



Affordable, Sustainable, Urban Housing

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The United Nations outlines seventeen sustainable development goals to fight climate change and social injustices. Of the seventeen goals, goal eleven is devoted to making cities “inclusive, safe, resilient, and sustainable” (Goal 11). Currently over half of the world’s population lives in an urban area with expectations for that to rise to about sixty percent of the global population residing in cities by 2030 (Goal 11). Residential areas must keep up with the growth of the city in order to maintain a healthy environment, and cities cannot grow without providing or creating more homes within them. With pressing climate issues, cities and their developers must consider their options for developing efficient homes. The developers’ decisions hold a lot of environmental weight, as residential buildings in the United States “account for approximately 22 percent of the nation’s total energy consumption, 20 percent of total consumer energy expenditure, and are responsible for 17 percent of greenhouse gas emissions” (Clean Energy Jobs).

Eleanor Tutt is a senior analyst at the Federal Reserve Bank of St. Louis and has experience in developing low-income housing. She argues that the sustainability of a specific property is not only determined by the property itself but also the community it inhabits (Tutt). Many factors such as site selection, density of the area, available transportation options, job availability, inclusionary zones (i.e. zoning which allows for high building diversity), and the availability of affordable housing, play a role in the sustainability of a new development. If a newly developed home with incredible energy efficiency is built in an area with low density and a need for automotive transport, the home is not ideally sustainable. An older, lower efficiency development in a city with public transportation, high density, and bike lanes is arguably just as sustainable. She argues that there is no way to know which home would have a lower overall carbon emission rate, but it is clear that there is more to a sustainable home than the house itself (Tutt).

Tutt has worked on many developments and has sought out sustainability in each one. Tutt included rain gardens, geothermal heating, and sidewalk in order to promote energy efficient living. One issue Tutt ran into was the residents’ reaction to the transition from less efficient to more efficient appliances such as switching the furnace to geothermal. Residents felt uneasy with the geothermal heat because they were unable to hear the heat turn on. She noticed that transitioning into high-efficiency methods brought surprising reactions and residents noticed abnormal adjustments to their daily habits. Through the numbers, Tutt was sure that her homes

were environmentally and fiscally sustainable but was unsure of the social sustainability behind her projects.

Social sustainability meets environmental sustainability in programs like Green Building Alliance (GBA). The GBA Northwest Branch Director, Guy McUumber, has some programs in place for people to learn about the energy efficiency of their homes. Their goal is to teach people, renters and landlords alike, about energy efficiency in the home. They inform people of different energy assistance programs available through the gas and electric companies in the Meadville area that unlike traditional energy assistance, where money is given to the person to aid in the payment of a utility bill, help people to be more energy efficient and thus drive the costs of their utilities down. This allows for people living in the homes to lessen their energy bills through, small efficient switches, such as LED lighting and/or efficient power strips. These small changes come at no cost to either the renter or the landlord and are paid for by the electric company. Programs such as these are very successful in allowing people to overcome the difficult relationship between renters and landlords. However, because these changes are so small not much difference is seen in the utility bills. Programs where in a portion of the money set aside for energy assistance is used to promote energy efficiency put the responsibility of seeking out these programs on the renter. The renter of the home is responsible for actually implementing use of these efficient lights and power strips. If this program, or one similar to it, became larger and began funding things like paying the difference between a high efficiency appliance and a low efficiency appliance, there would be a much greater impact on the utility bills of the renter of the home.

When a house is built to Passive House standards, it is much more energy efficient, most especially in terms of space heating and cooling which are generally the biggest users of energy in a home. Some incredibly efficient houses have shown that this relationship to space conditioning and energy usage can be completely upturned when building to these standards. One house built to Passive House standards showed that rather than the majority of energy usage coming from space conditioning, sixty five percent of the electrical use came from plug loads, things like lights and appliances (Sullivan). The materials necessary for a house to be as efficient in space heating and cooling as Passive House standards intend, cost significantly more than their less efficient counterparts.

Cost is a major hurdle to overcome when building more efficient housing and developers and architects generally charge more when designing with ecological sustainability in mind. There are also significant fees involved in obtaining building sustainability certifications. In turn, these economic factors unfortunately drive the costs of ecological sustainable housing upward resulting in a more expensive residence overall. Sustainable housing does not consider all facets



of sustainability, it generally only considers environmental issues and has no regard for economic or social sustainability.

The elevated cost can be attributed to manufacturers' unwillingness to supply more efficient counterparts to traditional and widely used appliances. The manufacturers who specialize in efficient products are thus able to raise prices, stopping those with lower incomes from seeking out efficient products. The lack of diversity in the market for efficient building materials and appliances leads to a price increase for these products. People with enough money to pay for a more efficient product are willing to invest more money initially because future savings justifies any excess cost. The savings in future energy costs are sometimes considered to be savings in the building costs as well. In the Passive House example, the home resulted in an additional one-hundred and sixty-six dollars of monthly savings over that of a house built to regular building code. However, the upfront costs are not worth the long-term investment for those who do not have the ability to pay high amounts up front. Many people are already bearing the weight of housing costs well over the recommended thirty percent of income. Housing is a burden for people across the country. To be able to say that one is making an investment in the future savings comes from a place of privilege. Many people are unable to justify spending more on a highly efficient house because it is not a possibility. The upfront cost for highly efficient housing is the biggest challenge people face when considering it. It is the high cost of efficiency that deters many people from seeking out efficient housing.

The median energy burden for city dwellers is three and a half percent of income across country (Drehobl). In northeastern cities the median energy burden is just below four percent of income (Drehobl). For Pittsburgh as a whole the city's median burden is just above four percent but in low income Pittsburgh households the burden is nine percent of yearly income (Drehobl). That is a two-hundred and fifty percent increase compared to the median burden for people in cities across the country. Low income households across the country are facing this high burden of energy costs. Those facing the high energy burden should be the people first considered when building high efficiency housing. If more efficient housing becomes available for low-income households the home would not be simply be ecologically sustainable but also socially and economically sustainable as well.

High-efficiency and environmental sustainability should not be a privilege only for those who can afford it. Market availability and the market targeting upper and upper middle-class consumers also stands in the way of building affordable efficient housing. Through an interview with Drew Brisley, Chief Product Officer of Module, a Pittsburgh based housing company, it became very clear that the market for sustainable housing does not yet exist for members of lower socioeconomic classes (Brisley). Module builds new homes in Pittsburgh that are designed to be easily added onto, in order to grow with the consumer. The most recent



project Module has been working on is in the neighborhood of Garfield. The house, like all of Module's houses, has been designed to Passive House standards (Brisley). However, in comparison to other homes for sale in the area it is much more expensive at \$435,000 whereas a similar house, although not new construction, in the same neighborhood can be found for about \$180,000 (5454 Black Street) (Pittsburgh, Pa Houses). This massive price gap shows that new Passive House homes are being built for people who are able to pay for a more expensive house. Module is marketed towards people actively looking for new construction within a city that is also able to cut down on electricity use. The company has to market itself toward a high-end consumer because otherwise there would not be enough of a profit margin to keep them in business.

Highly efficient residential buildings could have an immense impact on ecological sustainability but is not an option for people without the necessary extra income. Building efficient housing adds up quickly, high efficiency appliances, many layers of insulation, more efficient windows and doors. Building a house to Passive House standards, intended to increase efficiency of a home through more natural space conditioning, costs five to ten percent more than building a single-family house that is simply code efficient (Passive House FAQ). If there is intent to acquire LEED certification the cost of building materials alone can increase by about thirty percent (Vamosi). Building more efficient housing costs significantly more than building a home to the efficiency standards in building code.

In order to solve the lack of affordable, sustainable, and efficient housing, there are many options, but only one which is both environmentally and economically effective on a widespread scale. These options include reuse, retrofit, and the most efficient, landlord responsibility. In terms of new construction, one way to offset the higher cost of efficient windows, insulation, and appliances is to reuse these building materials from previous homes. The old building materials can usually be found for little to no cost to the developer and by reusing materials, there is less of a demand for new building materials to be manufactured. With less demand for these materials, the building process is responsible for less carbon emission and is thus more environmentally sustainable. While this method could reduce the building cost significantly and allow for more money in the budget to prioritize efficient new materials, reusing materials is not the best answer for widespread development. Because cities are growing and houses are in high demand, developers would be building more houses than getting rid of old ones. If this practice is utilized on a large scale, the demand for reusable materials would overwhelm the current market in which less buildings are taken down than built. Reuse of building materials is not a part of many contractors' plans. Contractors have systems set up to increase productivity and profits. Because the developer does not have control over the contractor's methods, he or she would not be able to implement the method of reuse on even a smaller scale.



Another option for developers is retrofitting older building stock. Retrofitting is a remodeling of the systems already in place. From replacing insulation to replacing kitchen appliances, retrofitting an existing home can be both cost effective and environmentally sustainable. However, retrofitting must be timed properly for it to have true net cost savings. For example, it is better to wait for a furnace to break than to replace it before it does. The other issue with retrofitting is that the initiative is typically on the owner of the home. In the case of a rental property, the initiative is not even on the resident but on the landlord. In most situations, the landlord does not live in the house or pay utility costs and may not be affected by the lack of efficiency at all. Due to a lack of motivation from the homeowner or the landlord and the upfront difficulty of big renovations, though the cost and environmental effects may be great, the owner is less likely to retrofit the building stock and more likely to look towards new construction.

Section 8 homes are the ideal way to look at home efficiency. Section 8 housing is regulated governmentally and gives homes to low income people. Guy McUmbler has been researching the ways renters, specifically in the Meadville Area are looking into energy efficiency in their homes. Many of the homes available for rent in Meadville are not very efficient and those living in affordable housing may have utility bills that cost over half of their rent payments. This is due to the passing on of utility bills by landlords. By passing utility payments to the renters of the home rather than having the landlord be responsible for them takes away the landlord's motivation to make the home more efficient. The renter, on the other hand is unlikely to want to make the home more efficient in any way because they are not the owners of the home and likely don't have the means necessary to make any switch. The relationship between the landlord and renter is mainly what stands in the way of being able to make efficiency changes to the rental property. The lack of motivation between both parties makes it nearly impossible to better the efficiency of a rental property.

The average section eight home with an income below \$50,000 in an urban area in the Middle Atlantic region of the United States uses about 7,332 KWH of electricity annually (U.S. Energy Information). This equates to roughly \$1,167 is spent annually in these homes on electricity (U.S. Energy Information). In these same homes where at least one appliance in the house is an energy star rated appliance or window the average overall electricity usage is 8,126 KWH equating to about \$1,252 (U.S. Energy Information). Although energy star appliances are more efficient than other appliances these homes still used more energy. This could be due to a few different factors, for example if the square footage of the homes is not standard thus creating different energy needs for space conditioning. It could also be due to people knowing that with the energy star appliance they will be using less energy and may justify using it more. An energy star appliance would allow someone to use the appliance more for roughly the same cost as the previous appliance. These two reasons are most likely why the energy demand is



increased in homes with at least one energy star appliance. However, if all energy star appliances were used in the homes about thirty percent less electricity would be needed to run the homes, resulting in an average use of 5,132 KWH and savings of about \$350 (U.S. Energy Information). If the homes were able to update to passive house standards the energy costs could go down by up to ninety percent, equating to savings of about \$1,296 in overall electricity costs. These extreme savings would likely not be quite as high when put into practice due to human interference. People tend to change their habits and use more electricity than normal when they know they are able to use energy more efficiently.

By focusing on section eight housing, energy standards are able to be set and assured by the government. Energy audits can be performed on the homes regularly in order to give both the tenant and landlord a benchmark of energy consumption to improve upon. With section 8 homes, the landlord should take on the cost of utilities and include it in the rent of the house. With the cost burden on the landlord, there is a higher initiative to decrease energy use by maintaining better and more efficient appliances. The landlord in this case is unable to ignore the home's effects on the environment and energy use.

The higher the decrease in energy consumption (as seen in the audit benchmark), the more the landlord would benefit. Utility companies have energy assistance programs already in place in order to lessen the bills of tenants in need of financial assistance. By taking on the utility bills, the section 8 landlord absorbs the monthly cost, but should be given a portion of the energy assistance money to help them invest in more efficient and sustainable appliances and materials. This would also further incentivize landlords to rent their properties to low income families. In this ideal plan, the landlord would be paid back for different levels of energy saving investments. The more energy savings you are able to provide the more money you would be given back. This money would come from money already set aside by the government for energy assistance. The landlord would already be paying for the energy bills directly thus meaning that on top of getting a subsidiary for providing low-income housing they would also benefit from the energy savings within the home. The main issue with allowing the landlord to also benefit from energy savings within section eight housing is making sure the landlord is not over charging the tenant for rent and energy costs. To protect tenants from this consistent monitoring of the utility bills of the homes where the tenants reside would be necessary.

In order to create a community which is as the United Nations describes: "inclusive, safe, resilient, and sustainable," developers and governments must look towards Section 8 Housing as the starting point to widespread sustainability. In order to have truly sustainable housing, the creation of a community around it must be a major focus because efficient housing can only be as efficient as the community around it. A sustainable community is one which supports everyone in it and utilizes all three components of sustainability: environmental, financial, and



social. In order to maintain social sustainability, the community must look towards what it can do for section 8 housing. Lower-income families are the least likely to invest in higher efficiency appliances, and the most likely to be positively affected by them. In order to best transform lower income households, the landlord should absorb the cost of utilities into rent. Putting the financial burden on the person in charge of the appliances and materials will lead to a stronger initiative to invest in better and more efficient materials. In this situation, by looking towards the whole community and creating financial initiative, more efficient materials will be typical in rental properties in section 8 developments.

About the Author:

Natalie Petrini is a 2021 graduate of The University of Pittsburgh with a bachelor's degree in urban studies as well as a certificate in sustainability and a minor in architectural design. Her interest in sustainability, urban development, and social justice brought her to study affordable sustainable housing at length. Through this research, she has discovered a gap between sustainable solutions and those who could benefit most. Natalie's goal is to aid in closing this gap.

Natalie enjoys surfing, working out, and making coffee.



Resources

"5454 Black Street." *Module*, Module Housing, <https://modulehousing.com/projects/build-ready-projects/5452-black-st-2/>.

Brisley, Drew. Personal Interview. 15 Oct 2019.

"Clean Energy Jobs and Oil Accountability Act." *Democratic Policy Committee*, Democratic Policy Committee, https://www.dpc.senate.gov/files_energybill/residential_buildings.pdf.

Drehobl, Ariel, and Lauren Ross. "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income And Underserved Communities." American Council for Energy Efficient Economy, 2016, pp. 1–56.

"Goal 11: Make Cities Inclusive, Safe, Resilient and Sustainable." *United Nations*, United Nations, <https://www.un.org/sustainabledevelopment/cities/>.

McUmber, Guy. Personal Interview. 5 Nov 2019.

"Passive House FAQs." *Passive House Institute U.S.*, Passive House Alliance, <https://www.phius.org/what-is-passive-building/passive-house-faqs>.

"Pittsburgh, PA Houses." *Zillow*, Zillow Group, <https://www.zillow.com/pittsburgh-pa/houses/>.

Sullivan, Bruce. "Passive House Busts High Cost Myth." *Zero Energy Project*, Zero Energy Project, 23 July 2018, <https://zeroenergyproject.org/2018/07/20/passive-house-busts-high-cost-myth-2/>.

Sullivan, Bruce. "Passive House Busts High Cost Myth." *Zero Energy Project*, Zero Energy Project, 23 July 2018, <https://zeroenergyproject.org/2018/07/20/passive-house-busts-high-cost-myth-2/>.

Tutt, Eleanor. Personal Interview. 13 Nov 2019.

"U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." *Residential Energy Consumption Survey (RECS) - Data - U.S. Energy Information Administration (EIA)*, Energy Information Administration, 2015, <https://www.eia.gov/consumption/residential/data/2015/>.

Vamosi, Stephen J. "The True Cost of LEED-Certified Green Buildings." *HPAC Engineering*, Informa US, 14 Nov. 2012, <https://www.hpac.com/archive/true-cost-leed-certified-green-buildings>.

