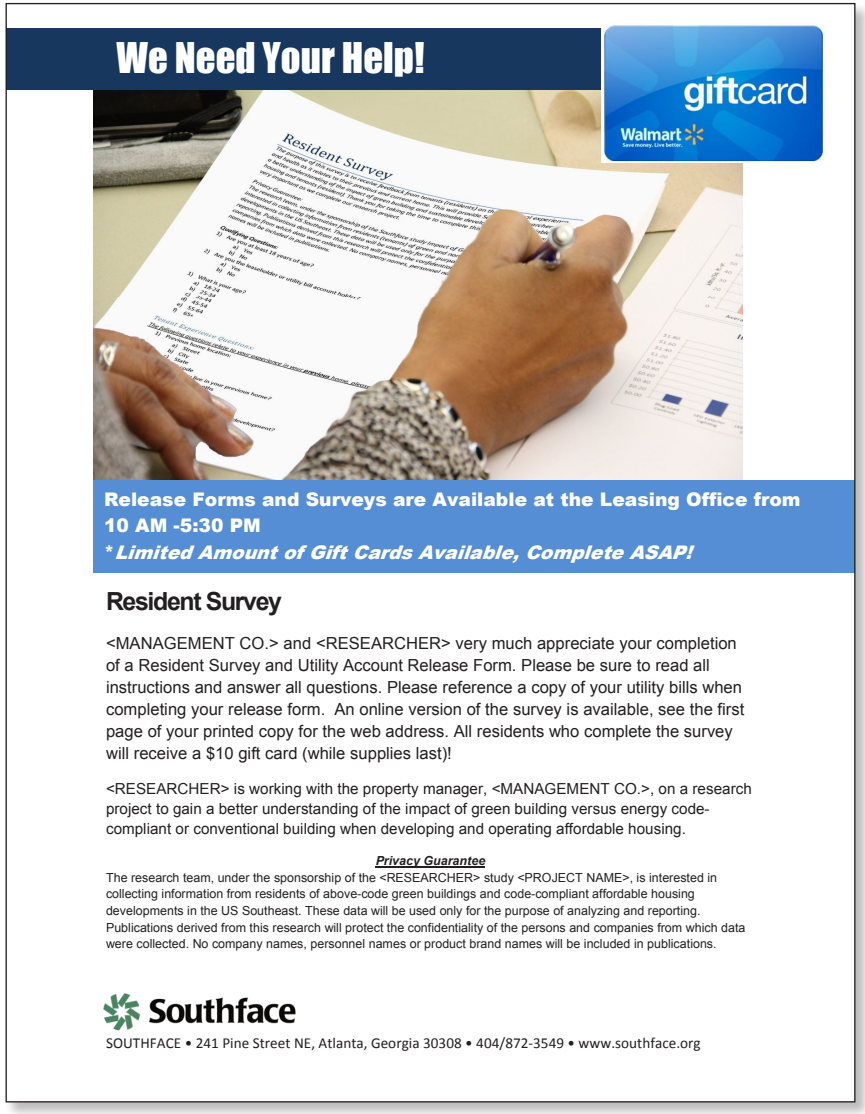
Resident Survey

<MANAGEMENT CO.> and <RESEARCHER> very much appreciate your completion of a Resident Survey and Utility Account Release Form. Please be sure to read all instructions and answer all questions. Please reference a copy of your utility bills when completing your release form. An online version of the survey is available, see the first page of your printed copy for the web address. All residents who complete the survey will receive a $10 gift card (while supplies last)!

<RESEARCHER> is working with the property manager, <MANAGEMENT CO.>, on a research project to gain a better understanding of the impact of green building versus energy code-compliant or conventional building when developing and operating affordable housing.

Privacy Guarantee

The research team, under the sponsorship of the <RESEARCHER> study <PROJECT NAME>, is interested in collecting information from residents of above-code green buildings and code-compliant affordable housing developments in the US Southeast. These data will be used only for the purpose of analyzing and reporting. Publications derived from this research will protect the confidentiality of the persons and companies from which data were collected. No company names, personnel names or product brand names will be included in publications.



Developer/Builder Construction Specs and Costs Survey

Introduction

Greetings,

We are excited to begin the construction costs and specifications survey process of collecting data for the Southface Study: Impact of Green Affordable Housing. Thank you for your valuable time; your participation is crucial to our ability to analyze data for the report.

Before taking the survey, please refresh your memory on the following items:

1. **A general idea of typical specifications for your housing developments, including: multifamily low-rise (1-3 story); multifamily mid-rise (4-7 story); multifamily high-rise (8+ story);**
2. **A general idea of typical costs for your housing developments, including: multifamily low-rise (1-3 story); multifamily mid-rise (4-7 story); multifamily high-rise (8+ story);**
3. **A general idea of cost difference between above-code green building certified units and energy code-compliant units.**

Please do not hesitate to contact us with questions or concerns. Finally, our privacy guarantee is below for reference. We appreciate your time and look forward to your responses!

Sincerely,

The Southface and VCHR Team

Privacy Guarantee
The research team, under the auspices of the Southface study on the Impact of Green Affordable Housing, is interested in collecting data from industry partners related to the costs and specifications of housing developments. These data will be used only for the purpose of analyzing and reporting. Publications derived from this research will protect the confidentiality of the persons and companies from which data were collected. No company names, personnel names or product brand names will be included in publications.

Background Information

1) Please provide your full name.*

_____

2) Please provide the name of your company.*

_____

3) What type of company do you work for?*

( ) Developer
( ) General Contractor
( ) Other: _____

4) What is your position in your company?*

( ) Accountant
( ) Administrator
( ) Design Professional
( ) Engineer
( ) Estimator

( ) Owner/Principal

( ) Project Manager

( ) Site Supervisor

( ) Other: _____

5) How many years of experience does your company have with affordable housing development?*

( ) 0-3 years

( ) 4-7 years

( ) 8-10 years

( ) 11+ years

6) Approximately how many affordable units has your company developed to date?*

( ) 0-100 units

( ) 101-500 units

( ) 501-1000 units

( ) 1001+ units

7) In which states has your company developed affordable housing units?*

Select all that apply

[ ] Alabama

[ ] Georgia

[ ] North Carolina

[ ] South Carolina

[ ] Other: _____

8) Have any of the affordable developments been constructed to the above-code green building certification programs below?*

Select all that apply

[ ] EarthCraft

[ ] ENERGY STAR

[ ] LEED for Homes

[ ] LEED New Construction (NC)

[ ] NAHB Residential Green Building Standards (RGBS)

[ ] Not applicable

[ ] Other: _____

9) Please indicate the types of affordable housing apartment buildings your company has constructed.*

Select all that apply

[ ] Low-Rise (1-3 story) Apartment Buildings

[ ] Mid-Rise (4-7 story) Apartment Buildings

[ ] High-Rise (8+ story) Apartment Buildings

Low-Rise Apartment Buildings: Specifications

Please review the specification sheet below for "low-rise (1-3 story) apartment buildings" before answering the following questions.

Average Code-Built SPECIFICATIONS - 1 - 3 Story Building (LOW-RISE)	
Cost Model Sizing - Model costs calculated for a 3 story building with 10' ceiling height, 400 linear feet of perimeter walls and 22,500 square feet of story area	
Item	System Description
Substructure- below grade structure	
Standard Foundations	Poured concrete; strip and spread footings
Slab on Grade	4" reinforced concrete with vapor barrier and granular base
Basement Excavation	Site preparation for slab and trench for foundation wall and footing
Basement Walls	4' foundation wall
Superstructure- above grade structure	
story Construction	Open web steel joists, slab form, concrete, interior steel columns
Roof Construction	Open web steel joists with rib metal deck, interior steel columns
Exterior Enclosure	
Exterior Walls	Face brick with concrete block backup (88% of wall)
Exterior Windows	Aluminum horizontal sliding (12% of wall)
Exterior Doors	Aluminum and glass
Roofing	
Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation
Interiors	
Partitions	Gypsum board and sound deadening board on metal studs (10s.f. of story/l.f. partition)
Interior Doors	15% solid core wood, 85% hollow core wood (80 s.f. story/door)
Fittings	Kitchen cabinets
Stair Construction	Concrete filled metal pan
Wall Finishes	70% paint, 25% vinyl wall covering, 5% ceramic tile
story Finishes	60% carpet, 30% vinyl composition tile, 10% ceramic tile
Ceiling Finishes	Painted gypsum board on resilient channels
Conveying	
Elevators & Lifts	One hydraulic passenger elevator
Plumbing	
Plumbing Fixtures	Kitchen, bathroom and service fixtures, supply and drainage (1 fixture/200 s.f. story)
Domestic Water Distribution	Gas fired water heater
Rain water drainage	Roof drains
HVAC	
Energy Supply	Oil fired hot water, baseboard radiation
Cooling Generating Systems	Chilled water, air cooled condenser system
Fire Protection	
Sprinklers	Wet pipe sprinkler system
Electrical	
Electrical Service/Distribution	600 ampere service, panel board and feeders
Lighting & Branch Wiring	Incandescent fixtures, receptacles, switches, A.C and misc. power
Communication & Security	Alarm systems, internet wiring, emergency lighting, antenna, intercom and security television
Other Electrical Systems	Emergency Generator, 11.5 kW

10) Do you agree with the above specifications sheet for low rise (1-3 story) apartment buildings?*

( ) Yes

( ) No

11) Why do you disagree with the above specifications sheet for low-rise (1-3 story) apartment buildings?*

_____

_____

_____

_____

12) Do you agree that the above specifications sheet for low-rise (1-3 story) apartment buildings is the same for above-code green certified buildings?*

( ) Yes

( ) No

13) How would the specifications sheet for low-rise (1-3 story) apartment buildings be different for above-code green certified buildings?*

_____

_____

_____

_____

Low-Rise Apartment Buildings: Construction Costs

The following questions refer to important cost information for low-rise (1-3 story) apartment buildings constructed by your company. Cost questions are

based on the specifications questions for low-rise (1-3 story) energy code-compliant apartment buildings.

14) What is your typical total development square footage (floor area) for low-rise (1-3 story) apartment buildings?*

( ) 0 - 10,000 sq. ft.

( ) 10,001 - 20,000 sq. ft.

( ) 20,001 - 30,000 sq. ft.

( ) 30,001 - 40,000 sq. ft.

( ) Other (Please Estimate): _____

15) What is your typical total development cost per square foot (design, construction, development costs and fees, etc. minus land acquisition cost) for low-rise (1-3 story) apartment buildings?*

( ) $100-110 per square foot

( ) $111-120 per square foot

( ) $121-130 per square foot

( ) Other (Please Estimate): _____

16) Based on your typical direct construction costs for low-rise apartment buildings (1-3 story), please provide a percentage allocation for each of the following cost categories.*

All answers must add to 100%.

_____Substructure - below grade structures

_____Superstructure - above grade structures

_____Exterior Enclosure

_____Roofing

_____Interiors

_____Conveying

_____Plumbing

_____HVAC

_____Fire Protection

_____Electrical

_____Other Direct Construction Costs

17) How does your typical direct construction cost for an above-code green certified low-rise (1-3 story) apartment building compare to that for energy code-compliant construction?*

( ) More expensive

( ) About the same

( ) Less expensive

18) By what percentage is the typical direct construction cost for an above-code green certified low-rise (1-3 story) apartment building more or less (+ or -) than the typical direct construction cost for an energy code-compliant low-rise apartment building?*

-100 _____[__]_____ 100

19) How would you characterize the following categories of direct construction costs for above-code green certified low-rise (1-3 story) apartment buildings compared to those for energy code-compliant low-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Substructure - below grade structures	( )	( )	( )
Superstructure - above grade structures	( )	( )	( )
Exterior Enclosure	( )	( )	( )
Roofing	( )	( )	( )

Interiors	( )	( )	( )
Conveying	( )	( )	( )
Plumbing	( )	( )	( )
HVAC	( )	( )	( )
Fire Protection	( )	( )	( )
Electrical	( )	( )	( )

20) Based on your typical indirect construction costs for low-rise (1-3 story) apartment buildings, please provide a percentage allocation for each of the following cost categories.*

All answers must add to 100%.

_____Site Development (including parking costs)

_____Site Hardscaping (i.e. sidewalks)

_____Permits and Fees (including water and sewer hookups)

_____Other Indirect Construction Costs

21) Is your typical indirect construction cost for an above-code green certified low-rise (1-3 story) apartment building more or less expensive than energy code-compliant construction?*

( ) More Expensive

( ) About The Same

( ) Less Expensive

22) By what percentage is the typical indirect construction cost (site development, site hardscaping and permits/fees) for an above-code green certified low-rise (1-3 story) apartment building more or less (+ or -) than the typical indirect construction cost for an energy code-compliant low-rise apartment building?*

-100 _____[__]_____ 100

23) How would you characterize the following categories of indirect construction costs for above-code green certified low-rise (1-3 story) apartment buildings, compared to those for energy code-compliant low-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Site Development (including parking costs)	( )	( )	( )
Site Hardscaping (i.e. sidewalks)	( )	( )	( )
Permits and Fees (including water and sewer hookups)	( )	( )	( )

24) Based on your typical development soft costs for low-rise (1-3 story) apartment buildings, please provide a percentage allocation for each of the following categories.*

All answers must add to 100%.

_____Builders Overhead & Development Allowance Per Development

_____Financing Placement Fee Allowance Per Development

_____Legal and Closing Allowance Per Development

_____Marketing/Sales Commission Allowance Per Development

_____Green Certification Costs and Consulting Fees

_____Other Development Soft Costs

25) Please describe any other soft costs not reported in the Building Section Table for low-rise (1-3 story) apartment buildings.

_____
_____
_____
_____

26) By what percentage is the total soft construction cost (overhead, allowance, fees, commission, etc.) for an above-code green certified low-rise (1-3 story) apartment building more or less (+ or -) expensive than those for an energy code-compliant low-rise apartment building?*

-100 _____[__]_____ 100

27) How would you characterize the following categories of soft costs for above-code green certified low-rise (1-3 story) apartment buildings, compared to those for energy code-compliant low-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Builders Overhead & Development Allowance Per Development	( )	( )	( )
Financing Placement Fee Allowance Per Development	( )	( )	( )
Legal and Closing Allowance Per Development	( )	( )	( )
Marketing / Sales Commission Allowance Per Development	( )	( )	( )

Mid-Rise Apartment Buildings: Specifications

Please review the specification sheet below for "mid-rise (4-7 story) apartment buildings" before answering the following questions.

Average Code-Built Unit SPECIFICATIONS - 4 -7 Story Building (MID RISE)	
Cost Model Sizing - Model costs calculated for a 6 story building with 10'-4" ceiling height, 500 linear feet of perimeter walls and 60,000 square feet of story area	
Item	**System Description**
Substructure- below grade structure	
Standard Foundations	Poured concrete; strip and spread footings and 4' foundation wall
Slab on Grade	4" reinforced concrete with vapor barrier and granular base
Basement Excavation	Site preparation for slab and trench for foundation wall and footing
Basement Walls	4' foundation wall
Superstructure- above grade structure	
story Construction	Open web steel joists, slab form, concrete, interior steel columns
Roof Construction	Open web steel joists with rib metal deck, interior steel columns
Exterior Enclosure	
Exterior Walls	Face brick with concrete block backup (86% of wall)
Exterior Windows	Aluminum horizontal sliding (14% of wall)
Exterior Doors	Aluminum and glass
Roofing	
Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation
Interiors	
Partitions	Gypsum board and sound deadening board on metal studs (8 s.f. of story/l.f. partition)
Interior Doors	15% solid core wood, 85% hollow core wood (80 s.f. story/door)
Fittings	Kitchen cabinets
Stair Construction	Concrete filled metal pan
Wall Finishes	70% paint, 25% vinyl wall covering, 5% ceramic tile
story Finishes	60% carpet, 30% vinyl composition tile, 10% ceramic tile
Ceiling Finishes	Painted gypsum board on resilient channels
Conveying	
Elevators & Lifts	Two geared passenger elevators
Plumbing	
Plumbing Fixtures	Kitchen, bathroom and service fixtures, supply and drainage (1 fixture/215 s.f. story)
Domestic Water Distribution	Gas fired water heater
Rain Water Drainage	Roof drains
HVAC	
Energy Supply	Oil fired hot water, baseboard radiation
Cooling Generating Systems	Chilled water, air cooled condenser system
Fire Protection	
Sprinklers	Wet pipe sprinkler system
Standpipes	Standpipe, fire pump
Electrical	
Electrical Service/Distribution	1600 ampere service, panel board and feeders
Lighting & Branch Wiring	Incandescent fixtures, receptacles, switches, A.C and misc. power
Communications & Security	Alarm systems, internet wiring, emergency lighting, antenna, intercom and security television
Other Electrical Systems	Emergency Generator, 11.5 kW

28) Do you agree with the above specifications sheet for mid-rise (4-7 story) apartment buildings?*

( ) Yes

( ) No

29) Why do you disagree with the above specifications sheet for mid-rise (4-7 story) apartment buildings?*

_____

_____

_____

_____

30) Do you agree that the above specifications sheet for mid-rise (4-7 story) apartment buildings is the same for above-code green certified buildings?*

( ) Yes

( ) No

31) How would the above specifications sheet for mid-rise (4-7 story) apartment buildings be different for above-code green certified buildings?*

_____

_____

_____

_____

Mid-Rise Apartment Buildings: Construction Costs

The following questions refer to important cost information for mid-rise (4-7 story) apartment buildings constructed by your company. Cost questions are

based on the specifications questions for mid-rise (4-7 story) energy code-compliant apartment buildings.

32) What is your typical total development square footage (floor area) for mid-rise (4-7 story) apartment buildings?*

( ) 40,000 - 50,000 sq. ft.

( ) 50,001 - 60,000 sq. ft.

( ) 60,001 - 70,000 sq. ft.

( ) 70,001 - 80,000 sq. ft.

( ) Other (Please Estimate): _____

33) What is your typical total development cost per square foot (design, construction, development costs and fees, etc. minus land acquisition cost) for mid-rise (4-7 story) apartment buildings?*

( ) $115 - 125 per square foot

( ) $126 - 135 per square foot

( ) $136 - 145 per square foot

( ) Other (Please Estimate): _____

34) Based on your typical direct construction costs for mid-rise (4-7 story) apartment buildings, please provide a percentage allocation for each of the following cost categories.*

All answers must add to 100%.

_____Substructure - below grade structures

_____Superstructure - above grade structures

_____Exterior Enclosure

_____Roofing

_____Interiors

_____Conveying

_____Plumbing

_____HVAC

_____Fire Protection

_____Electrical

_____Other Direct Construction Costs

35) How does your typical direct construction cost for an above-code green certified mid-rise (4-7 story) apartment building compare to that for an energy code-compliant mid-rise apartment building?*

( ) More expensive

( ) About the same

( ) Less expensive

36) By what percentage is the typical direct construction cost for an above-code green certified mid-rise (4-7 story) apartment building more or less (+ or -) than the typical direct construction cost for an energy code-compliant mid-rise apartment building?*

-100 _____[__]_____ 100

37) How would you characterize the following categories of direct construction costs for above-code green certified mid-rise (4-7 story) apartment buildings compared to those for energy code-compliant mid-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Substructure - below grade structures	( )	( )	( )
Superstructure - above grade structures	( )	( )	( )
Exterior Enclosure	( )	( )	( )
Roofing	( )	( )	( )

Interiors	( )	( )	( )
Conveying	( )	( )	( )
Plumbing	( )	( )	( )
HVAC	( )	( )	( )
Fire Protection	( )	( )	( )
Electrical	( )	( )	( )

38) Based on your typical indirect construction costs for mid-rise (4-7 story) apartment buildings, please provide a percentage allocation for each of the following cost categories.*

All answers must add to 100%.

_____Site Development (including parking costs)

_____Site Hardscaping (i.e. sidewalks)

_____Permits and Fees (including water and sewer hookups)

_____Other Indirect Construction Costs

39) Is your typical indirect construction cost for an above-code green certified mid-rise (4-7 story) apartment building more or less expensive than that for an energy code-compliant mid-rise apartment building?*

( ) More Expensive

( ) About The Same

( ) Less Expensive

40) By what percentage is the typical indirect construction cost (site development, site hardscaping, and permits/fees) for an above-code green certified mid-rise (4-7 story) apartment building more or less (+ or -) than the typical indirect construction cost for an energy code-compliant mid-rise apartment building?*

-100 _____[__]_____ 100

41) How would you characterize the following categories of indirect construction costs for above-code green certified mid-rise (4-7 story) apartment buildings, compared to those for energy code-compliant mid-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Site Development (including parking costs)	( )	( )	( )
Site Hardscaping (i.e. sidewalks)	( )	( )	( )
Permits and Fees (including water and sewer hookups)	( )	( )	( )

42) Based on your typical development soft costs for mid-rise (4-7 story) apartment buildings, please provide a percentage allocation for each of the following categories.*

All answers must add to 100%.

_____Builders Overhead & Development Allowance Per Development

_____Financing Placement Fee Allowance Per Development

_____Legal and Closing Allowance Per Development

_____Marketing/Sales Commission Allowance Per Development

_____Green Certification Costs and Consulting Fees

_____Other Development Soft Costs

43) Please describe any other soft costs not reported in the Building Section Table for mid-rise (4-7 story) apartment buildings or indicated by selecting the "other" option.

_____
_____
_____
_____

44) By what percentage is the total soft construction cost (overhead, allowance, fees, commission, etc.) for an above-code green certified mid-rise (4-7 story) apartment building more or less (+ or -) expensive than that for an energy code-compliant mid-rise apartment building?*

-100 _____[__]_____ 100

45) How would you categorize the following categories of soft costs for above-code green certified mid-rise (4-7 story) apartment buildings, compared to those for energy code-compliant mid-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Builders Overhead & Development Allowance Per Development	( )	( )	( )
Financing Placement Fee Allowance Per Development	( )	( )	( )
Legal and Closing Allowance Per Development	( )	( )	( )
Marketing / Sales Commission Allowance Per Development	( )	( )	( )

High-Rise Apartment Buildings: Specifications

Please review the specifications sheet below for "high-rise (8+ story) apartment buildings" before answering the following questions.

Average Code-Built Unit SPECIFICATIONS - 8 -24 Story Building (HIGH RISE)	
Cost Model Sizing - Model costs calculated for a 15 story building with 10'-6" ceiling height, 442 linear feet of perimeter walls and 145,000 square feet of story area	
Item	System Description
Substructure- below grade structure	
Standard Foundations	Cast-in-place concrete pile caps
Special Foundations	Steel H-piles, concrete grade beams
Slab on Grade	4" reinforced concrete with vapor barrier and granular base
Basement Excavation	Site preparation for slab, piles and grade beam
Basement Walls	4' foundation wall
Superstructure- above grade structure	
story Construction	Open web steel joists, slab form, concrete, interior steel columns
Roof Construction	Open web steel joists with rib metal deck, interior steel columns
Exterior Enclosure	
Exterior Walls	Ribbed precast concrete panels
Exterior Windows	Aluminum horizontal sliding
Exterior Doors	Aluminum and glass
Roofing	
Roof Coverings	Built-up tar and gravel with flashing; perlite/EPS composite insulation
Interiors	
Partitions	Gypsum board on concrete block and metal studs (10 s.f. of story/l.f partition)
Interior Doors	15% solid core wood, 85% hollow core wood (80 s.f. story/door)
Fittings	Kitchen cabinets
Stair Construction	Concrete filled metal pan
Wall Finishes	70% paint, 25% vinyl wall covering, 5% ceramic tile
story Finishes	60% carpet, 30% vinyl composition tile, 10% ceramic tile
Ceiling Finishes	Painted gypsum board on resilient channels
Conveying	
Elevators & Lifts	Four geared passenger elevators
Plumbing	
Plumbing Fixtures	Kitchen, bathroom and service fixtures, supply and drainage (1 fixture/210 s.f. story)
Domestic Water Distribution	Gas fired water heater
Rain water drainage	Roof drains
HVAC	
Energy Supply	Oil fired hot water, baseboard radiation
Cooling Generating Systems	Chilled water, air cooled condenser system
Fire Protection	
Sprinklers	Wet pipe sprinkler system
Standpipes	Standpipe, fire pumps
Electrical	
Electrical Service/Distribution	4000 ampere service, panel board and feeders
Lighting & Branch Wiring	Incandescent fixtures, receptacles, switches, A.C and misc. power
Communications & Security	Alarm systems, internet wiring, emergency lighting, antenna, intercom and security television
Other Electrical Systems	Emergency Generator, 30 kW

46) Do you agree with the above specifications sheet for high-rise (8+ story) apartment buildings?*

( ) Yes

( ) No

47) Why do you disagree with the above specifications sheet for high-rise (8+ story) apartment buildings?*

_____

_____

_____

_____

48) Do you agree that the above specifications sheet for high-rise (8+ story) apartment buildings is the same for above-code green certified buildings?*

( ) Yes

( ) No

49) How would the specifications sheet for high-rise (8+ story) apartment buildings be different for above-code green certified buildings?*

_____

_____

_____

_____

High-Rise Apartment Buildings: Construction Costs

The following questions refer to important cost information for high-rise (8+ story) apartment buildings constructed by your company. Cost questions are

based on the specifications questions for high-rise (8+ story) energy code-compliant apartment buildings.

50) What is your typical total development square footage (floor area) for low-rise (1-3 story) apartment buildings?*

( ) 80,001 - 90,000 sq. ft.

( ) 90,001 - 100,000 sq. ft.

( ) 100,001 - 110,000 sq. ft.

( ) 110,001 - 120,000 sq. ft.

( ) Other (Please Estimate): _____

51) What is your typical total development cost per square foot (design, construction, development costs and fees, etc. minus land acquisition cost) for high-rise (8+ story) apartment buildings?*

( ) $145 - 155 per square foot

( ) $156 - 165 per square foot

( ) $166 - 175 per square foot

( ) Other (Please Estimate): _____

52) Based on your typical direct construction costs for high-rise (8+ story) apartment buildings, please provide a percentage allocation for each of the following cost categories.*

All answers must add to 100%.

_____Substructure - below grade structures

_____Superstructure - above grade structures

_____Exterior Enclosure

_____Roofing

_____Interiors

_____Conveying

_____Plumbing

_____HVAC

_____Fire Protection

_____Electrical

_____Other Direct Construction Costs

53) How does your typical direct construction cost for above-code green certified high-rise (8+ story) apartment buildings compare to that for energy code-compliant high-rise apartment buildings?*

( ) More expensive

( ) About the same

( ) Less expensive

54) By what percentage is the typical direct construction cost for an above-code green certified high-rise (8+ story) apartment building more or less (+ or -) than the typical direct construction cost for an energy code-compliant high-rise apartment building?*

-100 _____[__]_____ 100

55) How would you characterize the following categories of direct construction costs for above-code green certified high-rise (8+ story) apartment buildings compared to those for energy code-compliant high-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Substructure - below grade structures	( )	( )	( )
Superstructure - above grade structures	( )	( )	( )
Exterior Enclosure	( )	( )	( )
Roofing	( )	( )	( )

Interiors	( )	( )	( )
Conveying	( )	( )	( )
Plumbing	( )	( )	( )
HVAC	( )	( )	( )
Fire Protection	( )	( )	( )
Electrical	( )	( )	( )

56) Based on your typical indirect construction costs for high-rise (8+ story) apartment buildings, please provide a percentage allocation for each of the following cost categories.*

All answers must add to 100%.

_____Site Development (including parking costs)

_____Site Hardscaping (i.e. sidewalks)

_____Permits and Fees (including water and sewer hookups)

_____Other Indirect Construction Costs

57) Is your typical indirect construction cost for an above-code green certified high-rise (8+ story) apartment building more or less expensive than that for an energy code-compliant high-rise apartment building?*

( ) More Expensive

( ) About The Same

( ) Less Expensive

58) By what percentage is the typical indirect construction cost (site development, site hardscaping, and permits/fees) for an above-code green certified high-rise (8+ story) apartment building more or less (+ or -) than the typical indirect construction cost for an energy code-compliant high-rise apartment building?*

-100 _____[__]_____ 100

59) How would you characterize the following categories of indirect construction costs for above-code green certified high-rise (8+ story) apartment buildings, compared to those for energy code-compliant high-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Site Development (including parking costs)	( )	( )	( )
Site Hardscaping (i.e. sidewalks)	( )	( )	( )
Permits and Fees (including water and sewer hookups)	( )	( )	( )

60) Based on your typical development soft costs for high-rise (8+ story) apartment buildings, please provide a percentage allocation for each of the following categories.*

All answers must add to 100%.

_____Builders Overhead & Development Allowance Per Development

_____Financing Placement Fee Allowance Per Development

_____Legal and Closing Allowance Per Development

_____Marketing/Sales Commission Allowance Per Development

_____Green Certification Costs and Consulting Fees

_____Other Development Soft Costs

61) Please describe any other soft costs not reported in the Building Section Table for high-rise (8+ story) apartment buildings or indicated by selecting the "other" option.

_____
_____
_____
_____

62) By what percentage is the total soft construction cost (overhead, allowance, fees, commission, etc.) for an above-code green certified high-rise (8+ story) apartment building more or less (+ or -) expensive than those for an energy code-compliant high-rise apartment building?*

-100 _____[__]_____ 100

63) How would you characterize the following categories of soft costs for above-code green certified high-rise (8+ story) apartment buildings, compared to those for energy code-compliant high-rise apartment buildings?*

	Less Expensive	**About The Same Cost**	**More Expensive**
Builders Overhead & Development Allowance Per Development	( )	( )	( )
Financing Placement Fee Allowance Per Development	( )	( )	( )
Legal and Closing Allowance Per Development	( )	( )	( )
Marketing / Sales Commission Allowance Per Development	( )	( )	( )

Resident Experience & Health Survey

The purpose of this survey is to receive feedback from residents on their personal experience and health as it relates to their previous and current homes. This will provide the researcher with a better understanding of the impact of above-code green building certification programs and green technologies on affordable housing development and tenants. The survey requires approximately 8 minutes to complete.

Privacy Guarantee:

The research team, under the sponsorship of the Southface study *Impact of Green Affordable Housing*, is interested in collecting information from residents of above-code green buildings and code-compliant affordable housing developments in the US Southeast. This data will be used only for the purpose of analyzing and reporting. Publications derived from this research will protect the confidentiality of the persons and companies from which data was collected. No company names, personnel names or product brand names will be included in publications.

Please read all instructions and answer all questions with as much detail and accuracy as possible.

Online Survey

If you prefer to complete an online version of this survey, please enter the following address in your web browser:

Qualifying Questions

If you respond "no" to question #1 or #2 below, then you are not eligible to complete the survey.

1) Are you at least 18 years of age?*

( ) Yes
( ) No

2) Are you the leaseholder or utility bill account holder?*

( ) Yes
( ) No

Resident Experience Questions: Previous Home

The following questions relate to your experience in your previous home, please answer accordingly.

3) What is your age?*

( ) 18-24
( ) 25-34
( ) 35-44
( ) 45-54
( ) 55-64
( ) 65+

4) What is your previous home's address?*

Street: _____
City: _____
State: _____
Zip Code: _____

5) How long did you live in your previous home?*

( ) Less Than 6 Months
( ) 6-12 Months
( ) 1-3 Years

( ) 3-5 Years

( ) Other: _____

6) Was your previous home an affordable development?*

Affordable Development/Housing Definition: *In general, housing for which the occupant(s) is/are paying no more than 30 percent of his or her income for gross housing costs, including utilities.*

( ) Yes

( ) No

( ) I Do Not Know

7) Was your previous home a green building?*

Such as EarthCraft, LEED, etc.

( ) Yes

( ) No

( ) I Do Not Know

8) How many bedrooms and bathrooms were in your previous home?*

# of Bedrooms: _____

# of Bathrooms: _____

9) Was your previous home in a multifamily building?*

I.e. Shared Walls

( ) Yes

( ) No

( ) I Do Not Know

10) Which appliances did you have in your previous home?*

Select all that apply

[ ] Oven/Range

[ ] Refrigerator

[ ] Dishwasher

[ ] In-Unit Laundry

11) What temperature (in degrees) did you set your personal thermostat in your previous home during the summer?*

Select one

( ) 68 and Below

( ) 69-72

( ) 73-75

( ) 76 and Above

( ) N/A (I Did Not Live in My Previous Home During Summer)

12) What temperature (in degrees) did you set your personal thermostat in your previous home during the winter?*

Select one

( ) 68 and Below

( ) 69-72

( ) 73-75

( ) 76 and Above

( ) N/A (I Did Not Live in My Previous Home During Winter)

13) To increase comfort in your previous home, did you open windows at any point during the year?*

Select all that apply

[ ] Fall

[ ] Winter

[ ] Spring

[ ] Summer

[ ] N/A

14) To increase comfort in your previous home, did you use any of the following?*

Select all that apply

[ ] Space Heater

[ ] Fan

[ ] Dehumidifier

[ ] Humidifier

[ ] Other: _____

[ ] N/A

When responding to the questions below, select the description from the listed options that most accurately describes your experience in your previous home.

15) Did you feel personally connected to other people in your previous building and development?*

Select one

( ) I Felt Very Connected (I Know All of My Neighbor's Names and We Gather together)

( ) I Felt Somewhat Connected (I Know Most of My Neighbor's Name but We Rarely Say More Than Hello)

( ) I Did Not Feel Connected (I Do Not Know My Neighbor's Names and We Rarely Say Hello When We Pass Each Other)

16) Please select the community areas from the list below that were available in your previous home.*

Select all that apply

[ ] Community Center

[ ] Playground

[ ] Green Space (Trees, Grass, Vegetation, Courtyard)

[ ] Vegetable Garden

[ ] Picnic Tables/Outdoor Grill

[ ] Walking Trails

[ ] Pool

[ ] Recreational Facilities (Gym, Basketball Court, Etc.)

[ ] Other: _____

17) How often did you use the community areas in your previous home?*

Select one

( ) Often, 4-5 Times a Week

( ) Sometimes, 2-3 Times a Week

( ) Rarely, 1 Time a Week or Fewer

( ) Never

( ) N/A

18) How did you feel when you were in the previous outdoor community areas?*

Select one

( ) I Felt Calmer and Less Stressed Than I Did Before I Used the Outdoor Community Area(s)

( ) I Felt About the Same as Compared to Before I Used the Outdoor Community Area(s)

( ) I Felt More Stressed Than Before I Used the Outdoor Community Area(s)

( ) N/A

19) Overall, how safe did you feel in your previous home, including outdoor community areas?*

Select one

( ) I Felt Very Safe

( ) I Felt Somewhat Safe

( ) I Felt Neutral - Neither Safe or Unsafe

( ) I Felt Somewhat Unsafe

( ) I Felt Very Unsafe

Select one

20) How would you describe your weekly activity level in your previous home?*

( ) I Took a Brisk Walk, or Performed Equivalent Activity, At Least 4 Times a Week for 20 Minutes Each Time

( ) I Took a Brisk Walk, or Performed Equivalent Activity, 1-3 Times a Week for At Least 20 Minutes Each Time

( ) I Took a Slow Walk, or Performed Equivalent Activity, At Least 4 Times a Week for 20 Minutes Each Time

( ) I Took a Slow Walk, or Performed Equivalent Activity, 1-3 Times a Week for At Least 20 Minutes Each time

( ) N/A

( ) Other Activity Level: (Please Describe Type of Activity, How Many Times and Length of Time): _____

Resident Experience Questions: Current Home

The following questions relate to your experience in your current home, please answer accordingly.

21) What is your current home's address?*

Unit #: _____

Street: _____

City: _____

State: _____

Zip Code: _____

22) How long have you lived in your current home?*

( ) Less Than 6 Months

( ) 6-12 Months

( ) 1-3 Years

( ) 3-5 Years

( ) Other: _____

23) Is your current home an affordable development?*

Affordable Development/Housing Definition: *In general, housing for which the occupant(s) is/are paying no more than 30 percent of his or her income for gross housing costs, including utilities.*

( ) Yes

( ) No

( ) I Do Not Know

24) Is your current home a green building?*

Such as EarthCraft, LEED, etc.

( ) Yes

( ) No

( ) I Do Not Know

25) How many bedrooms and bathrooms are in your current home?*

# of Bedrooms: _____

# of Bathrooms: _____

26) Is your current home in a multifamily building?*

I.e. Shared Walls

( ) Yes

( ) No

( ) I Do Not Know

27) What appliances do you have in your current home?*

Select all that apply

[ ] Oven/Range

[ ] Refrigerator

[ ] Dishwasher

[ ] In-Unit Laundry

28) What temperature (in degrees) do you set your personal thermostat in your current home during the summer?*

Select one

( ) 68 and Below

( ) 69-72

( ) 73-75

( ) 76 and Above

( ) N/A (I Have Not Lived in My Current Home During Summer)

29) What temperature (in degrees) do you set your personal thermostat in your current home during the winter?*

Select one

( ) 68 and Below

( ) 69-72

( ) 73-75

( ) 76 and Above

( ) N/A (I Have Not Lived in My Current Home During Winter)

30) To increase comfort in your current home, do you open windows at any point during the year?*

Select all that apply

[ ] Fall

[ ] Winter

[ ] Spring

[ ] Summer

[ ] N/A

31) To increase comfort in your current home, do you use any of the following?*

Select all that apply

[ ] Space Heater

[ ] Fan

[ ] Dehumidifier

[ ] Humidifier

[ ] Other: _____

[ ] N/A

When responding to the questions below, select the description from the listed options that most accurately describes your experience in your current home.

32) Do you feel personally connected to other people in your current building and development?*

Select one

( ) I Feel Very Connected (I Know All of My Neighbor's Names and We Gather together)

( ) I Feel Somewhat Connected (I Know Most of My Neighbor's Name but We Rarely Say More Than Hello)

( ) I Do Not Feel Connected (I Do Not Know My Neighbor's Names and We Rarely Say Hello When We Pass Each Other)

33) Please select the community areas from the list below that are available in your current home.*

Select all that apply

[ ] Community Center

[ ] Playground

[ ] Green Space (Trees, Grass, Vegetation, Courtyard)

[ ] Vegetable Garden

[ ] Picnic Tables/Outdoor Grill

[ ] Walking Trails

[ ] Pool

[ ] Recreational Facilities (Gym, Basketball Court, Etc.)

[ ] Other: _____

34) How often do you use the community areas in your current home?*

Select one

( ) Often, 4-5 Times a Week

( ) Sometimes, 2-3 Times a Week

( ) Rarely, 1 Time a Week or Fewer

( ) Never

( ) N/A

35) How do you feel when you are in your current outdoor community areas?*

Select one

( ) I Feel Calmer and Less Stressed Than I Did Before I Used the Outdoor Community Area(s)

( ) I Feel About the Same as Compared to Before I Used the Outdoor Community Area(s)

( ) I Feel More Stressed Than Before I Used the Outdoor Community Area(s)

( ) N/A

36) Overall, how safe do you feel in your current home, including outdoor community areas?*

Select one

( ) I Feel Very Safe

( ) I Feel Somewhat Safe

( ) I Feel Neutral - Neither Safe or Unsafe

( ) I Feel Somewhat Unsafe

( ) I Feel Very Unsafe

37) How would you describe your weekly activity level in your current home?*

Select one

( ) I Take a Brisk Walk, or Perform Equivalent Activity, At Least 4 Times a Week for 20 Minutes Each Time

( ) I Take a Brisk Walk, or Perform Equivalent Activity, 1-3 Times a Week for At Least 20 Minutes Each Time

( ) I Take a Slow Walk, or Perform Equivalent Activity, At Least 4 Times a Week for 20 Minutes Each Time

( ) I Take a Slow Walk, or Perform Equivalent Activity, 1-3 Times a Week for At Least 20 Minutes Each time

( ) N/A

( ) Other Activity Level: (Please Describe Type of Activity, How Many Times and Length of Time): _____

Resident Experience Questions: Previous vs. Current

The following questions compare your experience in your previous home to your current home, please answer accordingly.

38) Compared with your previous home, how would you rate the comfort of your current home during summer?*

Select one

( ) Much More Comfortable

( ) About the Same

( ) Much Less Comfortable

39) Compared with your previous home, how would you rate the comfort of your current home during winter?*

Select one

( ) Much More Comfortable

( ) About the Same

( ) Much Less Comfortable

40) Compared with your previous home, how would you rate the affordability of your current home in terms of utility costs alone?*

Select one

( ) Much More Affordable

( ) About the Same

( ) Much Less Affordable

41) Compared with your previous home, how would you rate the affordability of your current home in terms of overall housing budget (rent + utilities)?*

Select one

( ) Much More Affordable

( ) About the Same

( ) Much Less Affordable

42) Compared with your previous home, how would you rate your overall satisfaction with your current home in terms of both comfort and affordability?*

Select one

( ) Much More Satisfied

( ) About the Same

( ) Much Less Satisfied

43) Please rate your experience with indoor noise in your current home.*

Select one

( ) I Never Hear My Neighbors through the Walls and/or Floors

( ) I Rarely Hear My Neighbors through the Walls and/or Floors

( ) I Sometimes Hear My Neighbors through the Walls and/or Floors

( ) I Always Hear My Neighbors through the Walls and/or Floors

44) Please rate your experience with outdoor noise in your current home (i.e. Heating/Ventilation/Air/Conditioning (HVAC), traffic, etc.)*

Select one

( ) I Never Hear Noise From Outside

( ) I Rarely Hear Noise From Outside

( ) I Sometimes Hear Noise From Outside

( ) I Always Hear Noise From Outside

45) Overall, how do you feel about the noise in/around your home?*

Select one

( ) Highly Satisfied

( ) Somewhat Satisfied

( ) Very Unsatisfied

Resident Health Questions

The purpose of this section of the survey is to receive feedback from residents on physical health as it relates to the conditions and impacts of previous and current homes on resident physical health.

The following questions relate to your personal health while residing in your previous home.

46) Did you have health/medical insurance while living in your previous home?*

( ) Yes

( ) No

47) Did you purchase health insurance through Healthcare.gov or The Affordable Care Act?*

Select one

( ) Yes

( ) No

( ) N/A

( ) Other (Employer, Etc.)

48) Did you suffer from asthma or other respiratory conditions in your previous home (bronchitis, pneumonia or lung disease)?*

Select one

( ) Asthma

( ) Asthma and Other Respiratory Conditions

( ) Other Respiratory Conditions but Not Asthma

( ) I Did Not Suffer From Asthma or Other Respiratory Conditions

49) Did you suffer from any other medical condition(s) in your previous home?*

( ) Yes

( ) No

50) Did the medical condition(s) change while you lived in your previous home?*

Select one

( ) My Symptoms Significantly Improved

( ) My Symptoms Improved

( ) My Symptoms Stayed the Same

( ) My Symptoms Worsened

( ) My Symptoms Significantly Worsened

( ) N/A (I Did Not Have Any Medical Conditions While Living At My Previous Home)

51) Did you take any medication (including over-the-counter and/or prescription medication) for your medical condition(s) while living in your previous home?*

( ) Yes

( ) No

( ) N/A

52) What percentage of your expendable income (income remaining after housing, taxes, food, and other basic needs) did you use on medication including over-the-counter and prescription medication while living in your previous home?*

Select one

( ) 1-10%

( ) 11-20%

( ) 21-30%

( ) 31-40%

( ) Over 41%

( ) N/A (I Did Not Spend Any Expendable Income on Medication While Living In My Previous Home)

53) Did you visit a doctor while living in your previous home?*

Select one

( ) 1-2 Times per Year

( ) 3-4 Times per Year

( ) 5+ Times per Year

( ) N/A (I Did Not Visit a Doctor While Living at My Previous Home)

54) How many times did you go to the emergency room in your previous home?*

Select one

( ) 1-2 Times per Year

( ) 3-4 Times per Year

( ) 5+ Times per Year

( ) N/A (I Did Not Visit the Emergency Room While Living At My Previous Home)

55) How many times did you need an ambulance in your previous home?*

Select one

( ) 1-2 Times per Year

( ) 3-4 Times per Year

( ) 5+ Times per Year

( ) N/A (I Did Not Use an Ambulance While Living At My Previous Home)

The following questions relate to your personal health while residing in your current home.

56) Do you currently have health/medical insurance?*

( ) Yes

( ) No

57) Did you purchase health insurance through Healthcare.gov or The Affordable Care Act?*

Select one

( ) Yes

( ) No

( ) N/A

( ) Other (Employer, Etc.)

58) Do you suffer from asthma or other respiratory conditions in your current home (bronchitis, pneumonia or lung disease)?*

Select one

( ) Asthma

( ) Asthma and Other Respiratory Conditions

( ) Other Respiratory Conditions but Not Asthma

( ) I Do Not Suffer From Asthma or Other Respiratory Conditions

59) Do you suffer from any other medical condition(s) in your current home?*

( ) Yes

( ) No

60) Have the medical condition(s) changed while you have been living in your current home?*

Select one

( ) My Symptoms Have Significantly Improved

( ) My Symptoms Have Improved

( ) My Symptoms Have Stayed the Same

( ) My Symptoms Have Worsened

( ) My Symptoms Have Significantly Worsened

( ) N/A (I Do Not Have Any Medical Conditions)

61) Do you take any medication (including over-the-counter and/or prescription medication) for your medical condition(s) in your current home?*

( ) Yes

( ) No

( ) N/A

62) What percentage of your expendable income (income remaining after housing, taxes, food, and other basic needs) do you use on medication including over-the-counter and prescription medication while in your current home?*

Select one

( ) 1-10%

( ) 11-20%

( ) 21-30%

( ) 31-40%

( ) Over 41%

( ) N/A (I Do Not Spend Any Expendable Income on Medication)

63) Have you visited a doctor in the past 12 months?*

Select one

( ) 1-2 Times

( ) 3-4 Times

( ) 5+ Times

( ) N/A (I Did Not Visit a Doctor in the Past 12 Months)

64) How many times did you go to the emergency room in the past 12 months?*

Select one

( ) 1-2 Times

( ) 3-4 Times

( ) 5+ Times

( ) N/A (I Did Not Visit the Emergency Room in the Past 12 Months)

65) How many times did you need an ambulance in the past 12 months?*

Select one

( ) 1-2 Times

( ) 3-4 Times

( ) 5+ Times

( ) N/A (I Did Not Use an Ambulance in the Past 12 Months)

Section VII. HFA Survey

HFA Survey

Introduction & Background

Page description:

The purpose of this **10 minute survey** is for Southface (researcher) to gain a better understanding from Housing Finance Agencies (HFA) on the impact of above-code green building certification programs and green technologies on the affordable housing development process, specifically the impact on HFA administration and staff/resources. Thank you for taking time to complete the survey, your responses are integral to completing our research project!

Please answer all questions in the survey and complete with as much detail as possible.

Privacy Guarantee:
The research team, under the sponsorship of the Southface study - Impact of Green Affordable Housing, is interested in collecting data from industry partners related to the operations, maintenance and administrative costs of affordable housing developments in the US Southeast. This data will be used only for the purpose of analyzing and reporting. Publications derived from this research will protect the confidentiality of the persons and companies from which data was collected. No company names, personnel names or product brand names will be included in publications.

1. Please provide your full name *

2. Please select the Housing Finance Agency (HFA) for which you are employed *

- Alabama Housing Finance Authority
- Georgia Department of Community Affairs
- North Carolina Housing Finance Agency
- South Carolina State Housing Finance & Development Authority

3. What is your position or title? *

4. How many years have you been with your current employer? *

- 1-3 Years
- 4-6 Years
- 7-9 Years
- 10+ Years

Property Management Operations and Maintenance (O&M)

Page description:
The following questions refer to the O&M of above-code green buildings compared to energy code-compliant buildings over the building's compliance period.

Definitions:

Above-Code Green Building Certification Program:
Green building certification systems are a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements. Rating systems and certification systems are frequently used interchangeably. Example programs include: LEED, EarthCraft, ENERGY STAR and NGBS.

Energy Code-Compliant Building:
Energy code compliance and verification are performed from different perspectives, but share the same end goal. Architects, designers, engineers, contractors, builders, and other construction industry stakeholders have a professional responsibility to design and comply with the required state energy code on behalf of the building owner/developer.

Green Technologies:
A product or service that improves operational performance, productivity or efficiency while reducing costs, inputs, energy and/or water consumption, waste or environmental pollution.

Indoor Environmental Quality (IEQ):
IEQ encompasses indoor air quality (IAQ), which focuses on airborne contaminants, as well as other health, safety, and comfort issues such as aesthetics, potable water surveillance, ergonomics, acoustics, lighting, and electromagnetic frequency levels.

Unit-Rollover:
The act of preparing a multifamily rental unit or home for a new tenant when the previous tenant has foregone lease.

For the following section, please indicate the degree to which you agree with the statement, with 1 being "strongly disagree", 3 being "neutral", and 5 being "strongly agree."

5. *Above-code green certified buildings* and/or *green technologies* are more energy efficient in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

6. *Above-code green certified buildings* and/or *green technologies* are more water efficient in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

7. *Above-code green certified buildings* and/or *green technologies* have lower utility costs in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

8. *Above-code green certified buildings* and/or *green technologies* have lower utility costs in comparison to *energy code-compliant buildings*, and should allow for a reduced utility allowance. *

Strongly Disagree — Neutral — Strongly Agree

Comments

9. *Above-code green certified buildings* and/or *green technologies* have lower overall operations and maintenance costs in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

10. *Above-code green certified buildings* are more durable and have longer lifecycles in comparison to *energy-code compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

11. *Above-code green certified buildings* and/or *green technologies* require less frequent maintenance in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

12. *Above-code green certified buildings* and/or *green technologies* require less property management staff time and resources for in-unit maintenance requests in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

13. *Above-code green certified buildings* are more desirable to renters in comparison to *energy-code compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

14. *Above-code green certified buildings* and/or *green technologies* require a greater level of resident education to operate units properly in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

15. *Above-code green certified buildings* experience less resident turnover in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

16. *Above-code green certified buildings* and/or *green technologies* require less resources for *unit-rollover* in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

17. *Above-code green certified buildings* and/or *green technologies* provide residents with an enhanced level of *indoor environmental quality (IEQ)* in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

18. *Above-code green certified buildings* and/or *green technologies* provide residents with an enhanced level of comfort (i.e. temperature, air quality, ventilation, humidity and lighting) in comparison to *energy code-compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

19. *Above-code green certified buildings* improve the overall health (emotional and physical) of residents more than in comparison to *energy-code compliant buildings.* *

Strongly Disagree — Neutral — Strongly Agree

Comments

HFA Administration

Page description:
The following questions refer to the administration of multifamily housing finance and development programs in terms of financing, reviews, inspections, quality assurance, compliance monitoring, etc. over the building's compliance period.

Definitions:

Above-Code Green Building Certification Program:
Green building certification systems are a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements. Rating systems and certification systems are frequently used interchangeably. Example programs include: LEED, EarthCraft, ENERGY STAR and NGBS.

Energy Code-Compliant Building:
Energy code compliance and verification are performed from different perspectives, but share the same end goal. Architects, designers, engineers, contractors, builders, and other construction industry stakeholders have a professional responsibility to design and comply with the required state energy code on behalf of the building owner/developer.

Green Technologies:
A product or service that improves operational performance, productivity or efficiency while reducing costs, inputs, energy and/or water consumption, waste or environmental pollution.

Third Party Verification:
The verification provided and required by *above-code green building certification programs* to ensure that design and construction elements are operating and installed as prescribed and meet the performance or testing levels mandated by the applicable green building program.

20. On average, how much are your State QAP application fees per funded development? *

Applies to LIHTC programs (4% credit and 9% credit)
Fees include: all pre-application, application/pre-award and post-award
(Architectural options, reviews, waivers, determination, credit processing, amendments, compliance monitoring, credit allocation, inspections, analysis, non-compliance, etc.)

- $10,000-$30,000
- $30,001-$50,000
- $50,001-$70,000
- $70,001-$90,000
- $90,001-$110,000
- $110,001+
- Other

Comments

21. Are total QAP application fees (pre-application, application/pre-award and post-award) per funded development representative of total HFA administrative costs on a per development basis? *

- Yes
- No

Comments

For the following section, please indicate the degree to which you agree with the statement, with 1 being "strongly disagree", 3 being "neutral", and 5 being "strongly agree."

22. Administration of developments with *above-code green building certifications* require less staff time and resources in comparison to *energy-code compliant buildings*. *

Strongly Disagree — Neutral — Strongly Agree

Comments

23. Overall, developments with an a*bove-code green building certification* have lower administrative costs to the HFA (application review, quality assurance and compliance monitoring) in comparison to *energy-code compliant buildings*. *

Strongly Disagree — Neutral — Strongly Agree

Comments

24. *Above-code green building certification programs* provide technical assistance services to developers that make HFA administrative and managerial tasks (application review, quality assurance and compliance monitoring) easier to complete. *

Strongly Disagree — Neutral — Strongly Agree

Comments

25. *Above-code green building certification programs* provide an enhanced level of quality assurance and compliance monitoring in comparison to *energy-code compliant buildings*. *

Strongly Disagree — Neutral — Strongly Agree

Comments

26. *Above-code green building certification programs* and/or *green technologies* that are incentivized or required in the QAP credit scoring process experience resistance from developers. *

Strongly Disagree — Neutral — Strongly Agree

Comments

27. *Above-code green building certification programs* and/or *green technologies* that are incentivized or required in the QAP credit scoring process experience resistance from developers, primarily due to cost containment concerns. *

Strongly Disagree — Neutral — Strongly Agree

Comments

Thank You!

Thank you for taking our survey! Your response is very important to us.

Developer/Builder Survey

Introduction

The purpose of this survey is for the researcher to gain a better understanding from development and contractor firms on the impact of *above-code green building certification programs* or *green technologies* on the *affordable housing* development process. The survey requires approximately 7 minutes to complete.

Please answer all questions in the survey and complete with as much detail as possible.

Privacy Guarantee:

The research team, under the sponsorship of the <PROJECT NAME>, is interested in collecting data from industry partners related to the costs and specifications of *affordable housing* developments in the US Southeast. This data will be used only for the purpose of analyzing and reporting. Publications derived from this research will protect the confidentiality of the persons and companies from which data were collected. No company names, personnel names or product brand names will be included in publications.

Please reference the glossary below for defined survey text in *italics*.

Glossary:

Above-Code Green Building Certification Program

Building certification systems are a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements. Rating systems and certification systems are frequently used interchangeably.

Above-Code Insulation

In climate zones 3 and 4, insulation values and greater than the following respective values: ceiling R-Value of 38 or 49, wood frame wall R-Value of 20 or 13 cavity + 5 continuous, mass wall R-Value 8/13, floor R-Value of 19, basement wall R-Value of 5/13 or 10/13, slab R-Value and depth of 0 or 10, 2 ft., and crawl space wall R-Value of 5/13 or 10/13.

Affordable Housing

In general, housing for which the occupant(s) is/are paying no more than 30 percent of his or her income for gross housing costs, including utilities. Please note that some jurisdictions may define affordable housing based on other, locally determined criteria, and that this definition is intended solely as an approximate guideline or general rule of thumb. Also referred to as low-income rental housing.

Energy Code-Compliant Building

Energy code compliance and verification are performed from different perspectives, but share the same end goal. Architects, designers, engineers, contractors, builders, and other construction industry stakeholders have a professional responsibility to design and comply with the energy code on behalf of the building owner/developer.

ENERGY STAR Appliances

ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency. ENERGY STAR qualified appliances incorporate advanced technologies and use 10 to 50 percent less energy than standard appliances. ENERGY STAR appliances include: air purifiers, clothes dryers/washers, dehumidifiers, dishwashers, freezers and refrigerators.

Financial Incentives

A monetary benefit offered to developers, owners or residents to encourage behavior or actions which otherwise would not take place. In the context of affordable housing, example incentives would be the low-income housing tax credit allocated by the U.S. Department of Housing and Urban Development (HUD) and administered by the State Housing Finance Agency (HFA), and utility company rebates.

Green Technologies

Any product or services that improves operational performance, productivity, or efficiency while reducing costs, inputs, energy consumption, waste, or environmental pollution.

High-Efficiency Mechanical Equipment

Federal regulations require boilers burning fossil fuels have minimum annual fuel utilization efficiency (AFUE) of 80%. AFUE is the thermal efficiency measure of combustion equipment. It represents the actual, season-long, average efficiency of the piece of equipment, including the operating transients. Energy Star requires a boiler to have an AFUE of 85% or greater. Federal regulations require furnaces burning fossil fuels have a minimum AFUE of 78%. Energy Star requires a gas furnace to have an AFUE of 90% or greater and an oil furnace 85% or greater. Seasonal energy efficiency ratio (SEER) of at least 14.5 or energy efficiency ratio (EER) of at least 12.

High-Efficiency Lighting

Compact fluorescent lamps (CFLs), T8 or T5 linear fluorescent lamps and light emitting diodes (LEDs).

High-Performance Windows

Properties in the South-Central climate zone with U-Factor of <0.27.

Low-Flow Water Fixtures

U.S. EPA WaterSense labeled fixtures. Bathroom faucets = 0.5/1.0 gallons per minute (gpm), kitchen faucet = 1.5 gpm, showerheads = 1.5-2.0 gpm and toilets = 1.28 gallons per flush (gpf).

Payback Period

The length of time, typically in years, for a capital investment to recover its initial expense in terms of profits or savings.

Renewable Energy

Unlike fossil fuels, which are exhaustible, renewable energy sources regenerate and can be sustained indefinitely. The five renewable sources used most often are: biomass, hydropower, geothermal, wind and solar.

Return on Investment (ROI)

Performance measure used to evaluate the efficiency of an energy or water saving investment or compare the efficiency of a multiple investments. Return on investment (%) = Net profit or savings ($) / Investment ($) × 100, or Return on investment = (gain from investment - cost of investment) / cost of investment.

Utility Allowance

Total Resident Payment for "rent" to include both shelter and the costs for reasonable amounts of utilities. The amount that a PHA determines is necessary to cover the resident's reasonable utility costs is the utility allowance. Such allowances are estimates of the expenses associated with different types of utilities and their uses. The utilities for which allowances may be provided include electricity, natural gas, propane, fuel oil, wood or coal, and water and sewage service, as well as garbage collection.

Background Information

1) Please provide the name of your company*

_____

2) Please provide your full name*

_____

3) What type of company do you work for?*

( ) Developer

( ) General Contractor

( ) Other: _____

4) What is your role in your company?*

( ) Accountant

( ) Administrator

( ) Design Professional

( ) Engineer

( ) Estimator

( ) Owner/Principal

( ) Project Manager

( ) Site Supervisor

( ) Other: _____

5) How many years of experience does your firm/company have with *affordable housing* development?*

( ) 0-3

( ) 4-7

( ) 8-10

( ) 11+

6) Approximately how many affordable units has your firm/company developed to date?*

( ) 0-100
( ) 101-500
( ) 501-1000
( ) 1001+

7) Please select all applicable building types that your firm has developed to date.*

Select all that apply
[ ] Single Family Attached (Including Townhomes and Duplexes)
[ ] Low-Rise Multifamily (1-3 Story)
[ ] Mid-Rise Multifamily (4-7 Story)
[ ] High-Rise Multifamily (8+ Story)
[ ] Other: _____

8) In which states have you built *affordable housing*?*

Select all that apply
[ ] Alabama
[ ] Georgia
[ ] North Carolina
[ ] South Carolina
[ ] Other: _____

Above-Code Green Building Certification Programs and Technologies Questions

9) Have any of the affordable developments been constructed to the *above-code green building certification programs* below?*

Select all that apply
[ ] EarthCraft
[ ] ENERGY STAR V2
[ ] ENERGY STAR V3
[ ] LEED for Homes
[ ] LEED New Construction (NC)
[ ] National Green Building Standard (NGBS)
[ ] Other: _____
[ ] N/A

10) Why does your firm choose not to implement *above-code green building certification programs*?*

[ ] Too Expensive
[ ] Lack of Professional Experience
[ ] Not Required
[ ] Not Incentivized
[ ] Other: _____
[ ] N/A

11) For any developments not constructed to an *above-code green building certification program*, please indicate the frequency of any *green technologies* installed.*

	Installation Frequency
"ENERGY STAR Appliances"	_____
"Above-Code Insulation"	_____
"High-Efficiency Mechanical Equipment"	_____
"High-Efficiency Lighting"	_____

"Low-Flow Water Fixtures"	_____
"Renewable Energy"	_____
"Above-Code Windows"	_____

12) What are the primary motivations for implementing *green technologies*?*

Select all that apply

[ ] Reduced Resident Utility Bills

[ ] Reduced Operations and Maintenance Costs (O&M)

[ ] Building Durability (Lifecycle)

[ ] Commitment to Sustainability

[ ] Other: _____

Financial Questions

13) Which *financial incentives* motivated your firm to implement *green technologies*?*

Select all that apply

[ ] Municipal

[ ] State

[ ] Federal

[ ] Utility Provider

[ ] N/A

[ ] Other: _____

14) When using an *above-code green building certification program*, are you recognizing a capital premium for implementing *green technologies*, when compared to *energy-code compliant buildings*?*

( ) Yes

( ) No

( ) I Do Not Know

( ) N/A

15) What is the average *payback period* on your initial capital investment for *green technologies*?*

( ) 0-5 Years

( ) 6-10 Years

( ) 11-15 Years

( ) 16+ Years

( ) I Do Not Know

( ) N/A

16) When using *above-code green building certification programs*, or implementing *green technologies*, are you realizing a *return on your investment (ROI)*?*

( ) Yes

( ) No

( ) I Do Not Know

( ) N/A

17) What is the *average return on investment (ROI), if any,* for projects that implement *above-code green building certification programs*, or *green technologies*?*

( ) 1-10%

( ) 11-20%

( ) 21-30%

( ) 31+%

( ) 0%

( ) I Do Not Know

( ) N/A

Above-Code Green Building Statements

For the following section, please indicate the degree to which you agree with the statement, with 1 being "strongly disagree", 3 being "neutral", and 5 being "strongly agree."

18) Resident *utility allowances* should be reduced for developments with an *above-code green building certification*.*

( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

19) *Above-code green buildings* provide benefits when compared to *energy-code compliant buildings*, in terms of:*

Total Cost (*includes all administrative, design, construction and development costs, minus land acquisition)*
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

20) *Above-code green buildings* provide benefits when compared to *energy-code compliant buildings*, in terms of:*

Scope of Work
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

21) *Above-code green buildings* provide benefits when compared to *energy-code compliant buildings*, in terms of:*

Construction Schedule
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

22) *Above-code green buildings* provide benefits when compared to *energy-code compliant buildings*, in terms of:*

Quality of End Product (Building)
( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

23) *Above-code green buildings* help my firm achieve its objectives and mission.*

( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

24) At my firm the perceived buy-in for *above-code green building certification programs* is prominent.*

( ) Strongly Disagree
( ) Disagree
( ) Neutral
( ) Agree
( ) Strongly Agree

Property Management Survey

Introduction

The purpose of this survey is for the researcher to gain a better understanding from property management companies and associations on the impact of above-code green building certification programs and green technologies on the affordable housing development process. Thank you for taking time to complete the survey, your responses are integral to completing our research project.

The survey requires approximately 10 minutes to complete.

Please answer all questions in the survey and complete with as much detail as possible.

Privacy Guarantee:
The research team, under the sponsorship of the <PROJECT NAME>, is interested in collecting data from industry partners related to the operations, maintenance and administrative costs of affordable housing developments in the US Southeast. This data will be used only for the purpose of analyzing and reporting. Publications derived from this research will protect the confidentiality of the persons and companies from which data was collected. No company names, personnel names or product brand names will be included in publications.

Background Information

1) Please provide your full name*

_____

2) Please provide the name of your employer*

_____

3) What type of company do you work for?*

( ) Property Management
( ) Developer
( ) Industry Association
( ) Other: _____

4) What is your position or title?*

_____

5) How many years have you been with your current employer?*

( ) 1-3 Years
( ) 4-6 Years
( ) 7-9 Years
( ) 10+ Years

Operations and Maintenance (O&M) Questions

The following questions refer to the operation and maintenance (O&M) of above-code green buildings compared to energy code-compliant buildings over the building's lifecycle.

For the following section, please indicate the degree to which you agree with the statement, with 1 being "strongly disagree", 3 being "neutral", and 5 being "strongly agree."

Definitions:
Above-Code Green Building Certification Program:
Green building certification systems are a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements. Rating systems and certification systems are frequently used interchangeably.

Energy Code-Compliant Building:
Energy code compliance and verification are performed from different perspectives, but share the same end goal. Architects, designers, engineers, contractors, builders, and other construction industry stakeholders have a professional responsibility to design and comply with the required state energy code on behalf of the building owner/developer.

6) *Above-code green buildings* are more energy efficient than *energy code-compliant buildings*.*

1 _____ [__] _____ 5

Comments:

7) *Above-code green buildings* are more water efficient than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

8) *Above-code green buildings* have lower utility costs than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

9) *Above-code green buildings* have lower utility costs than *energy code-compliant buildings,* and allow for a reduced utility allowance.*

1 _____ [__] _____ 5

Comments:

10) *Above-code green buildings* have lower overall operations and maintenance costs than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

11) *Above-code green buildings* require less frequent maintenance than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

12) *Above-code green buildings* require less staff time and resources for in-unit maintenance requests than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

13) *Above-code green buildings* require a greater level of resident education to operate units properly than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

14) *Above-code green buildings* experience less resident turnover than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

15) *Above-code green buildings* require less resources (time, money, etc.) for *unit-rollover* than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

16) *Above-code green buildings* provide residents with enhanced *indoor environmental quality (IEQ)* (health, safety, and comfort) than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

17) *Above-code green buildings* provide residents with enhanced comfort (i.e. temperature, air quality, ventilation, humidity and lighting) than *energy code-compliant buildings.

1 _____ [__] _____ 5

Comments:

Administration

The following questions refer to the administration of property management and multifamily housing finance and development programs in terms of operations and maintenance (O&M), quality assurance and compliance monitoring over the building's lifecycle.

For the following section, please indicate the degree to which you agree with the statement, with 1 being "strongly disagree", 3 being "neutral", and 5 being "strongly agree."

Definitions:
Above-Code Green Building Certification Program:
Green building certification systems are a type of rating system that rates or rewards relative levels of compliance or performance with specific environmental goals and requirements. Rating systems and certification systems are frequently used interchangeably.

Energy Code-Compliant Building:
Energy code compliance and verification are performed from different perspectives, but share the same end goal. Architects, designers, engineers, contractors, builders, and other construction industry stakeholders have a professional responsibility to design and comply with the required state energy code on behalf of the building owner/developer.

18) Administration of developments with *above-code green building certifications* require less staff time and resources than *energy-code compliant buildings*.*

1 _____ [__] _____ 5

Comments:

19) *Above-code green building certification programs* provide an enhanced level of quality assurance and compliance monitoring in terms of *third-party verification* than *energy-code compliant buildings*.*

1 _____ [__] _____ 5

Comments:

20) *Above-code green building certification programs* have less overall administrative and management costs than *energy-code compliant buildings*.*

1 _____ [__] _____ 5

Comments:

21) *Above-code green building certification programs* increase staff knowledge and ability to verify (*third-party verification*) in terms of construction and development specifications than *energy-code compliant buildings*.*

1 _____ [__] _____ 5

Comments:

22) *Above-code green building certification programs* improve the overall health (emotional and physical) of affordable housing residents more than *energy-code compliant buildings*.*

1 _____ [__] _____ 5

Comments:

23) *Above-code green building certification programs* that are incentivized or required in State Qualified Allocation Plans (QAP) credit scoring process experience resistance from developers.*

1 _____ [__] _____ 5

Comments:

24) *Above-code green building certification programs* that are incentivized or required in State Qualified Allocation Plans (QAP) credit scoring process experience resistance from developers, primarily due to cost containment concerns.*

1 _____ [__] _____ 5

Comments:

25) *Above-code green building certification programs* provide technical assistance services that make administrative and managerial tasks easier to complete.*

1 _____ [__] _____ 5

Comments: