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Housing the Homeless: A Framework for Sustainable, Affordable Housing

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Abstract

New York City's building stock is comprised of nearly one million structures. Buildings are responsible for unconscionable amounts of global energy, water, resources, and greenhouse gas (GHG) emissions. Thousands of buildings are annually constructed when the truth is that there is a significant stock of buildings that could stand to be rehabilitated. New green developments present an opportunity to increase efficiency while reducing energy use, resource consumption, and waste. If virgin new green developments provide the aforementioned opportunities, then it logically follows that sustainably retrofitting preexisting buildings represents an even greater opportunity to promote environmental sustainability and reduce inefficiencies. As of July 2017, a little over 60,000 people were living in New York City's (NYC) homeless shelters (Coalition for the Homeless, 2017). A proven solution that has been proposed for ending homelessness is: actually, housing the homeless. Marrying the issues of sustainable development and homelessness, this thesis argues that sustainable renovation and building reuse are cost-effective ways to tackle homelessness in NYC in a way that is mutually beneficial for the city, the homeless, and the communities that are mostly affected by homelessness and the threat of homelessness. An analysis of Norwood Terrace, and affordable housing development is treated through environmental studies to conceptualize how retrofitting sustainably is the best option for NYC to house the homeless. Property management and development shows how monitoring, collaboration, and innovation can be instrumental in providing housing at a price the city can afford. Lastly, architecture and urban planning illustrates how efficient, sustainable housing can and should be designed.

Keywords: homelessness, environmental studies, green retrofitting, sustainability

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Introduction

There are three pillars of sustainability. They are: economic sustainability, environmental sustainability, and social sustainability. This thesis explores a way in which sustainable property development[1] , specifically sustainable renovation (or rehabilitation), can be used to create environmental, economic, and social sustainability in communities. With thousands of new units built each year, it is important for us to think about the ways in which we go about new developments. There is some speculation surrounding how many buildings are actually vacant and available in NYC. In 2012, The Daily News reported about a joint study between Picture the Homeless and Hunter College which concluded that there were more than 3,500 vacant buildings across the five boroughs and 2,400 vacant lots, while in 2016, The Real Deal published an article stating that there were "as many as 541 properties in the five boroughs [that] may be sitting vacant". Buildings use 40 percent of global energy, 25 percent of global water, and 40 percent of the world's raw material resources, while emitting one-third of greenhouse gas emissions (UNEP). Often times the illusion that hinders sustainable development is cost. Strategies, such as the Passive House Strategy, which is a voluntary standard for creating low energy buildings, can be costly at the outset however these measures pay for themselves with a quick investment recovery period. Some states will even reward homeowners and developers for implementing environmentally friendly strategies and technologies. What developers fail to realize is that architectural retrofitting can oftentimes be more cost effective than the virgin production of a building.

[1] Sustainable Property Development refers to the wide range of activities which range from the renovation of existing buildings to the purchase of raw land for either keeps or to re-lease to a third party.

This is primarily because the materials and structure are preexisting, especially if you find an older building in decent condition.

Homelessness has been a growing problem in New York City and is a major social issue for a number of reasons. The first being that people should have shelter and a safe place to lay their heads, especially because a significant portion of the homeless population is comprised of the mentally ill, and families with children. Second, because homelessness is essentially an extreme form of poverty and increasingly, more people are falling into homelessness due to job loss, health crises, addiction, and domestic violence. As incomes, rent and amounts of available, actually affordable housing move in opposite directions the amount of people having to live in subways, on the streets, and in shelters increases.

As of July 2017, over 75,000 units of "affordable housing" was added to NYC under Mayor Bill de Blasio's Housing New York (HNY) Initiative (NY Times). However, only a small portion of these units are dedicated to the extreme poor. The best solution that has been put forth to solving the issue of homelessness is to give homes to the homeless. There are programs that move homeless individuals into subsidized apartments while also connecting these individuals to vital resources that can help them find jobs, get treatment for addiction, and emotional support should they need it. Methods such as rent subsidies have been shown to be effective as well. It has also been found that housing the homeless is less costly than renting shelter beds. Shelters are often overcrowded, unsanitary, lacking resources, and dangerous.

The purpose of this thesis is to propose a framework to mitigate the issue of homelessness by implementing sustainable strategies in the rehabilitation and reuse of

preexisting structures. This thesis marries the issues of homelessness and inefficient structures which are social and environmental issues in their own right and explores how the two can work together to enrich the social and environmental capital of all cities across the country. Adopting sustainable strategies in development and renovation will enable cities to harness the myriad environmental benefits, financial savings, and social benefits of sustainable architecture.

This exploration will start with a walkthrough of the issue of homelessness including the history of homelessness in NYC, the policies that contributed to the state of homelessness, and the current state of NYCs homeless shelters. In chapter two, I elaborate on some of the most important aspects to consider when picking a building or site for any type of structure. I also give a brief overview of Enterprise Green Communities (EGC), one of the many standard setting boards that are geared towards creating more sustainable structures and communities. The third chapter will discuss the affordability of Affordable housing including an overview of costs associated with building affordable units and an overview of how affordable projects are and can be financed. The fourth chapter presents a case study of an affordable housing unit built by B and B (B&B) Urban, an affordable housing development company in NYC. I will discuss the structure of the building, the technologies used or not used, and the social services provided, if any. I will also illustrate how the development fits into the surrounding community and lastly the price of its construction and maintenance. The second half of the chapter focuses on the project conceptually and theoretically had it been a rehabilitation or building reuse project for the intention of providing sustainable, affordable housing. My purpose for juxtaposing a novel construction

with that of a rehabilitated property is to show that even if affordable housing is built for the homeless using sustainable methodologies, renovating a building for the same purpose using sustainable methodologies is not only more efficient and better for the environment, but is cheaper in the long run. It can also be used, with proper property management, to create more opportunities for savings and possibly generate extra revenue to help the residents of the building.

Moreover, I marry these issues together to show that homelessness does not have to be a stagnant cycle. In concluding the entire work, I paint a picture that succinctly illustrates where affordable housing, sustainability, and renovation intersect. I make policy recommendations that are important for New York City as it continues to tackle homelessness, as well as discuss my sentiments for the future of sustainable, affordable housing especially in the wake of recent developments. Lastly, I make a case for the rehabilitation of vacant buildings as perfect sites for public social services.

Chapter 1: The Walkthrough: The History of Homelessness in NYC

Single-Room Occupancy (SRO) housing units are units intended for single occupancy but have shared kitchen and bathroom facilities. In the 1950s there were more 200,000 SRO units citywide (Sullivan). Between the 1950s and 1970s these SRO units had an essential role in providing low-cost housing for childless couples and families. They were also the last resort for single adults, the majority of whom were ex-convicts, addicts, disabled, or elderly (Coalition for the Homeless). It is during the 1970s that New York begins to see the emergence of "Modern Homelessness" which is significant as homelessness had not been a major issue in New York City since the Great Depression in the 1930s. This emergence of modern homelessness was a result of what seemed to be an attack on SROs by the city starting in the mid-1950s and persisting for nearly 30 years (Sullivan). During the time period of 1955 to the 1980s, the city banned the construction of new SRO units, excluded families from using SRO units, altered building codes and zoning laws that impeded SRO occupancy, and provided tax incentives that encouraged the conversion of SROs to higher rent apartments (Sullivan). One of these measures included a tax benefit program enacted in 1955[2] which, when you look at the number of individuals who came to depend on SRO units in the 1960s, established a fixed number of units for a growing SRO dependent population.

[2] The J-51 program was created in 1955 to encourage the renovation of substandard dwellings. In relation to SROs it incentivized the conversion of Single Room Occupancy units into "regular Class A Multiple Dwellings (a building used for permanent occupancy)". The J-51 Guidebook did mention that the rehabilitation of SRO units was eligible for "enriched exemption and abatement benefits" but this activity was not covered under the J-51 Program. Also, unless the building already received substantial amounts of government monies, it was not eligible for tax benefits. (J-51 Guidebook)

Coinciding with the aforementioned city activities was the release of approximately 125,000 resident patients from the state's psychiatric institutions between 1955 and 1985, as a result of the adoption of "deinstitutionalization" (Sullivan). SRO units then also became vital resources for the mentally ill patients discharged from these institutions, as these individuals received no help in relocating to permanent housing and were released by the thousands into New York City communities. The activities that persisted between 1976 and 1981 resulted in the elimination of nearly two thirds of the city's SRO housing stock (Malone). Also, the city's tax benefit programs, coupled with the fact that many SRO buildings were located in gentrifying areas pushed landlords further away from the preservation of these units and closer to converting their buildings to luxury apartments. As single-room occupancy units became increasingly occupied by the poorest of the poor and came to be seen as bad investments, landlords resorted to terrible tactics in order to remove SRO tenants from their buildings. These tactics included renting units to prostitutes and drug dealers, turning off the heat, hiring thugs to throw tenants out, and burning down the building altogether (Sullivan).

By the 1980s "harassment, homelessness, and misery" were the results of the 30-year attack on SROs as well as the elimination of more than 100,000 units of affordable housing (Sullivan). In an effort to cope with the lower housing stock, and to mitigate the results of previous policies, the city prohibited conversion of SRO units (Coalition for the Homeless). 1979 saw the landmark case of *Callahan v. Carey* filed by the Legal Aid Society and established the "right to shelter" in New York City (Kim). This case put an end to homeless individuals having to rough it on NYC streets. At the outset of modern homelessness,

hypothermia and cold related deaths and injuries were the norm and in response to this the city erected pitiable emergency shelters that were often filled to capacity (Coalition for the Homeless). The 1980s saw a spike in family homelessness due to economic factors and cutbacks in the Federal Housing program under the Reagan administration. Also during this time, two thirds of homeless New Yorkers resided nightly in shelters. This population was overwhelmingly comprised of families and children. Despite these conditions however, courts still failed to institute permanent housing assistance (Coalition for the Homeless).

New housing initiatives in the 1980s launched by Mayor Koch's "Housing New York" led to the creation and rehabilitation of some 150,000 affordable apartments, 15,000 of which specifically targeted homeless households in 1986 (Coalition for the Homeless). Under Mayor Dinkins in the 1990s, homelessness among single adults decreased, falling by 37 percent, while homelessness among families did the opposite. Under his administration over 3 thousand units of permanent supportive housing were constructed under a joint policy between himself and Governor Cuomo called the "New York/New York Agreement" (Coalition for the Homeless). The city began providing enhanced rental assistance and supportive housing to an increased number of individuals and families affected by AIDS. He also made reforms in the shelter system such as downsizing armory shelters and created smaller specialized shelters that provided specialized services to those with special needs and disabilities (Coalition for the Homeless). In addition, welfare hotels and barracks style shelters for homeless families and children were phased out and eliminated (Coalition for the Homeless).

Next, under the Giuliani administration the homeless shelter census rose from 23,000 to 30,000 as a result of dramatic cutbacks in targeted housing assistance and aggressive attacks on the right to shelter which was further pursued and instituted by Mayor Bloomberg who followed Giuliani (Coalition for the Homeless). Also, Giuliani implemented bureaucratic reforms that were hindrances to families in need getting access to emergency shelters as well as aggressive policing policies that ordered the arrest of homeless individuals sleeping on the streets and in NYC public spaces. The housing affordability gap grew under Mayor Bloomberg's 3 term administration and the homeless population exceeded 50,000 people. Under his administration, all permanent housing assistance for homeless families was eliminated, the shelter system was expanded with low income apartments actually being used as temporary shelters, and NYC homeless services expenses rose to over $ 1 billion (Coalition for the Homeless). Also, his administration adopted new policies that, it was thought, would empower the homeless thus forcing homelessness into decline. As a result of these policies the homeless would no longer get priority access to public housing and would only receive short term help with the rent via rent subsidies (Elliot). During this time in 2004, rents rose and low-income wages came to a standstill (Elliot).

Currently, shelter conditions in NYC have been quoted as being "poor…[and] a breeding ground for criminal activity" leaving a high volume of people living on the streets (Chen). New York City's current mayor, Bill de Blasio has described NYC shelters as being "not safe enough or clean enough" and in reference to shelters that he "[does not] want anyone refusing to come into a shelter because of bad conditions". Steven Banks, Human Resources Administration Commissioner, has admitted that "fixing buildings will be much

less expensive in the long run than constantly repairing them" (Chen). As of 2016, approximately 3 to 4 thousand people are estimated to be living on the street[3]. Currently, New York's shelter system is comprised of 500 shelters and in an audit of New York's shelters, Comptroller Scott Stringer has identified 18,000 health and safety violations (Chen). These violations include vermin infestation, inoperable smoke detectors, and peeling lead paint. City inspectors have cited shelters such as the Auburn Family Shelter featured in Andrea Elliott's New York Times work "Invisible Child", for "deplorable conditions" including sexual misconduct by staff, spoiled food, asbestos exposure, and again- lead paint and vermin. Some shelters also do not have essential services needed to aid in the amelioration of homelessness. The lack of housing specialists or on-site child care are barriers that prevent residents from searching for jobs or permanent housing (Elliott).

The definition of homelessness is ambivalent and increasingly categorical. Under the Stewart B. McKinney Homeless Assistance Act, a person is considered homeless if they: lack a fixed regular and adequate night-time residence and has a primary night time residence that is either a) supervised publicly or privately operated and designed to provide temporary living accommodations, b) an institution that provides a temporary residence for individuals intended to be institutionalized, or c) a public or private place not designed for, or ordinarily used as, a regular sleeping accommodation for human beings (Kim).The United States Department of Housing and Urban Development (USHUD) on the other hand defines individuals and families eligible for government aid by categorizing them into 4 categories.

[3] This is the approximate number of the homeless individuals living on the streets who are not counted in the over 60,000 residents of shelters.

They are: the literally homeless, imminent risk of homelessness, homeless under other federal statutes, and fleeing or attempting to flee domestic violence (Kim). The National Coalition for the Homeless categorizes the homeless according to three different definitions. Those who are likely to be in the shelter for long periods of time are categorized as being chronically homeless (Kim). This level of homelessness is often comprised of older people and the "hard-core unemployed" (Kim). The second level is the transitional homeless who enter the shelter system for a short time while they transition to permanent housing. The third level, is the episodic homeless which is comprised of individuals who go in and out of the shelter system (Kim).

NYC taxpayers are heavily burdened by the growing homeless population, as they are the ones who are footing the aforementioned $1 billion-dollar tab to shelter the homeless. They would benefit form a permanent housing approach as opposed to a shelter based one (Kim). As stated in the introduction, and as seen throughout the history of homelessness - housing the homeless is the optimal solution to mitigating homelessness in NYC. A study in Los Angeles, California found that permanently housing 4 chronically homeless individuals saved the city over $80 thousand a year (Kim). Additionally, taxpayers are more likely to foot the bill for hospitalization, medical treatment, police intervention and jails or prison for the homeless (Kim).

Research shows that homelessness does not bode well for the social capital of a society specifically, when it comes to homeless children. Children who grow up in poverty grow up with less education, lower earning power, are more likely to have drug addictions,

wind up in prison, and have psychological trauma and disease (Elliot). Some 24,000 children are homeless in New York City (Coalition for the Homeless).

Chapter 2: The Cost and Strategies of Sustainability

One major reason in support of retrofitting older, preexisting buildings is that the structure and its materials are already present. Creating a new development on the other hand sometimes uses resources that are either essentially nonrenewable (relative to the rates at which we are consuming them) and/or environmentally unfriendly or inefficient. Even in building a new green development there is still consumption of space and resources. The transport of these materials to new building sites also creates pollution and can be costly. When considering the design of a building there are a plethora of things to consider in order for it to be sustainable. These considerations include site design, water quality and usage, energy use, indoor air quality, as well as materials and resources. What I am discussing in this chapter is an integrated design process which marries some aspects of passive house design concepts with sustainable design and planning.

In an integrated design project such as this one, it is important to note that the marriage between the two strategies will not be effective so long as it is thought to be an amalgamation of passive house strategies with the latest green technology. Much like a real marriage, a project like this is successful only with some give and take especially when it comes to building reuse. Interrelated design elements must be separately optimized, and then re-evaluated and integrated into an all-encompassing building solution.

The Passivhaus concept got its introduction more than 20 years ago in 1990, in

Germany (Gonzalo) and is a standard for state of the art energy efficient buildings (Kiss)[4]. A passive house is a building which optimizes indoor air quality, offers extreme thermal comfort to tenants, and uses up to 90 percent less energy than a conventional building (PR Web). The most pressing issue for environmental efficiency in residential buildings is energy usage, specifically the energy used for heating and cooling. The science of the passive house concept deals with this issue in a major way and is explained as follows: heating energy is ultimately needed to replenish heat lost through the building's envelope. Such losses are mainly the result of poor insulation or the uncontrolled displacement of air (Dequaire)[5]. The heat requirement is achieved by using a highly insulated building envelope that keeps heat inside the building. To achieve this, low U values are required for the roof, walls, windows, and doors (Dequaire). After this issue is remedied the next cause of heat loss is uncontrolled air displacement and the solution to this, according to the standard, is to secure a minimum "air tightness" standard for the building envelope. The air is then managed by a mechanical ventilation system that reclaims heat from expelled air and reintroduces this heat to the building with fresh incoming air (Dequaire). Architect and author Roberto Gonzalo offers that the Passive House Concept is "simply...one of the most scientifically sophisticated and practical energy efficiency standards for buildings...".

A green building is, ideally, a project that preserves and restores habitats that are vital for sustaining life and becomes a net producer and exporter of resources, materials, energy,

[4] It is important to note that Passive House and Passivhaus are not exactly interchangeable. The former refers to passive house concepts adopted from the latter which is the original concept developed in Germany.

[5] Recently, passive house standards are also being applied to reduce the energy requirements for cooling as well.

and water rather than being a net consumer (GGGC). The construction and lifetime operation of green buildings assure the healthiest possible environment while also representing the most efficient and least disruptive use of land, water, energy, and resources (GGGC). Sustainable site planning is the use of the knowledge of earth's processes relative to certain locations to "discriminate between lands that should remain in their natural condition, [and] lands that are permissive to certain uses but not for others" (McHarg).

The Cost Considerations of Sustainable Buildings. Myth: green always costs more. This assertion is actually flawed and only half true, especially when the asserters are only considering up-front costs. The notion that green projects cost more is the main barrier to potential passive house and other green developments. The truth is that all green buildings perform better than conventional buildings (Hunt), and although the cost of building sustainably is relative, in short-- they do not really cost more than conventional buildings. Initially, investments in sustainable technologies to incorporate into the building cost money, and do add to construction costs in comparison to a conventional building (considering these would be unnecessary expenses for a traditional building). However, if the end goal is a sustainable building, a conventional building is an unfair benchmark, and sensibly speaking, added materials equal added cost.

What makes a sustainable building unique is the mitigation of these initial extra costs due to lower operating and maintenance expenses in the long run. Consider this small example: high performance, triple glazed windows cost more initially but pay for themselves when owners start seeing lower energy bills, a reduction in the size of the buildings heating and cooling system, and therefore a reduction in the cost of said system (GGGC). When

approaching sustainable development, it is important not to think about what you will save by not building sustainably, and instead compare the initial costs with the reductions in costs associated with the total life cycle of the building as a result of sustainable strategies. This is especially important because buildings depreciate over time, and over the lifetime of a building, the operating costs actually outweigh its upfront costs (Assa). Also, it is important to think about what you would lose, namely: energy and water savings, tax benefits, reduced waste, improved indoor air quality, increased resident health, and again, lower operating and maintenance costs.

Advocating for Renovation over Conventional Construction. In places like Germany, Switzerland, Austria, and Sweden, the cost of building a passive house decreased from as low as 5 percent to as high as 10 percent of the cost of erecting a conventional building[6] (Kiss). Recently, the Passive House concept has been applied to the retrofit of existing buildings. The first Passive House oriented renovation took place in Sweden and approximately 30 percent of the total retrofit costs were energy related (Kiss). The reality is that building retrofits have demonstrated that energy efficiency improvements are technically feasible, socially favored, and also provide cost effective reductions of primary energy and GHG emissions (Kiss). When the passive house concept is applied to high performance retrofits the potential energy savings for heating the buildings is high, some 70 to 90 percent (Kiss).

Building reuse almost always has fewer environmental impacts than new

[6] This is the cost reduction to build a passive house from scratch, not to retrofit a building using passive house methods

construction. Even if they are LEED certified, newly constructed buildings can take anywhere from 10-80 years to override the negative environmental impacts incurred during its construction (Sifferlin). Placing an emphasis on the value of building reuse is not just beneficial to the environment, it also presents an economic opportunity and a means of incorporating sustainability into a project. Ideally, since historical buildings were built before the advent of such technologies like air conditioning, it is assumed that these buildings utilize the earth's natural energies such as sunlight and wind (Elsorady). Although renovation projects use less material, renovations take longer than new construction, so they require more labor. The need for surplus labor is an opportunity to source labor locally which enables workers to work in close proximity to where they live, it saves them time on commuting, and increases the economic ability of the worker's family and by extension of the community. The potential for building reuse is amplified when considering that almost 1 billion square feet of buildings are torn down and replaced in the U.S. annually (Sifferlin). It is only fair to discuss the limitation of rehabilitation projects. In reference to rehab projects it is important to note that there are two types: moderate rehab and substantial rehab. Rehab projects always tend to seem like the cheaper option, however it is difficult to estimate the construction costs with a rehab project, so it is better to associate savings with a "moderate scope rehab" (Bell) as opposed to a gut renovation. However, in a city like New York with an abundance of vacant warehouses and large commercial/industrial buildings sometimes a gut renovation is necessary. This is why every project is relative and must be optimized with sustainable technologies that are the best fit for said project.

Strategy Considerations. When building green it is imperative to establish

environmental goals for the project. There are 8 overarching areas that should be treated. Some of the key criteria to focus on include: site design, location of the building and site improvements, water reuse and conservation, energy efficiency, and materials. The first is sustainable site design. Sustainable site design minimizes urban sprawl by placing more value on higher density development as opposed to lower density projects in an effort to mitigate the destruction of land, and the loss of habitat and green space. Instead, sustainable site design encourages urban redevelopment. In fact, one of the key strategies for this design consideration is to "make more efficient use of space in existing occupied buildings, [as well as] renovate and reuse existing vacant buildings, sites, and associated infrastructure" (GGGC). Designers should evaluate the site in terms of considering the location and orientation of buildings in order to maximize opportunities to use passive solar energy for heating and natural lighting. Also, the buildings orientation could take advantage of natural breezes and increase natural ventilation (GGGC).

The second criteria to consider is the location of the building and the neighborhood fabric. When it comes to building in a city such as New York, things to consider under this criterion are to avoid building on land with a slope greater than 15 percent, public parklands, and land within a flood zone (2015 Enterprise Green Communities Checklist- EGC[7]). Also, your building should be in close proximity to important infrastructure such as roads and sewers to eliminate the need for additional construction and connections, as well as services such as grocery shopping, transit, and open space (EGC).

[7] I am choosing to use the Enterprise Green Communities Checklist because it is the only comprehensive framework that aims to do what I am proposing here. It provides a green building framework for affordable housing.

Site improvements is the third criteria and expects considerations surrounding environmental remediation, erosion and sedimentation control, low impact development, the use of native plants in landscaping, efficient irrigation and water use, using light colored paving to reduce the heat-island effect, and surface storm water management (EGC). This leads into another criterion: water quality and conservation. This includes using design and building improvements in such a way that the pre-development hydrologic system can be mimicked and the natural water cycle of the site can be preserved (GGGC). However, in terms of retrofits, this can be hindered by previous design choices therefore, storm water retention, groundwater recharge, and on-site filtration are key. Storm and rain water retention can be extremely useful for minimizing the overuse of drinking water for those activities related to construction that require the use of water but not necessarily potable water. The least costly and least time-consuming design for site and storm water management is one that mimics or maintains (if possible) the natural preexisting flow of water through the site (GGGC). During construction over or further compaction of the soil should be avoided to maintain permeability and aeration of the soil, and storm water leaving the site should be filtered either naturally or mechanically to remove pollutants (GGGC).

Energy efficiency includes using energy efficient technologies such as energy star appliances and high efficiency lighting-- for this, designers may want to consider using lighting controls such as motion sensors in office buildings or in high traffic areas of the house, as well as light dimmers. Other considerations include electricity monitoring, and orienting the building design towards some method of on-site energy generation, i.e. through the installation of photovoltaic panels (EGC). When it comes to materials it is important to

use recycled and regional (locally sourced) materials; low to no VOC paints, coatings, and primers, adhesives, and sealants; certified salvaged and engineered wood products as well as woods that emit no formaldehyde; prohibit the use of carpet in areas such as the bathroom, kitchen, laundry room, and entryways; use "durable, cleanable surfaces throughout bathrooms, kitchens, and laundry rooms"; do not use materials that cause or trigger asthma, use an Energy Star certified roofing material, and lastly, use effective waste management strategies and recycling on the construction site (EGC).

When approaching green design or using passive house methods, designers should aim to exceed the minimum requirements set in the guidelines of those standards and make use of additional, optional points if they can. The indoor environmental quality of a building should also be considered. The design of the buildings should assure good indoor air quality, ventilation, thermal comfort, access to natural light and breezes, and control of the surrounding acoustical environment (GGGC).

When applying passive house standards with the 5 key elements of green buildings to retrofit projects we face a certain number of drawbacks. One of the most important and best parts in deciding to build green is to make that decision from the outset of the project. This way sustainability can be considered and integrated from the very beginning to the very end of the project. When deciding to retrofit a preexisting structure this opportunity has been severely limited. Personally, this fact represents one of the most fascinating aspects of architecture which is to create a solution while considering a number of constraints that are out of your control because they were already previously established. Also, this can present added costs as incorporating green technology and design solutions become less available

and more costly as the project progresses. However, these costs can be reduced when considering what was saved on materials as a result of a preexisting structure.

There are also 4 Passive House buildings principles to consider. Passive house standards are more scientific as the following 4 principles discussed are also in accordance with 4 science principles. The first is continuous insulation which is already touched on. This principle is explained as continuous thermal insulation throughout the entire [building] envelope without any thermal bridging. The second is air tight construction where the building envelope is extremely airtight, preventing the infiltration of outside air and the loss of conditioned air (PHIUS). Next is optimized solar performance and solar gains. High performance windows, typically triple paned, are carefully selected and positioned to take advantage of solar gain and provide supplemental heat in the cooling season while preventing overheating in the heating season (PHIUS). Following this is good indoor air quality made possible by a whole house mechanical ventilation system.

Currently in New York City (NYC), Mayor Bill de Blasio has created a policy, Plan One City: Built to Last, in an effort to reduce citywide carbon emissions by 80 percent by 2050. In this plan, the Passive House concept is the only building standard mentioned (NYPH). Proportionate to current climate change, Passive House is the only standard that reliably and affordably delivers deep cuts in energy use while also providing increased comfort, indoor health, climate resilience, and net zero and energy positive buildings (NYPH). Buildings designed to the Passive Building Standard consume 86% less energy for heating and 46% less energy for cooling when compared to a code compliant conventional building (US-PHIUS).

Already, it is shown that sustainable site planning can be combined with passive house and green building standards as all three concepts share a number of similar ideals. Although the initial investment to implement such systems can be costly, the pay off in the end is ultimately more beneficial for tenants, owners, and the environment as a collective. The GGGC offers some valuable insight in stating that "the best solution is not necessarily the one that requires the least amount of physical work." Meaning, that if designers are willing to take the time and be smart about their investments buildings can be used for more than simply providing a basic shelter.

Approaching building design and planning sustainably, and with the idea that building in this way lowers the operating costs of a building over its lifetime can make this type of planning more feasible, and is specifically important for the issue this thesis deals with and that is, housing the homeless. To house the homeless in this way, does many things but the main goal it achieves is to house them at a lower cost which extends the lifetime of such programs and hopefully leaves them less vulnerable to budget cuts.

Chapter 3: The Affordability of Affordable Housing: Placing Emphasis on Sustainability

In many ways the habit of building affordable housing in communities that are already geographically segregated, in debt partly because of high upfront development fees among other debts, and limited in the amount of rent they can generate does not benefit the community in which it is built (Barber). This can lead to an unsustainable economic situation in which the project is unable to fund maintenance and capital improvements because the majority of its revenue is going towards paying its operating expenses and preexisting debt

(Barber). Anything that is not beneficial for the community disrupts the balance between the social, economic, and environmental sustainability of a neighborhood. A building's lack in the ability to make capital improvements and pay its debts and expenses will result in dilapidated buildings, the transfer of a building to an owner that does not want to maintain it as affordable housing, and a reduction in the health and self-esteem of community residents.

It is important to approach affordable housing through the lens of sustainable development, because sustainable development presents an opportunity to lower operating costs, while the added benefits of building reuse presents a possibility of lowering construction costs (which, especially in a city like New York, has little opportunity to be reduced). These cost cuts are essential to building affordable housing developments because it turns out that providing affordable housing is actually pretty costly. Developers rely on loans and other financial sources to fund construction-- but developers can only receive these loans and sources providing the building will generate enough revenue to pay those funds back (Urban Institute). In order to do this, rents must be high enough to generate enough revenue for the buildings to pay back its debts as well as to cover the costs of operation and maintenance. This is where the problem lies, rents are too high for what people, especially the extremely poor can afford. There is a discrepancy between what rents "must" be and what people can afford to pay (Urban Institute).

Although there are programs to lower certain costs associated with the construction of Affordable Housing, it can be difficult to navigate all of the tax benefits and incentive programs. In addition, even applying for these programs costs money (although bonds, if received, can be used to make up for these costs). When it comes to affordable housing, in

addition to cutting costs where possible during the acquisition and construction phases, and implementing sustainability throughout all levels of development, the management of the finished project represents an opportunity for added savings.

Financing Sustainable, Affordable Housing. Tax incentive programs are administered by the office of Housing Preservation and Development (HPD) and reduces or eliminates the amount of taxes a property owner must pay to the city. Most times, these awards are essentially an exchange in which the owner receives tax benefits and in return, they agree to make an investment that benefits the public i.e. dedicating a percentage of their units to affordable housing (although tax incentives can be awarded as-of-right also). The benefits received from HPD can then be used by the owner and developers to offset the cost of this public good investment. Tax benefits can either be an exemption or an abatement. An exemption lowers the amount of taxes owed by reducing the property's assessed value while an abatement is a reduction in the property taxes for a set period of time via a credit applied to taxes owed based on the cost of the improvement (Tax Incentives).

The Low-Income Housing Tax Credit (LIHTC) Program, the governments primary program to build housing for the poor, was created by Congress in 1986 (NHLP). Its purpose was to incentivize owners of private property to create and maintain affordable housing. The program works through a "subsidy mechanism" in which[8]:

1. The IRS allocates funds to a state on a per capita basis[9], although it is unclear whether homeless people are counted in this basis.

[8] The breakdown that followed was referenced from the NHLP
[9] States received $2.35 per person in 2016 (NovoCo)

2. The funds are entrusted to the state's Housing Finance Agency (HFA) and they assume the responsibility for allocating tax credits to developers. Credits can be awarded because the project fits by law, called "as-of-right", while other programs are rolling, yet still some are competitive.
3. In exchange for receiving tax credits from the state, the owner agrees to dedicate a certain number or percentage of units to affordable low-income housing- rent at below market rates.
4. Developers essentially sell these credits to a bank or get into contact with a Syndicator who can link them to investors in search of tax credits. These credits usually sell for slightly higher than they are worth and provide cash equity that developers can use to reduce or subsidize the project's development costs.
5. Investors benefit from the tax credits, while developers benefit from the cash.

The LIHTC Program is a dollar for dollar reduction in federal taxes owed on income and the cash investors pay in exchange for credits reduces the amount of money a developer has to pay to borrow and consequently pay interest on (NHLP). This provides the ability for the project to survive while offering lower rents and closing the gap between what people can afford and what developers must charge. LIHTCs can be used for single and multi-family housing; for construction or rehabilitation; special needs housing for the elderly or the disabled; and permanent, supportive housing for homeless families and individuals (LIHTC Program). Therefore, the LIHTC is perfectly suited for multi-family housing that is a rehabilitation project for the benefit of formerly homeless families and individuals.

Priority to receive LIHTCs are given to those projects that produce affordable housing units for low, and very low-income persons; projects that convert city owned land or buildings that are difficult to develop; that create permanent housing for special populations such as homeless families with children, homeless individuals, the homeless mentally ill, and other homeless groups; and projects that meet Enterprise Green Communities' Criteria and benchmark requirements[10](QAP). There are two levels of LIHTCs: 4 percent and 9 percent. 4 percent tax credits are usually applied to on a rolling basis while the 9 percent credits are competitive. Developers must adhere to two levels of unit set-aside options: they can set aside 20 percent of the units catering to people making below 50 percent of the Area Median Income (AMI), or they can set aside at least 40 percent of units catering to those making below 60 percent of the AMI (NLIHC). Increasing units for low-incomes can lead to more tax credits but the aforementioned are the standard minimums (NLIHC). Buildings can also combine the 4 and 9 percent tax credits, the 4 percent tax credits can be used for the acquisition of building(s) for substantial rehab[11], for new construction projects or substantial rehab projects subsidized with other federal funds, and for projects financed with tax exempt bonds (NLIHC). The 9 percent credits can then be used to renovate the buildings, but the catch is that the 9 percent credits are only available to those projects that are not receiving any other federal funds (NLIHC).

The amount of tax credits a project can receive, and therefore the amount of equity it can attract from investors, is dependent upon the project's eligible basis which considers the

[10] All projects receiving LIHTCs must comply with EGC criteria, but that does not mean there is no opportunity or incentive to go above and beyond these criteria.
[11] The cost of rehabilitation must average at $3,000 per unit

project's costs and the amount, if any, of federal funds the project will receive. The eligible basis is lowered by the amount of federal funds received and does not factor in the cost of land acquisition and permanent financing (NLIHC). Participating in the LIHTC program also requires a compliance period of 15 years with an extended use period of another 15 years. Some states require even longer compliance periods. In states that do not require longer compliance periods, at the 14- year mark, owners can request to either sell their building or convert it to market rate housing (NLIHC). If the HFA cannot find a buyer willing to purchase the building and keep it in compliance as low-income housing for the rest of the 30-year period, the owner can convert their units to market rate housing, and current tenants receive enhanced vouchers which enable them to stay in their apartments for an additional 3 years (NLHIC), but in the meantime, they should start thinking about their next move.

There are various programs available to developers of low and mixed-income housing to apply for aside from the LIHTC Program. There is the 501 (c)(3) Bond Financing Program which offers financing to not-for-profit organizations; there is the 421-A program, renamed the "Affordable New York Housing Program" which offers multifamily developers tax breaks to build mixed income housing; the 420-C program is considered the best option for mixed-income properties, especially those that target low-income housing (BisNow). A project's funds can also be eligible for a 30 percent increase for being located in an area that HPD has designated as being in need of Urban Renewal (Tax Incentive Programs). These programs have their own requirements including whether the developer is a non-profit or at least partnered with one. There is also the HOME Investment Partnerships Program which is the largest federal block grant to state and local governments, and is designed exclusively to

fund the building, buying, and/or rehabilitation of affordable housing for low-income households. Tax benefits also exist for developers to add solar panels and green roofs to their buildings.

Reducing Costs After Construction. Aside from financing that can be acquired pre-construction, financial benefits also exist for the lifelong maintenance and operation of the resulting property. It is important to explain here that in order to provide apartments and housing at below market rates, tax credits, discussed above, are needed both for equity for a building as well as to reduce the debt load on the buildings after its construction. This reduction in debt load is important for repaying outstanding debts faster and therefore for less. Reducing the building's debt means increasing its gross profits. Following this line of reasoning, it is worth it to adopt sustainability in order to see its usefulness in further reducing debt load.

Although many of the programs used for new construction also support rehabilitated projects as well, I want to advocate for a preference for rehabilitation from a financial standpoint. This is because construction is considered by lenders as inherently risky, borrowers (developers, owners, etc.) can expect to pay higher interest rates during the construction phase than during the permanent phase (Cooper). On the other hand, because there is less construction risk associated with a rehabilitation project, the borrower can expect to see consistency in interest rates throughout the rehab and permanent phases (Cooper).

Effective property management is the next level that presents the greatest opportunities for continued sustainability and savings. These opportunities and savings result from both the technologies implemented in the building's design and suggested by the EGC

checklist, one of the biggest ones being technologies that allow property managers to monitor the tenants use of utilities such as water, electricity, and heating/cooling. After construction, it is important to get acquainted with benefits offered by utility companies as they are the main sources for savings at that point.

Overall, providing affordable housing is not cheap, and building affordable housing sustainably adds to upfront costs. However, building reuse reduces acquisition costs at the outset and sustainable strategies and technologies provide savings later on throughout the building's life. The LIHTC is the biggest means of financing affordable housing but developers should also make use of additional tax benefits for other aspects of their projects such as being or partnering with a non-profit organization, including solar panels or green roofs, providing social services, and including higher amounts of low-income units. After construction, property managers should look to utility companies as well as educate their residents in order to benefit from additional savings.

Chapter 4: Building Reuse and Preservation for Affordable Housing

The purpose of this chapter is to posit that building reuse and historic preservation can be methods that make providing affordable housing more possible, and to explore methods that can be employed to reduce costs associated with providing sustainable affordable housing. For the most part, the two are looked at as separate entities: as sustainable housing on the one hand and affordable housing on the other. The Department of Housing Preservation and Development (HPD) requires projects receiving LIHTCs (read: affordable housing) to comply with the Enterprise Green Communities Checklist. This requirement is the basis for marrying sustainability with affordable housing. The fact that affordable

housing is actually expensive to build, coupled with the research in favor of both the sustainability and financial savings associated with rehabs over new construction is what led to the preference of the former over the later. In addition to tax credits, and the decision to do a rehabilitation project, it is important to explore the possibilities for additional savings through the incorporation of sustainable strategies and technologies. Aside from the physical sustainability of a building, it is equally important to pay attention to the way in which a housing project affects the social and economic sustainability of its residents and the area in which it is located.

Case Study and Conceptualization. Norwood Terrace, in the Bronx, was developed by B&B Urban and is an affordable housing development that provides on-site supportive services to residents who are living with mental illness. It is an 8 story, 90,000 square foot building that includes 115 apartments, 58 of which are studios that house the aforementioned residents receiving supportive services and 56 apartments catering to households earning below 60% of the AMI (B&B). The building features energy efficient appliances, a community room, computer lab, children's library, exercise room, laundry room, rooftop garden, recreation space in the rear yard, and a large rooftop photovoltaic solar installation (B&B). It is located about 3 blocks away from the 2 and 5 trains, across the street from the Bx41 as well as in close proximity to the Bx28, 30, 38, and 39. The site is also around the corner from the Metro North station at Williams Bridge. The project as a whole is in compliance with the New York State Energy Research and Development Authority (NYSERDA) and Enterprise Green Communities programs while the site achieved the

highest rated track 1 clean-up status, which is notable since it was formerly an old gas station.

Norwood Terrace was built using LIHTCs as well as received solar tax credits in the amount of $125,000 which helped to cover 35% of the initial $359,000 it cost to install the photovoltaic system (Pinillos)[12]. In addition, B&B was able to include the cost of the solar panels in determining the eligible basis for the LIHTCs for the project, although receiving the solar credit led to a reduction in the amount of the basis by one half the amount of the solar tax credit (Bell)[13]. NYSERDA provides additional grants that can help to further reduce the installation costs of solar electrical systems, they also give out incentives like the New York Sun Initiative, through utility companies such as Con-Edison (Pinillos). The total cost of the project was a little over 5.5 million dollars. This includes an acquisition cost of close to 3 million with the costs associated with the implementation and installation of environmental technologies and services totaling some $560,000 which makes up only about 10% of the total cost of the project.

In theory, thinking of Norwood as a rehabilitation project it is hard to say how much money could have been saved. The average price per square foot in the Bronx in 2015[14] was

[12] Heli Pinillos is a project manager responsible for overseeing the development of all B&B projects from inception to completion. His experience includes residential and commercial real estate development, and partnering with non-profits, financial institutions and government. Heli holds a Bachelor's degree in Architecture from New Jersey Institute of Technology and Master's degree in Real Estate Development from New York University.

[13] Alan Bell is a founding principal of The Hudson Companies, Inc., one of New York's leading affordable and market rate housing development companies. He has built over 6,600 units of new housing in 50 separate developments, including approximately 2,500 units of affordable housing, over a career in real estate that spans almost 30 years. Alan Bell has also been in the forefront of building for energy efficiency, especially in the use of photovoltaic solar panels.

[14] The project was completed in the summer of 2016

$30 (CBCNY), so for a 90,000-square foot property that would price out to $2.7 million—not much savings from the original $3 million acquisition costs. According to Alan Bell, rehab projects are rarely opportunities for savings unless it is a moderate rehab limiting renovations to small tasks like renovating the bathroom and small miscellaneous repairs, gut renovations are hardly cheaper than new construction. However, rehabilitations still do represent an opportunity for sustainability through a cut down on the use and transportation of materials as well as mitigation of negative environmental impacts associated with new construction.

Norwood as a rehabilitation project, could have had the opportunity to receive more LIHTCs by increasing the eligible basis through acquisition and renovation costs as "the eligible basis is the cost of new construction, acquisition of existing property, and the costs of any improvements to that property" (NovoCo, 2017). Construction, mechanicals, and structure are considered to be the costliest part of development (Pinillos & Bell). Structure includes: foundation, walls and floors, roof, stairs, elevator shaft, etc. (Bell). The prevailing view is that with a rehabilitation project all of these features are already in existence however, caution lies in how much repairs these structures need as some buildings are just in better, or worse, conditions than others. Assuming the preexisting building had pretty good bones there could have been a potential to see a reduction in structure associated costs. The extent to which a preexisting building needs to be repaired is what contributes to the uncertainty associated with the cost of a rehab project.

Norwood Terrace has already incorporated solar panels, a rooftop garden, and energy efficient appliances in units such as the stoves, refrigerators, and air conditioners. When the

main concern of the building is energy efficiency these strategies are important, systems that are put in place to monitor the usage of utilities such as water and electricity are critical. When it comes to monitoring these systems supers and property managers must be diligent. Technologies such as water meters that are placed on sinks and toilets to detect abnormalities such as leaks can be very useful in keeping utility costs low, although there is not much research on how much money this saves in the long run (Bell). For tenants who do not pay their utility bills, this information is irrelevant to them, however the property manager can use such data to incentivize residents to use less and even educate them on how much resources their household uses. Activities such as this can help residents in the event that they do have to pay for utilities in the future, or in the event that they are fortunate enough to move into their own homes one day-- being made aware of resource use is an invaluable skill, especially with the direction society is presently moving in. In addition, since a utility allowance is included in the rents not only for affordable housing but for some other rental housing as well, reductions in utility bills allow for excess cash to be allocated in the gross profits of a building.

So far this year, Norwood terrace has saved 561 trees, 2,954 barrels of oil, and 56, 269 pounds of carbon (B&B, 2017). Since the Photovoltaic panels were powered on in June of 2017, the system has saved the project $8,842.25 in electricity costs (B&B, 2017). In addition, as a Bright Power customer, Norwood Terrace has the option to generate power, and sell the excess which over the life span of the buildings could be a real opportunity to use sustainability to generate excess income that, in conjunction with added measures to reduce

utility use and waste, can be allocated to such things as capital improvements, investment in added or improved social services, and/or community engagement activities.

Another example of an opportunity to reduce operating costs is collaboration with utility companies who have their own incentives and programs for lower resource use. Con Edison advertised using Wi-Fi enabled air conditioners. This A/C would allow residents to control their air conditioner from an app on their phones. They could turn it on some time before they come home to avoid running it all day, they could also turn the unit off in the event tenants forget to power off the A/C when they leave the house. As for the building as a whole, the property manager could take advantage of off-peak benefits. They could program the air to cool the building during off peak hours when residents are not running in and out—allowing the building's envelope to remain relatively secured (which is important for building reuse as the building may never be as air tight as it should be) while the building cools.

It would be useful for a building to have a revolving door as its main method of movement into and out of the building. Revolving doors are energy efficient as they reduce or eliminate drafts, reducing the amount of energy needed to heat or cool the building. In addition, there are opportunities to use revolving doors to harness "wasted human energy" and use it for power generation. A 2006 study by MIT students found that having everyone use revolving doors on a campus building would save about 1.5 percent of the total energy needed to cool and heat the building annually (Slate, 2008). Although the savings would be minimal, it is an added benefit, a fun innovation with major potential, and is better than nothing. This could also increase the points possible for EGC criteria by increasing on site

energy generation. Note that these measures would be in addition to a building that has already been rehabilitated to be well insulated and optimized the use of passive and active heating and cooling strategies. Also, all common areas except for areas meant for 24-hour use (such as the lobby), or areas that would be dangerous to residents in the absence of light should be equipped with motion sensor lighting and lights that turn off automatically as well.

The Possibilities of Building Reuse and Historic Preservation. Structures age, outgrow their original functions, and eventually need to be updated. According to LEED, the intent of building reuse is to "extend the life cycle of buildings and conserve resources, reduce waste, and reduce environmental harm from materials manufacturing and transport for new buildings" (LEED). In addition to that, Adaptive Reuse is a process of retrofitting old buildings for new uses (Clark)[15].

Building Reuse allows structures, and by extension, neighborhoods to preserve their historic identities and aesthetics while adapting to the present needs of the community. One of the advantages of building reuse is the savings associated with materials and the reduction in negative environmental impacts. Reuse also allows developers to avoid costs associated with the demolition and reconstruction phases of development (Clark). This represents a reduction in the embodied energy[16] of the structure compared to that of a novel building as well as reduces negative environmental impacts associated with new construction. Approximately 85 percent of the total embodied energy in materials is used in their

[15] Dave Clark is a project manager at the Baltimore Office of Structural Preservation Systems, a structural repair, masonry, and concrete restoration provider to name a few trades. He is also the Vice President of the Association for Preservation Technology's Washington, D.C. chapter (Buildings).
[16] The energy consumed by all of the processes associated with the production of a building from the processing of natural resources for materials to product delivery.

production and transportation (Elsorady). Building reuse also has a positive impact on the social welfare of an area as older buildings add a character and have aesthetic features that we cannot afford to build anymore (Clark). We especially cannot afford these expensive features in New York City where rents are already too high or with affordable housing where the same problem exists. Building reuse for affordable housing allows low-income residents to live in a building that is historically charming, aesthetically pleasing, and structurally different from the monotone design of many affordable housing projects.

In addition to the aforementioned benefits of building reuse, there is the fact that acquisition is often less expensive, and most if not all connections to necessary utility infrastructures already exist-- save for the fact they might need light modernization (Clark, 2008). There is a possibility of receiving Federal Historic Rehabilitation Tax Credits for building reuse so long as the project is historical in nature (Clark,) and a project can also get New York State Historic Tax Credits providing the project is located in New York State. The provisions to be eligible for Federal Historic Rehabilitation Credits are that the property:

1. Must be certified by the National Park Service (NPS) with appropriate fees paid to them as well
2. Must be used for an income producing purpose and finished in a timely manner
3. Owners must follow strict guidelines for rehab which are established by the Secretary of the Interior[17]

[17] The Secretary of the Interior has published Standards for Rehabilitation which are 10 standards pertaining to historic buildings of all types and reference the interior, exterior, and surrounding environment of the structure. Compliance with these standards are mandatory to apply for Federal Tax Credits (Clark, 2008).

It has been suggested that the preservation of older, (built before 1950) "historic" homes represent yet another opportunity for the United States to remedy the housing crisis it is currently facing (Rypkema). According to Donovan Rypkema, an associate at the National Trust for Historic Preservation, only 11 percent of the housing stock in the U.S. suffers from severe to moderate problems[18]. Between the years of 1997 and 2005, rental housing was being developed under the Historic Rehabilitation Tax Act, accounting for the addition of over 44,000 units of housing with over 40 percent of them being rehabbed from warehouses, factories, department stores, office buildings, and previously vacant upper floors of downtown buildings (Rypkema). This strategy allows affordable housing to be incorporated into the city fabric in a variety of neighborhoods, thus adding to the housing stock and the diversity of neighborhoods, without adding to urban sprawl and mitigating the segregation of neighborhoods. Historic buildings also promote diversity as historic districts typically have a wide variety of housing sizes, conditions, ages, quality, and prices (Rypkema).

Older buildings can also have their limitations as they can be unpredictable and may also contain hazardous materials that can be costly to remove. Considering that to a developer, added costs are limitations, building reuse requires the employment of a Building Envelope Specialist who can assess the condition of the building as well as how efficient it is. Although hiring this professional is an additional cost it is detrimental to the overall success of a sustainable retrofit. A Building Envelope Specialist can help the team make

[18] Rypkema does not however in his writing explain what types of housing he is referring to, single family, multi family, etc.

important decisions such as whether to salvage or upgrade such things as the doors, windows, roof, and walls—or completely replace them.

Recent Developments. In New York City, although there are supposedly 541 vacant buildings that are possibilities for affordable housing, their conditions and suitability for sustainable, affordable housing are hazy, so for this framework assume that the 541 buildings are not enough. Currently, in the city there are plans to add mixed-income developments to underused, meaning parking lots and playgrounds, New York City Housing Authority (NYCHA) sites (Warerkar). When it comes to capital repairs and improvements across all NYCHA sites, they are the root causes of many building issues according to Shola Olatoye, the CEO of NYCHA (Warerkar).

The program to include mixed-income developments on NYCHA's underused sites is officially named "NextGen Neighborhoods" but is also referred to as the "50/50 Plan". It is known as the 50/50 plan because the new developments will be structured in a way that includes 50 percent market rate housing and 50 percent affordable housing, 25 percent of which will be set aside for NYCHA residents to apply to (Warerkar). The two new developments that NYCHA is starting with, Holmes Towers in the Upper East Side and Wyckoff Gardens in Brooklyn are expected to provide 350-400 units and 550-650 units, respectively.

Chapter 5: Where Do We Go from Here?

The reason for the mention of monitoring, of innovation, and of effective property management in chapter 4 is to illustrate the importance of best practices, after construction, that could save the building money over its lifetime and reduce the building's carbon

footprint. This is especially important because the truth is that it is very possible that the framework put forth in this thesis is no longer a viable option in NYC. Therefore, strategies that reduce costs by other measures over the long run are the best and only options for stretching the million-dollar price tags associated with providing affordable housing. Investors and developers, as far as NYC is concerned, must be in it for the long haul as quick returns on their investments will require higher prices that the city and its residents cannot afford.

The opportunity to renovate buildings in New York City and turn them into affordable housing is not as prevalent now as it was 30 years ago (Bell). The city has already renovated much of its vacant buildings and of the hundreds that are supposedly left, their condition and suitability for housing is uncertain and it is also possible that those buildings will not be enough to house the thousands of residents who are homeless and rent burdened. Mostly, the building opportunities that are left are in the form of land and underused sites such as gas stations (like Norwood which was a brownfield site). However, this does not mean that this theory cannot be applied to up and coming markets such as those in Chicago, Detroit, Michigan, and parts of New Jersey, to name a few.

Going forward, B&B's Heli Pinillos asserts, and Alan Bell agrees, that there will be a new normal where energy efficiency replaces old building codes and becomes the new standard. Once green becomes the new normal, there will be increasingly more energy efficient standards that will not be an option as they are today, but will be mandatory. As the prevalence, use, and knowledge of green technologies and strategies increase they will become cheaper and more efficient.

In order to make sustainable, affordable housing in NYC more affordable, the city must recognize its current limitations, namely that there are not many buildings left that are suitable for affordable housing without substantial renovation, and if land is increasingly becoming the only option upon which to build affordable housing the government must allow the cost of land somehow be included or considered in the eligible basis of LIHTCs.

In reference to the NextGen Neighborhoods plan, it could represent an amazing opportunity for mobility within the housing market assuming the new mixed-income housing will have at least slightly higher rents[19]. This would allow project residents to move up and out of NYCHA developments adding fluidity to the affordable housing market. Project residents could move up and eventually, hopefully, out while needier citizens could get access to a unit that they can afford. In addition to the NextGen Neighborhoods plan, the city should consider renovating existing projects as well because it would be unfair to all parties involved to place newer mixed-income developments in the midst of dilapidated NYCHA projects.

It is also important to consider how these new developments will affect the surrounding neighborhoods. The city must be careful of creating enclaves of more affluent residents among less fortunate ones, as well as allowing more affluent residents to completely alter the neighborhood in such a way that lower income residents cannot afford amenities such as laundry and grocery shopping.

[19] Currently, residents of Wyckoff Gardens pay between $200-300 a month in rent (Plitt)

It is my hope that this framework can serve as an actual model for promoting sustainability, affordability, and fluidity within New York City's Neighborhoods and reduce negative environmental impacts associated with population growth, poverty, and homelessness.

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