Post-Pandemic Utilization of Office to Residential Adaptive Reuse Strategies in Cities

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ABSTRACT

American cities are facing an epidemic. Affordable housing is nearly impossible to find in desirable cities. This shortage has cost-burdened almost half of American families who spend 30% or more of their gross income on housing. The COVID-19 pandemic has also exacerbated previously grim outlooks for the office market. Cities nationwide are experiencing historic highs in office vacancy rates and catastrophic deficits in net absorption. Adaptive reuse is an innovative, sustainable, and viable solution to this two-pronged problem. It is the process of taking an older or underutilized structure and repurposing that structure for a new or different use. In this present situation, city officials have the ability to work with owners of underutilized office buildings to assist in repurposing these structures into residential units through a number of tools such as tax credits, grants, expedited permitting, trusts, affordable housing incentives, and much more. Adaptive reuse is a multi-dimensional solution to an emerging problem which encapsulates the real-estate market, city dynamics, zoning, housing stock and prices, homelessness, and long-term sustainability of cities. This paper serves as a guide to planners, students, and citizens to elaborately define the problems at hand, explore a successful case study, provide a repeatable and thorough analysis, present feasible tools and policies to enact change, and discuss the challenges of doing so. With this research, planners in large urban areas can assess the need and usefulness of adaptive reuse to help curb the constantly changing problems cities face and the effects of COVID-19 in their communities.

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INTRODUCTION

The COVID-19 pandemic has taken stronghold over the United States for the past nine months. In this time, 'Stay at Home orders' were put in place by state governments for varying amounts of time and restrictions. However, all across the country, a similar trend arose. The immediate transfer to a virtual workspace ensued. Many corporate employers do not have a plan yet for their employees to begin commuting back to the office environment. To couple fears of employee safety, these corporations carry exorbitant downtown office leases that they soon may forgo or downsize. An August 2020 survey by KPMG found that 68% of large company CEOs plan to downsize or cast aside their office space (Egan, 2020). In Washington DC for example, daytime population has dropped from 225,000 in February of 2020 to 22,000 as of July, a 90% decline. 95% of downtown D.C. office workers had been working virtually for over eight months (Clabaugh, 2020). Is the office as we know it, dead? This trend, expedited by COVID-19, may leave these towering downtown office parks relics of the past.

Cities are also experiencing affordable housing shortages in dire quantities. Gentrification and migration trends have inflated housing prices throughout cities, displacing many residents. The National Community Reinvestment Coalition (NCRC) identified 954 neighborhoods with indications of gentrification with concentrations in 20 "intensely gentrifying" metro areas affecting high percentages of low-income people (NCRC, 2020). Washington DC had the highest of these indicators from the period 2000-2012 where some property values rose by over 200% during that time. 179 other neighborhoods were identified as "Opportunity Zones in the process of Gentrifying" (NCRC, 2020). This crisis has affected hundreds of thousands of long time, low-income residents who are being pushed out of their neighborhoods due to exponentially increasing taxes, rents, and housing costs. With the COVID-19 pandemic halting the American economy and leaving citizens out of work, evictions are at an all-time high with millions in the process of eviction, only briefly halted by a summer moratorium, which may end in January of 2021. (Eviction Lab, 2020).

The adaptive reuse mechanism is a catalyst solution of a two-pronged problem: housing unaffordability and office market obsolescence. Adaptive reuse is essentially the process of taking an older or underutilized structure and repurposing that structure for a new or different use. The process can be done through simple re-zoning and cosmetic changes of the building, or complete overhauls and renovations. It has been historically tied to preserving vacant or underused buildings with cultural or historical significance so that they would not become abandoned safety concerns or face demolishment. Today, developers are using adaptive reuse to bag better returns on their property investment by changing the general use of their low-leased buildings, in order to capture (or compromise with) current market conditions and demands. In this particular moment in time, the COVID-19 pandemic has brought forth a crash in the office market demand, leaving landowners with a difficult decision: how can I utilize my building to seize the best returns? The answer is office-to-residential adaptive reuse. This paper will go in-depth to answer this question in detail and sketch out the feasibility of adaptive reuse, hurdles and tools city planners may have in the process, the changes of market dynamics, and the optimality of prospective office buildings for repurposing.

The crossroads of these two emerging issues: the lack of housing and underutilized office spaces, call for innovative solutions. Some cities have been stagnant with how their city should be zoned and operated, a stark contrast to how market forces variably change. Planners have the ability to work with developers and landowners to develop tools and techniques to promote adaptive reuse and increase the affordable

housing stock in their respective cities. But, the flexibility that adaptive reuse is important in a number of other ways. It offers a contingency plan for fluid and dire situations. It can seemingly bring the market to equilibrium through landowners leasing their buildings out to the most in-demand need. And the flexibility of our ever-so-changing reality is the reason why many cities, like Washington DC are revamping their zoning codes to offer flexibility through mixed-use zoning, transit-oriented development, and conditional zoning.

At the end of the day, it is the focal of the city planner's job to create a livable space for all of its residents. Adaptive reuse is a multi-dimensional possible solution to an emerging problem which encapsulates the real-estate market, city dynamics, zoning, housing stock and prices, homelessness, and long-term sustainability of cities. With this research, planners in large urban areas can assess the need and usefulness of adaptive reuse to help curb the constantly changing problems cities face and the effects of COVID-19 in their communities.

BACKGROUND: THE AFFORDABLE HOUSING PROBLEM

Our country is facing a crisis. A crisis that many argue endangers a human right to decent housing. The United States is in the midst of a housing affordability problem, that is cost-burdening more than half of American renters. We as a nation pride ourselves on being the land of opportunity, yet for the last two decades, American cities have been unable to ameliorate the housing shortage problem and there seems to be no immediate solution in sight.

In 1965, the U.S. Department of Housing and Urban Development (HUD) was founded by Lyndon Johnson and his administration as a cabinet-level agency. This agency was part of the "Great Society" to aid in combating domestic issues, but the main goal was to eliminate poverty and racial injustice. HUD was responsible for developing and executing policies and programs for housing and urban poverty (Caves, 2004). However, this dream of Johnson's was short-lived. The Nixon administration put a moratorium on the construction of public housing after a number of failed attempts such as the Pruitt-Igoe complex in St. Louis, which became internationally infamous for its poverty, degradation, and demolishment in the early 1970s (Bristol, 1991). On top of this, the Reagan administration drastically cut HUD's rental assistance program by $240 million in 1985, leaving behind many local housing authorities and renters relying on federal subsidies and aid (Kurt, 1985). This has made homelessness a permanent fixture in American society (Roberts, 2016). All the while, the federal government has consistently subsidized middle- and upper-class homeowners at a disproportionate rate. The chart below from the National Low Income Housing Coalition shows the 2020 spending on housing programs, which displays this unequal spending on the mortgage-interest deduction (MID), a program that allows homeowners to deduct interest payments on their mortgage from their federal taxes (Sisson, Andrews, and Bazeley, 2020).

This brief historical monologue is only a portion of the problem. The fact of the matter is; economic conditions in the United States have become so polarized that affordable housing has become extremely difficult unless it is subsidized by the government or built on depreciated land, usually near environmentally hazardous areas or in rural America far away from amenities (Schu

etz, 2019). There are a number of factors that have influenced this over the years. The first is that there is an affordable housing shortage. There are multiple reasons for this, including restrictive zoning, the increased cost of land in many cities, and the rising costs of labor and materials. This is discussed more in-depth in the *Lack of Housing Supply* section of this paper. There are also a number of factors and trends that keep housing prices inflated such as migration trends of middle- and upper-class Americans, increased permitting delays and cost, insufficient permits issued to meet the demand, the "not in my backyard" (NIMBYism) problem, and the wage-to-home price gap steadily rising. These factors are discussed more thoroughly in the following sections: *Rising Housing Prices in Urban Cities* and *Factors and Trends*.

Rising Housing Prices in Urban Cities

To first explore the depth of the housing shortage and gentrification of major cities, it is vital to examine the history, statistics, and repercussions of rising housing prices in urban areas. The Department of Housing and Urban Development released a report in 2018 on the "Displacement of Lower-Income Families in Urban Areas". This reports looks at gentrification trends, geographical statistics, outcomes

for new and existing residents, and the underlying causes of gentrification. Gentrification has been one of the biggest issue for the booming urban areas. Gentrification is defined as the process of neighborhood change that results in the disruption and replacement of lower income residents with higher incomes ones creating a social and cultural shift of the neighborhood (Bunten, 2019).

The chart (below, right) signifies the drastically increasing rents of low-income city tracts in urban areas (HUD, 2020). It hasn't necessarily been the overall surge in population growth in urban areas that has created this problem, but rather the compositional shift of younger, college-educated residents with higher salaries and more disposable income. However, it is important to recognize that gentrification is not occurring across the country. Instead, it tends to happen in cities with rigid housing markets in a select number of neighborhoods (Kennedy & Leonard, 2010).

Gentrification has been identified occur for four basic reasons: (I) the nation's economy generates great demand for labor and housing at the regional level; (II) public funding mechanisms (federal, state, city, and non-profit organizations) have the motivation, resources, specific policies,

Share of Low-Income City Tracts in U.S. Metropolitan Areas Seeing Large Gains in Rents Relative to Metropolitan Area

Source: Ellen and Ding (2016)

and overall strategies to direct revitalization efforts in targeted areas of American cities; (III) public officials seek to reduce areas of concentrated poverty by attracting higher income families into high-poverty neighborhoods, or by assisting in the movement of poor residents to move to other portions of the metropolis where poverty is less concentrated; and (IV) public redevelopment creating the impetus for private investments of preferred amenities that attract higher-income persons (HUD, 2020). Through basic economics, it is easy understand that when housing demand outpaces supply, the price of said housing will increase. Neighborhoods near the urban core were largely disinvested in the mid-20th century due to implications of white flight, diminishing property tax revenue, and institutional racism. Now that these areas are being sought after again, those who built their livelihood in these neighborhoods are being priced out.

The prices in these desirable urban cities are exponentially rising. Median home values, adjusted for inflation have nearly quadrupled over the 60-year period since the first housing census of 1940. Harvard economists found that Boston had median home prices increase 153% between 1980 and 2000 (Glaeser, Gyourko, & Saks, 2004). In Washington DC, for example, the average year-end sales price has increased 275% from 2000 to 2013, while the United States as a whole has increased only 53% (Urban Institute, 2016). Already, 34% of households are cost burdened, meaning they spend over 30% of their gross income on housing. This percentage increases to 41% in the 10-biggest metropolitan areas (Urban Institute, 2016). In order to provide citizens with an inclusive and desirable residence, city officials must tackle the housing shortage and unaffordability problems that plague their cities.
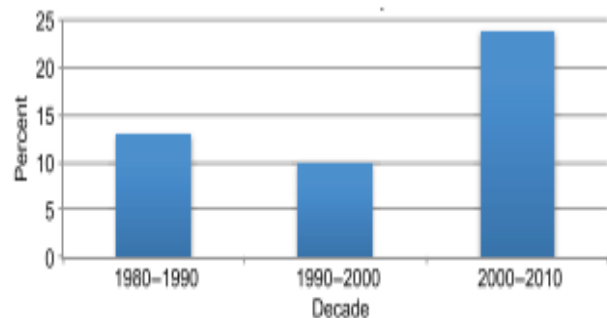
Lack of Affordable Housing Supply

Affordable housing is defined as housing available to families with a median household income at or below the national or local housing affordability index (HAI) (Bhatta, 2010). This index developed by the Massachusetts Institute of Technology (MIT), captures the total cost of ownership by individual choices, which varies greatly depending on the area or region in which the index is applied (MIT, n.d.). For example, the HAI in San Francisco has a much higher median household income than rural North Carolina. Using this measurement and others produced by the World Bank (i.e. the median multiple), there is not enough affordable housing in the United States. According to the National Low Income Housing Coalition, there is a shortage of 7.2 million affordable housing units, which has left more than 500,000 Americans homeless and 75% of extremely low income families paying more than half of their income on rent (NLIHC, 2020). From HUD and American Community Survey Data collected by the Urban Institute, for every 100 extremely low-income households (families whose income does not exceed 30% of the region's median family income), there are only 29 adequate, affordable, and available rental units (Urban Institute, 2020). There is a large gap between the cost of building and maintaining affordable housing and the rents that most families below the MAI can pay.

In an overarching view, home prices are rising faster than wages. An ATTOM Data report found that this notion is true in 80% of U.S. markets. Home prices are increasing at an average rate of 6.7% annually and rental rates are increasing at 3.5%, while actual year-over-year nominal wages are only increasing 3% according to the Economic Policy Institute's Nominal Wage Tracker (Lloyd, 2019) (EPI, 2020). The growth target by the Federal Reserve is 3.5-4%, a 0.5-1% annual gap, signifying how far the U.S. economy is from a full recovery since the Great Recession. This gap also can be blamed for the affordable housing crisis.

Another issue that keeps affordable housing unable to be constructed at the demand necessary is the cost of constructing these units. The producer price index of construction materials has risen by 24% since 2009 and lumber, which accounts to up to 10% of the total building cost, has fluctuated wildly in the same period (Sisson, Andrews, and Bazeley, 2020). The chart *below* visualizes the producer price index increase, which peaked in the fall of 2018.

Figure 2: Ten-year Time-Series for Cost of Construction Materials

The cost of construction materials

The producer price index has risen by 24 percent since 2009

Source: U.S. Bureau of Labor Statistics

This is only getting worse. The Associated General Contractors of America (AGCA) say that the threat of new tariffs has already led to dramatic increases in the cost of construction materials. From May of 2017 to 2018, the producer price index jumped by 17.3% for aluminum mill shapes, 13.9% for lumber and plywood, 13.8% for copper and brass mill shapes and 10.5% for steel mill products (AGCA, 2018). The cost of land is also increasing in the areas that affordable housing is needed the most. Increases in the gross amount of people and demand in urban areas have risen the price of land dramatically making it extremely difficult for developers to provide affordable housing that offsets the costs of construction. Most importantly though, is the availability of labor. The National Association of Home Builders (NAHB) conducted a 2018 survey signaling that 85% of the organization's members believe the cost and availability of labor is their biggest issue, leading to competitive bidding for trade specialists like carpenters, electricians, plumbers, and masons (NAHB, 2020). The NAHB also found that 55.6% of the final sales price goes to construction costs, 21.5% to finished lot costs, and 10.7% to builder profit (Makridis, 2019). With the majority of the reflected housing price coming from construction costs, it is an extremely onerous task to keep housing prices down.

Restrictive zoning is another reason for the shortfall. Historic zoning policies divided cities into zoning districts with specific permitted uses. In nearly all cities, single-family zoning makes up the majority of these zoning districts, inhibiting density and sufficient housing supply. For example, residential zoned land is 75% detached single-family in Los Angeles, 77% in Portland, 81% in Seattle, and 84% in Charlotte (Badger and Bui, 2019). America, embodied by the dream of a nice house with a yard, had become the norm in most cities and was further embraced and enforced by local governments through zoning codes. However, amid the mounting crisis of housing affordability and racial justice, a needed reckoning of single-family zoning is taking place. In December of 2019, Minneapolis City Council voted to end single-family zoning citywide. Similar trends are being ventured by Oregon, which would end zoning exclusively for single-family homes statewide (Monahan, 2018). However, this is not a vision shared by all. Major backlash from single-family households has taken place in these cities and states fearing that this overhaul in zoning would destroy the integrity of their neighborhoods (Kahlenburg, 2019). Simply put, Minneapolis defeated NIMBYism. In order to achieve this abolition of single-family zoning, city officials must overcome the refutes of its citizens who prefer the status quo.

This section has outlined in detail many (*but not all*) the reasons that America is facing a housing unaffordability epidemic. So, what are local and federal governments doing to subsidize and assist in the building of this type of housing? The short answer is, not nearly enough. First, local governments need to enact zoning reform. Since it is illegal to build multi-family style housing units in three-quarters of land in U.S. cities, city officials must first rectify this. And even in areas where multi-family housing is permitted, there are restrictive zoning rules such as building height caps, minimum lot sizes, and exorbitant parking requirements. Second is adjusting land value taxes. Unlike property taxes, taxes that charge a higher tax rate on land and a lower rate on structure encourage owners of expensive land to build more intensely. Also, assessing taxes on the increased land values not only incentivizes more development quickly on expensive land, but also allows for cities to benefit from the returns of the additional land value (Schuetz, 2020). Since land is most expensive in city centers and areas in the most need of affordable housing, land value taxes change the financial incentives for owners of land with low-density structures. Lastly, there is a need for more housing subsidies. These subsidies currently include housing, rental, developer, non-profit housing, public housing, and rental supplements (i.e. Section 8 housing). Current increases in HUD's budget has not rectified the long history of slashing HUD's budget,

which began in the late 1970s when the budget stood at $83 billion. In FY21, HUD's budget is a mere $47.9 billion, $8 billion less than the previous year (HUD, 2020). Federal housing subsidies are also not entitled, as one-fifth of eligible renter households currently receive federal assistance (Schuetz, 2020).

This leaves city officials with the task of providing sufficient affordable housing for its lower-income residents. With a finite amount of land, and the vast majority of that land owned by private owners, innovative techniques to promote housing production and affordability is in dire need. Adaptive reuse of office buildings into residential conversions is one of those innovative techniques that can leverage private owners, who are seeking profits from their underutilized office buildings that have become vacant due to the pandemic and termination of corporate leases. This mechanism supports sustainability of the current city landscape, preserves historical buildings at risk of abandonment, and can increase the housing stock and housing affordability. Some of the ways city officials can incentivize this sustainable behavior is discussed in-depth throughout the rest of this paper, but more explicitly in the *Planner's Toolbox for Adaptive Reuse* section.

Factors and Trends

Building homes for families to reside in seems like a rather simple theory of supply and demand. Families in need of a house, a basic necessity, will pay or be assisted to have a house built and the builders will gladly accept the payment. However, it has proven much more complex than that. The fact of the matter is that the construction industry has not fully recovered since the Great Recession. The economy has added 8.2 million since 2008, but construction and manufacturing jobs have continued to lag. In July of 2017, there were roughly two million fewer workers in construction and manufacturing than ten years' prior at the start of the Great Recession (Scott, 2017). With more and more American teens and young adults choosing a college degree over trade school, the market for laborers and trade specialists is further dwindling. The efforts to intensify deportation and curtail immigration has curbed the construction industry's growth, as immigrants comprise of 25% of the sector's workforce (Short, 2018).

There has also been a drastic change in demographics of many urban cities. Many of the arising preferences for young, college-educated professionals is living in a walkable and/or bike-able environment. This essentially translates to residing in a densely-populated urban area. This changing demographic is also a reason for the inflating prices in a less direct way. Millennials residing in these cities are often single or have double income, no kids (referred to as DINKs by many). This leaves the residents of the city with more income to spend on luxurious housing, in turn, incentivizing developers to build accordingly. It also decreases the density of these cities as more single people occupy housing units, creating a larger demand for housing in a rather stagnant supply, further inflating prices (Singzinski, 2016).

Another cause is the city's permitting process. With more regulations in place, city planners are understaffed to grant construction permits. This creates added cost and time delays to building, which artificially increases the cost of building housing units and decreases housing production. *Figure 2* below shows the annual building permits issued in Washington DC. Since 2006, DC has not been able to permit sufficient building permits to meet demand (Urban Institute, 2016).

Figure 3: DC Housing Permits Issued from 2000 to 2014

DC Region Must Ramp Up Housing Production to Meet Future Demand

Annual building permits issued, DC metropolitan statistical area, and projected annual future need
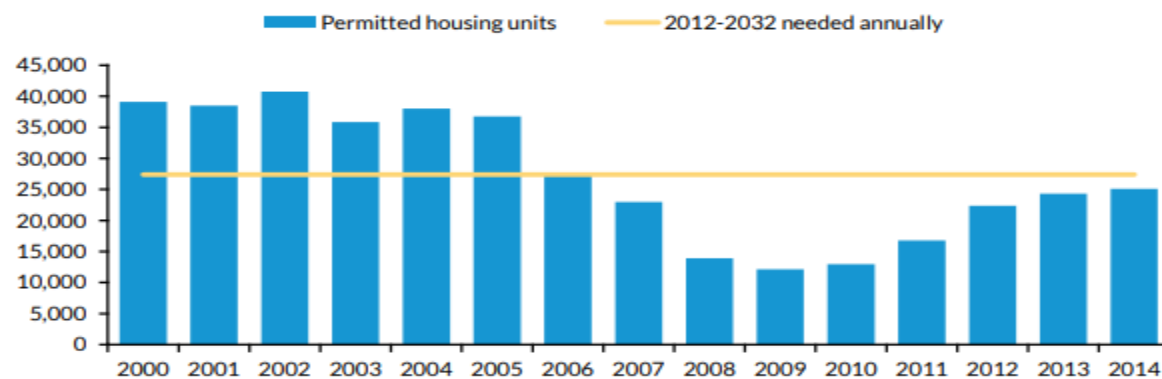
Sources: US Census Annual Permits by Metropolitan Area, DC Office of Planning; Sturtevant and Chapman (2013).

COVID-19 has only exacerbated the building process. Before the pandemic, residential building was robust in North Carolina, trending upwards with the overall economy. Since March of 2020, new building has dropped drastically, suggesting a lack of confidence in the housing market due to fears of impending recession (Sleeman, 2020). Multi-family building permits have decreased from 2019 to 2020, however, there has been a greater demand for larger single-family units. This is another repercussion of the pandemic, as more people are substituting their small city apartments for suburban homes with more space to live and work in.

The increase in frequency and severity of natural hazards is another factor that diverts home builders to rebuild homes devastated by disasters. Rather than creating new homes for residents, the finite workforce of construction workers is redirected to the aftermath of disasters for families in grave need. In the spring of 2019, over 250,000 construction jobs remained unfilled across the country (Walker, 2018). Economic losses from disasters totaled almost $400 billion in 2017, the costliest year by far consisting of 16 separate billion-dollar disaster events including: three tropical cyclones, eight severe storms, two inland floods, a crop freeze, drought and wildfire (Smith, 2018). With climate change and severe disasters becoming regular events, this trend will only get worse. These factors and trends only further signify the need for intervention and an influx of construction workers to provide housing for an ever-growing population.

BACKGROUND: OFFICE MARKET OBSELESENCE

The conventional office made its way into cities during the late 19th century and for about a century, office zones--characterized by an ubiquity of tall buildings filled with swivel chairs and underground parking garages, have dominated city centers. As corporate giants emerged, staff was needed to hold face-to-face meetings, circulate memos, store and log paperwork, and meet with clientele. All of this required the staff in close proximity, accommodating workers by hosting the workspace in a central office space. However, this system always had obvious drawbacks which have worsened in last past decade, especially in terms of commute time, overcrowding, and exorbitant office rental space. The normalization of the two-working parents have created a growing issue in terms of finding child care. Social distancing and sterilization of the office space has created uncertainty with respect to the feasibility of having staff in a centralized location.

The battle of the future of the common workplace has just begun. With a majority of white collar workers still working remotely during the pandemic, the elephant in the room is the question of permanence. Will I ever go back to the office? Will my company downsize its office space or do away with it completely? A recent RAND report found that 40% of respondents to a recent survey indicated they are working from home (Ward, 2020). Around the globe, corporations are testing the hypothesis: are offices obsolete? While 84% of the French office workers are back at their desks, only 40% of British staff have returned to their offices (Economist, 2020). Head of Twitter Jack Dorsey stated that staff could telework forever, meanwhile Reed Hastings of Netflix discerned working from home is a "pure-negative". In the years before COVID-19, only 3% of Americans worked from home regularly, but during pandemic the majority of the white-collar workforce has experienced it. Preliminary results show that telework can be productive and many people prefer doing it there. So much so that workers were willing to accept an 8% pay cut to work from home according to a 2017 paper published by the *American Economic Review* (Economist, 2020). Productivity also stems from worker happiness. A 2004 study by Daniel Kahneman of Princeton University assessed that commuting was among the least enjoyable activities people did routinely.

The state of the office is teleworking for the present, but what will happen after an effective vaccine is administered? The best predictive comparison we can make is from countries where the virus is under control. According to Morgan Stanley, 74% of German workers now go to their place of work, but only half of them are there all five days of the work week (Economist, 2020). Many positions have been made permanently remote and others give the worker the option and ability to stagger their office schedules. With the ability of an optional presence and some being flexed to entirely remote, office demand may shrink even more because corporations weigh the costs and benefits of a large office space. These corporations may then choose to either downsize or liquidate their office presence entirely. The COVID-19 pandemic has revealed how many offices are simply 20th century relics, as companies adopt technology that completely transforms white-collar work.

There have also been many studies conducted on the productivity of teleworking – a recurring inhibitor expressed by most CEOs on the transition to fully remote. A 2015 study by Nicholas Bloom of Stanford University looked at Chinese call centers. They found that those who worked from home were more productive and processed more calls than their office counterparts (Economist, 2020). During the mandatory telework experiment, sick days for employees have plummeted. There has also been more

productivity due to working longer hours and workers were more likely to send and respond to emails after normal work hours.

While it is true that some companies may be more resistant to the telework transition than others, the majority of white-collar companies have already made the capital expenditure to provide their employees with work-from-home equipment. They have also experienced a trial run that has largely seen success without productivity loss. With companies needing less in-person office space to operate, and the culture of remote work becoming more prevalent and accepted as the new norm, the office and its real estate market may begin to topple from their days of glory.

History and Nuances of the Office Market

The office has historically been a steadfast example of routine and conventionality, but it is quickly devolving into a source of economic uncertainty. The $30 trillion global commercial property market is haunted by a deeper downturn. With the average lease length lasting a half of a decade, the repercussions of the COVID-19 pandemic for the office market may have yet to hit rock bottom. The sublease market – a key barometer for the office market – is now larger than during the dot-com bubble and could feasibly reach 150 million square feet of availability by the end of 2020 (Economist, 2020).

Absorption may be an even better indicator of how bleak the outlook for the office market is. It is the way commercial real estate investors gauge tenant demand and is measured in square footage. The total absorption is the total new square footage leased by tenants. Building on this, net absorption is the sum of square feet that became occupied minus the sum of square feet that became vacant during the same period. A negative net absorption is particularly worrisome because it exemplifies the lack of demand of the office market signaling that more tenants are leaving their leases than occupying or renewing them. The graph below by JLL research displays that magnitude, as the net absorption was ~-40,000,000 square feet so far in 2020. This is the first time the office market has seen a negative net absorption with the last time coming ten years earlier in 2010 – following the recession of 2008.

Figure 4: Net Absorption of US Office Space in Square Feet (sf)

Net absorption

Source: JLL Research
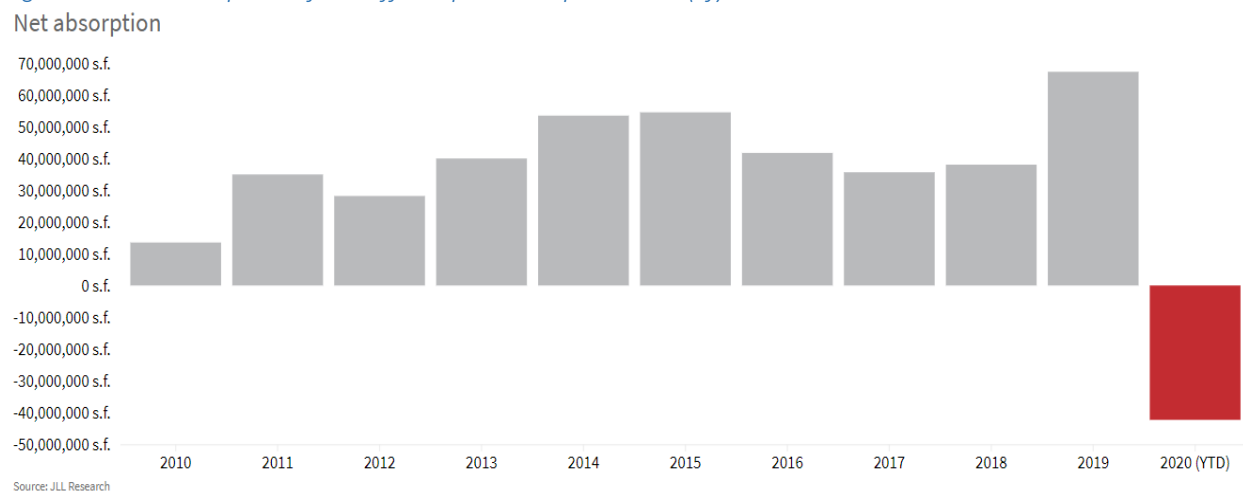
Offices are classified through a number of indicators. The first is class, which varies by market, but is defined and standardized as its quality in relation to its counterparts. In the office market, there are four

classes: A, B, and C. There is not a definitive formula to define office class, however, the general characteristics of class are as follows. Class A represents the top of the line buildings. They are the newest and highest quality buildings in the market featuring the best location, access, management, and construction. Class B is the next notch down. They are generally a little older, but still exhibit good quality, management, location, and access. Class B buildings can be returned to the upper-most Class A through renovations to the façade and common spaces. The lowest classification is Class C, which do not meet the criteria of Class B. These are the older buildings located in less desirable areas and the building technology is often outdated. As a result, Class C buildings have the lowest rental rates, take the longest to lease, and are often targeted for re-development (Golden, 2013). The second indicator is the office star rating created by The CoStar Building Rating System[SM]. This provides a national rating for commercial buildings with 5 being the highest and 1 being the lowest. This building rating system differs slightly from the A, B, and C classifications which are predominately local indicators of quality within a specific market location. Instead the star rating is intended to compare commercial buildings between markets and are nationally consistent (CoStar, n.d.).
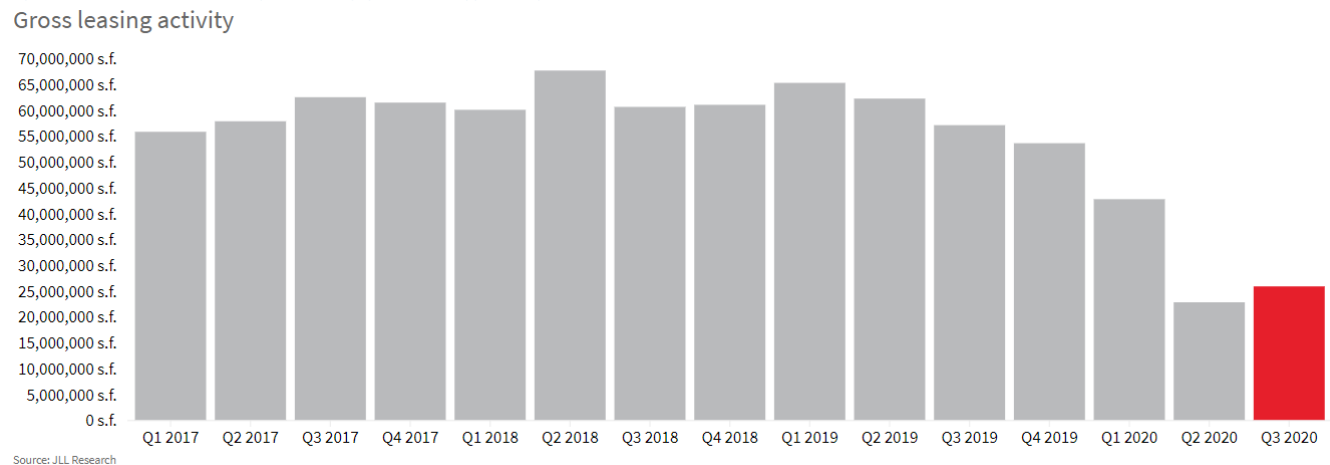
Office Vacancy Rates in Urban Areas

The lockdown has simply accelerated pre-existing trends of work-from-home life due to a mandatory social and workforce experimentation. Before the pandemic, the world may have been in an "imperfect equilibrium" in which home-work was less prevalent than it should have been. An August 17th report from Moody's Analytics stated that the office sector had already been experiencing "downward pressure on the usage intensity of office space before the COVID-19 pandemic" and that US office vacancy rates is projected to hit historic highs in 2021 (Storace, 2020).

In a normal market, three to eight percent is considered 'normal vacancy' (Remøy & Vander Voordt, 2018). All across America, a similar trend is being realized – available office buildings and lease space are growing. In Westchester County, NY, the office vacancy rate is 25.1% in Quarter 3 of 2020. New Jersey saw its vacancy balloon to 24.4%. Texas markets have been hit hard with Houston at 25.1%, Dallas at 22.4%, Fort Worth at 20.7%, and San Antonio at 15.7% vacancy. Washington DC, a city comprised of many consulting and lobbying white-collar companies, is at 17.6% (JLL, 2020).

Some cities are doing better than others though. The equilibrium of telework versus in-office employees is unique to each city, where industries and workplace culture differ. Some white-collar industries may be better suited for telework, while others may not be. Contrary to intuition, tech-giant cities have been less affected in terms of vacancies. Silicon Valley and San Francisco, the home for big-tech, reported 10.6% and 9.6% office vacancies in Q3. Austin, TX is just above at 11.6%. Denver, an emerging tech-industry city sits at 16.1% (JLL, 2020). Seattle, WA has the lowest vacancy rate among the major U.S. office markets at 8.2% (CoyDavidson, 2020).

All of these vacancies in turn leave a huge amount of unleased square footage. Give-backs across markets led to a 28.9-million-square-foot decline in occupancy (the largest single-quarter drop on record) and a subsequent surge in vacancy to 16% (JLL, 2020). Gross leasing activity is down ~20,000,000 square feet nationwide compared to just a few months earlier in Q1 of 2020. The chart *below* displays the drastic dip in gross leasing activity through Q3 of 2020, and is speculated to get worse as the pandemic continues.

Gross leasing activity

Source: JLL Research

Although vacancy rates are historically high in most urban areas across the United States, this is not as much the case in suburban and rural areas. According to data acquired by CoStar, the Washington DC office market is suffering much worse than its suburban counterparts of Virginia and Maryland. Washington's sales volume for 2020 is down almost 59% from 2019, while the suburban office market has seen a 31.1% sales growth from the previous years. Similar findings were had by the Carolina Tracker. Overall, North Carolina's office vacancy has increased 2.9% from September 28, 2019 to the same date of 2019. More concerning is that the net absorption has trended into the high hundred-thousands in 2020, suggesting serious difficulty in finding and retaining office tenants across the state (Planey, 2020). The map below shows the change in office vacancy rates in North Carolina. Although, the office markets in rural and suburban counties of North Carolina are generally volatile due to their size, there is a stark contrast between the urban counties and its rural/suburban counterparts. This may be an indicator that companies are choosing lease affordability as opposed to the high-cost of proximity, a trend that is a possibility to become mainstreamed in the coming years during and after the pandemic.

Figure 6: Year-to-Year Spatial Change in Office Vacancy Rates in North Carolina

Change in office vacancy rates in North Carolina

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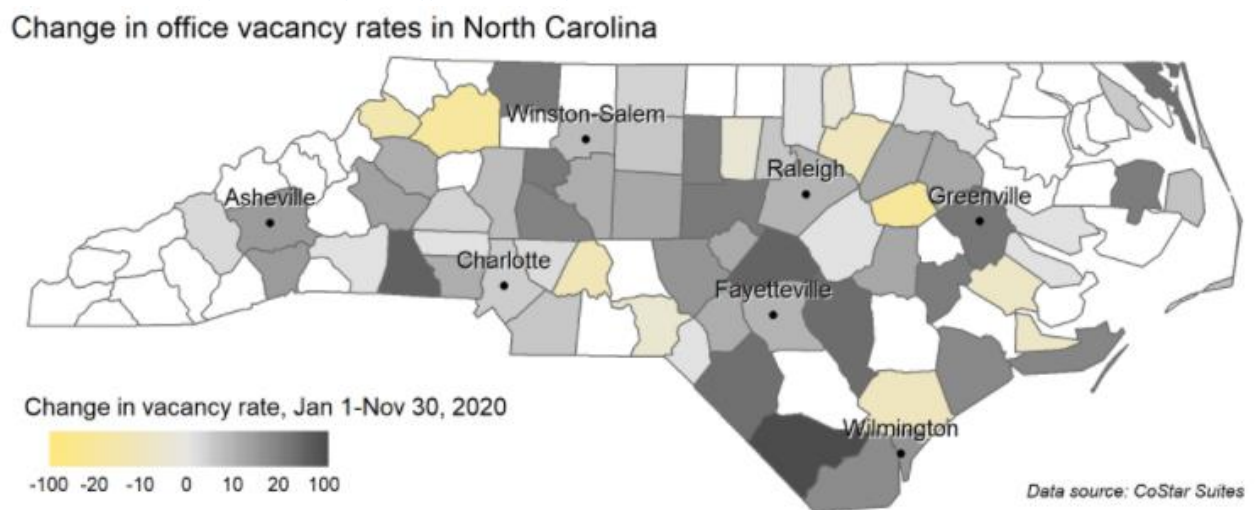
Office Zoning in Cities

In 1926, the historical and landmark case of *Village of Euclid v. Ambler Realty Co.* was held in favor of city planners, who attempted to prevent industrial growth spreading into the residential area of their village of Euclid, Ohio and to separate different types of housing. This decision bolstered zoning ordinances in towns across the nation and validating the government's role in maintaining the character of a neighborhood and regulation of where certain land uses should occur. Following the industrial revolutions and the transition into the information age, many corporations sought optimal locations in downtown cities as a means to lure potential workforce and clientele. This agglomeration of white-collar work in central business districts (CBDs) led to a cultural shift in zoning, which created office and CBD zoning districts located in downtowns of most every American city. This transition has led to the current environment and depiction of large urban environments as large office skyscrapers as the central node of the city.

Often, the CBD is synonymous with the city's financial district or commercial and cultural center. It is usually the central nucleus of the city and the rest expands outward. No two cities are alike, but many resemble this pattern of a CBD, mainly consisting of office and commercial buildings. Smart Growth America, in partnership with George Washington University's Center for Real Estate and Urban Analysis, published a study of why companies are situated downtown. Their reasons included attracting and retaining a talented workforce, building a brand identity and culture, supporting creative collaboration, proximity to customers and business partner, centralization of operations and supporting a triple-bottom line business outcome (Smart Growth America, 2015).

However, smaller companies are starting to realize the costs outweigh the benefits of an expensive downtown lease. Between 1979 and 1999 in the nation's 13 largest metropolitan areas, 74% of the office space was found in central cities. By the turn of the century, the downtown share of office space dropped to 58%, while the suburban share grew to 42%, signaling companies prioritizing lower office lease cost for optimal location (Lang, 2000). With zoning somewhat stagnant for decades, many of these traditional office buildings are becoming obsolete, as companies migrate elsewhere. In 2000, the distribution of urban and suburban office space varied greatly among the largest metropolitan cities. Cities like Houston, Dallas, Chicago, New York, and Denver had the majority of their office space located downtown, while Philadelphia, Atlanta, DC, Miami, and Detroit had the majority of their office share in the suburbs (Lang, 2000).

These shifts in market preferences and the city landscape have been seen before. Cities were manufacturing powerhouses during the industrial revolution. Industrial buildings and warehouses were situated near the downtown core so that the city's workers were in close proximities to their factories. Eventually the industrial revolution subsided and in replacement, the information age arose. This left undesirable buildings emitting pollution into the densely populated center cores of the city. Thus, these buildings were abandoned, and in many rust belt cities, these old warehouses have been converted to beautiful residential lofts and shops.

The urban spatial structure of a city is ever-changing and the policies and zoning should reflect that dynamic environment. All too often, cities in the mid-19th century exhibited rigid Euclidean zoning, which separated zones and uses entirely without much flexibility. These Unified Development Ordinances (UDOs) and zoning practices held in place for a long time, until the last ten years. Since the 2010s, there was been a great upheaval in many large municipalities to revamp their UDOs in order to

provide flexibility, sustainability, pedestrian-friendly areas, reduce traffic, entice development, and stimulate more variety in the design and density of housing (Sustainable Development Code, n.d.). Large cities such as Baltimore, Washington DC, Chicago, Houston, and many more have updated their zoning codes and zoning districts to reflect a similar them of more mixed-use zoning and transit-oriented development. Yet, there are still cities and towns all across America with antiquated, strict, and segregating zoning codes which inhibit the natural market forces and preferences in those cities. As these market preferences and trends change, as they do so frequently, certain uses and building types may become more or less desirable. This is especially true amidst a pandemic and looming recession, where economists and experts are predicting the collapse of small business and the office market (Fitzpatrick, 2020). Complex urban planning rules and zones will need a systematic overhaul to allow these structures and districts to be redeveloped for new uses.

CASE STUDY: LOWER MANHATTAN – PIONEERS OF ADAPTIVE REUSE

Office-to-residential conversions are not necessarily a new invention. In the mid-1990s, Lower Manhattan in New York City was highly successful in an effort to revitalize the region when more than 25% of the area's 100 million square feet (9.3 million sq. m) of space was vacant (Williams, 2016). Lower Manhattan was considered a cultural wasteland consisting of minimal restaurants, bars, and very few residential units. During this time, there was virtually no life in the neighborhoods beyond its 9-5 office workers. Jane Jacobs expressed her discontent of the status of the cities' once vibrant neighborhoods in her writings and fought diligently over the Lower Manhattan Expressway and the preservation of urban living. Jacobs described Lower Manhattan as a "deathlike stillness that settles on the district after 5:30 and all day Saturday and Sunday" (Donovan, 2001). Since then, the area is now among the top neighborhoods for growth since 2000 with abundant rental housing (up 142% from 2000) and the average resident spending $1,000 a month on dining and entertainment (Downtown NY, 2016).

So how did it get there? The answer is a response to a previous decision. The demolition of historic Penn Station in the early 1960s caused New Yorkers to rethink the decisions to destroy buildings, especially those with historical significance. This rethinking transcended into the technique of adaptive reuse conversions and empowered the Landmarks Preservation Commission (LPC) to designate landmarks and historic districts in order to safeguard "buildings and places that represent New York City's cultural, social, economic, political, and architectural history," (Landmarks Preservation Commission, n.d.)

The first of many converted buildings was "Ol' Jeff" in Greenwich Village. It was voted one of the most beautiful buildings in the country in 1880 and was used as a courthouse for police and firemen until it closed in 1958 and stayed abandoned for several years (Schier, 2017). In 1967, shortly after the demolition of Penn Station, architects converted the structure into a library, rallied by a group of community preservationists who feared the building would face the same fate as Penn Station (Dolkart, 2009). The redesign of the building's interior for its new use as Jefferson Market Library was one of the first adaptive reuse projects in the United States. The library was saved from demolition and now boasts its place on the U.S. National Register of Historic Places and National Historic Landmarks list.

Soon, a plethora of historic buildings of all types were being converted into a different use entirely. This innovative technique ameliorated the abandonment issue and provided the city with an amenity that was in demand. NYC architects found the challenge of repurposing old, historic buildings with new uses particularly exciting. A number of mid-19th century churches were converted into residential buildings in the 1990s including Mt. Pleasant Baptist Church and Washington Square Methodist Episcopal Church. An interesting implementation of this newly-formed technique came to fruition in the 1970s when developers bought 240 Centre Street of Lower Manhattan. The building formerly housed the headquarters of the New York City Police Department from 1909 to 1973 before it became abandoned for a number of years. This beautiful building, and NYC landmark was converted into condominiums in the 1980s and is now known as the Police Building Apartments (White & Willensky, 2000). Dozens more of these historic and wonderfully aesthetic buildings became repurposed as residential units as New York City and its elite began to seek uniqueness in these turn-of-the-century buildings. This was especially true in Lower Manhattan, home to the Police Building Apartments, where the penthouse unit was listed for $39.9 million in 2015 (Schier, 2017).

While the beginning of the adaptive reuse phase started as underutilized historic buildings being converted into all different types of uses, the trend soon expanded to underutilized buildings of all

different archypes into condominiums or apartments. A large part was due to the city's adaptive use of regulations and permissions of repurposing inadequate and underutilized buildings. Before the separation of industrial zoning from residential, many industrial buildings and warehouses were built near the city core so that its many workers could be in close proximity, often working 16 + hours per day. Due to market forces and industry changes, land use patterns were also affected. As New York City moved away from the Industrial Revolution and towards the Information age, large industrial buildings and warehouses were left empty in Manhattan and its surrounding Burroughs.

In Lower Manhattan, there were many of these large abandoned warehouses and industrial buildings, as residing there was undesirable in the early to mid-1900s. In 1996, one-fifth of the buildings and warehouses were empty (Cooper, 1996). Dozens of industrial to residential conversions took place in Lower Manhattan, ridding the area of vacant relics and replacing them with lively and uniquely-appealing apartments or condominiums. One of the most remarkable examples of adaptive reuse came in Lower Manhattan's Tribeca West Historic District. A 1924 windowless cold storage building was converted into apartments in 1996. The before and after conversions are pictured below:

Source (right): Landmark Preservation Committee; (left): Google Maps Street View

Once undesirable to reside, Lower Manhattan became an exciting up-and-coming neighborhood in the latter part of the 20th century. LPC Chair Meenakshi Srinivasan stated that "adaptive reuse of these (industrial) building types has transformed entire neighborhoods" (Bindelglass, 2015). The notion of living in a converted space became "trendy" in New York, and soon, New Yorkers began to demand more and more housing in the Lower Manhattan area.

Just as industrial buildings became unnecessary and underutilized in Lower Manhattan in the mid-19th century, so did commercial and office space in the late 19th century. However, there is a significant

difference with commercial buildings, which are well-suited for residential uses. Office buildings often have floor plans and layouts that accommodate light and air and building systems that do not need serious renovation. Srinivasan states that typical changes are trivial compared to industrial and historical public use buildings and usually require changes like "replacing windows, installing HVAC equipment, and installing terrace dividers and setbacks" (Bindelglass, 2015).

Lower Manhattan contained a high percentage of commercial buildings compared to its residential population. The Financial District was a prime example of this, where massive corporate skyscrapers encompassed every block, but few residential buildings were to be found. Jane Jacobs deplored central business districts that exemplified no residential or cultural purposes, noting that Lower Manhattan restaurants were packed at lunch, but didn't offer dinner service (Donovan, 2001). Before long, these large financial and commercial office buildings were being redeveloped for residential uses as well.

In 1995, city officials released the Lower Manhattan Revitalization Plan, which offered incentives to convert underutilized commercial properties to residential use. Five laws comprised of this plan, which included: The Lower Manhattan Real Property Tax Abatement, Commercial Rent Tax Special Reduction, Energy Program, Residential Conversion Program, and Mixed-Use Property Program (Finkelshteyn, 1995). Some of the incentives realized by these laws were abatements and reductions in real property taxes, commercial rent taxes, reduced energy costs, further tax-reductions to conversions of non-residential buildings to residential, and tax exemptions to mixed-use properties containing residential units (Finkelshteyn, 1995). These five laws created unavoidable incentives for landowners and developers to garnish the area with more residential units.

Lower Manhattan continues to see change in its commercial landscape. 70 Pine Street in the Financial District was completed in 1932, and at 932 feet tall, it was the third-largest building at the time. Since 2013, the building has been undergoing a residential conversion (Bindelglass, 2015). This massive conversion follows suit with previous large office buildings like the Liberty Tower (converted into a residential co-op in 1979), Steinway Hall (now called 111 West 57th Street), and the Knickerbocker Hotel, which was converted to an office building during the prohibition and continued that use until 2010, now reutilized as a hotel.

And so, with the aid of city officials and innovative developers and architects, Lower Manhattan has gradually changed. During the 1990s, the number of residents of Lower Manhattan increased by over 60% and by 2001, there were several grocery stores, dry cleaners, schools, restaurants, and bars (Knox and Moor, 2001). Fast forward 10 years, the 2010 census saw an increase of another 97.6% in residence from the previous census conducted in 2000 (Census, 2010). The area is considered very prosperous as well with a median household income of $144,878 ($125,565 in the Financial District), lower than average unemployment and percentage of residents who are rent burdened. According to Census Reporter, Districts 1, 2, and 3 (which make up Lower Manhattan) are home to over 331,000 residents in 2017, which is a net-gain of over 200% from 1940, while much of Manhattan saw a negative gain in residence over the same time period (City University of New York City, 2012) (Census Reporter, n.d.).

ANALYSIS REGION: WASHINGTON DC METROPOLITAN AREA

Repercussions of COVID-19 and telework have created record highs in DC for office vacancy. In a city characterized by one of the highest white-collar economic markets, many lobbying, consulting, and government firms are positioned in and around the city. This naturally creates an agglomeration economy where specialized workers concentrate in the area in hopes of obtaining a job working for the government. However, with the pandemic, many of these jobs have become remote, as much of the white-collar work can be done from the comfort of the worker's homes. In turn, the city's office vacancy rate reached an all-time high of 15.2% in the second quarter of 2020, according to Coldwell Banker Richard Ellis' (CBRE) Washington D.C. Office MarketView Q2 2020 (CRBE, 2020). Additionally, Washington DC posted 300,000 square feet of occupancy loss in second quarter (CRBE, 2020). Figure 7 from CRBE signifies the trend of office space loss and vacancy rates from 2011 to 2020. It is expected that more pronounced shifts in market dynamics will occur drastically during the second half of the year with some companies carrying out the final terms of their leases. Brookings Institute came out with a report that telecommuting will likely continue long after the pandemic with more people learning how to use remote technology effectively and companies analyzing the cost-benefit of forgoing or downsizing their office space in favor of teleworking (Guyot & Sawhill, 2020). With downtown office parks becoming ghost towns and office landowners seeking revenue, a perfect opportunity can arise with the adaptive reuse of these structures in favor of residential units.

Figure 7: Historical Office Supply and Demand Dynamics in Washington DC
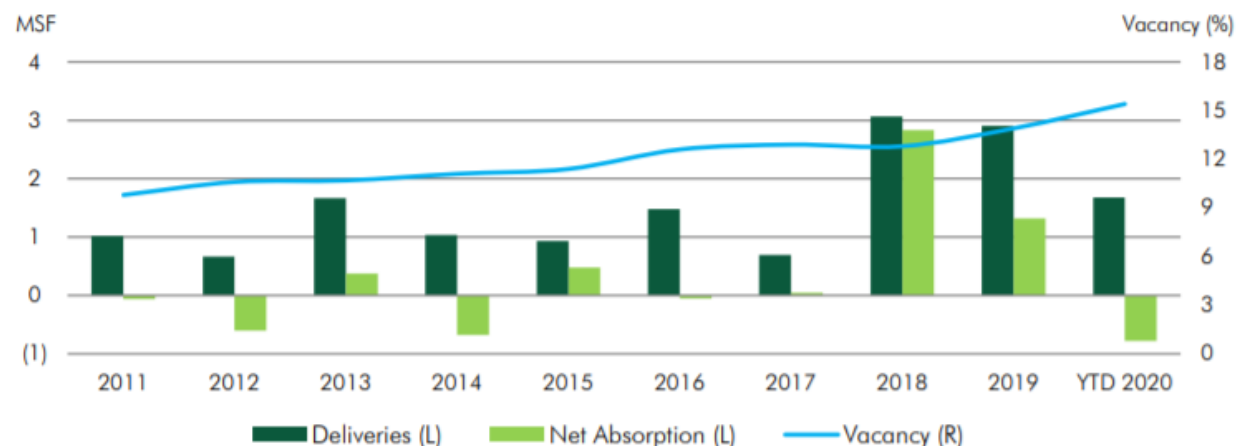

Source: CBRE, Q3 2020.

There are a number of cities that are rapidly gentrifying, but there is a focus on the Washington DC metropolitan area, which has seen a drastic increase in housing prices since the turn of the century. Washington DC is unique in the fact that it has a height ordinance on buildings adopted to preserve the views of the national monuments and prevent overcrowding. The district has become one of the most expensive places to live behind San Francisco and New York City. The figure on the following page shows the average year-end sale price of a home in the United States since 2000.

Figure 8: Median End-of-year Sale Prices for the Washington DC Metro Area

DC Region Home Values Outpace Nation

Median end-of-year sale prices (in thousands of dollars), all homes, by jurisdiction
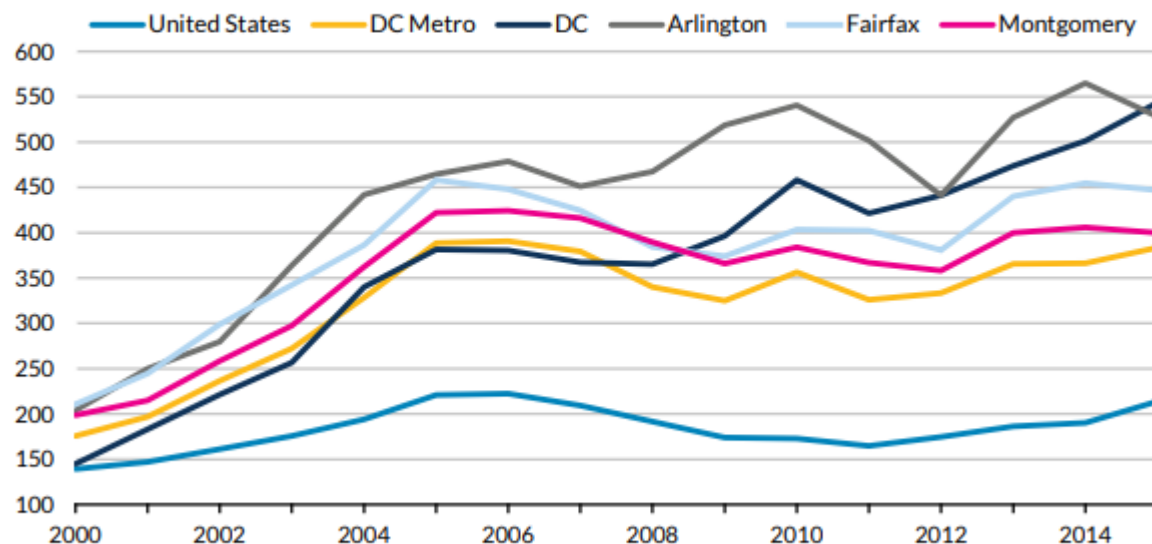
Source: Zillow.

In that time, the average sale price in the U.S. increased by 53%, compared to 118% in the DC MSA, and as much as 275% in Washington DC (Blumenthal, McGinty, & Pendall, 2018). Adaptive reuse can assist in residential redevelopment efforts. This section will look at the proposal of adaptive reuse in Washington DC and the optimal approach for converting underutilized office space into residential units to benefit both the housing market and curb the vacancy problem.

Methodology

Identifying the optimal approach to adaptive reuse in Washington DC involves a two-pronged methodology. First, I will assess the need of housing in the region by analyzing the housing availability, housing affordability trends, and housing location. Zillow Data will be used to analyze the rental and housing prices over the last ten years to signify the affordability and increase in housing costs. Data from the United States Census will provide the housing stock and population. The second part of the analysis will focus on the office inventory in Washington DC and the surrounding metropolitan area. In a data agreement reached with CoStar, the leader in commercial real estate information, office lease data was obtained to assess property-level data, including vacancy, rents, size, type, location, and class of the office space currently available. Office lease data was extracted from CoStar's frequently updated database on December 2, 2020. CoStar has an incredible amount of information on the commercial real estate market by assigning researchers which have direct contact to a portfolio of brokers who are responsible for contacting once a month to update their information. This company has the widest array of office leasing information in Washington DC and the nation. The analysis will be conducted using data processing and geospatial functions in R to determine the optimal market location, class, and type of office buildings which would have the greatest positive impact for Washington DC by analyzing signals such as vacancy rates, distance to amenities (accessibility), and proximity to residential land uses

(feasibility of converting the office zone to residential or mixed use). These market analytics can provide micro- and macro-level insight into the dynamic office market of Washington DC.

DC Housing Market Insights

The DC housing market has experienced exponential growth in the price of rent since the turn of the century. This is not necessarily a new realization. Numerous reports and advocate groups have been fighting the hyper-inflation of rents, which has pushed out much of its lower-income and minority residents. Myron Orfield, director of the Institute on Metropolitan Opportunity, has been tracking demographic and economic changes in neighborhoods in the 50 largest U.S. cities from 2000 to 2016. He states that while gentrification is happening, many cities are not experiencing displacement, however, Washington is one of the few places where real displacement is occurring, and at an alarming rate (Lang, 2019). This map by the Washington Post exemplifies that displacement, where Washington DC is experiencing an outward shift of its low-income persons from inside the city to the outer suburbs.

Figure 9: Low-income Migration Trends in the Washington DC Region (2000 to 2010)
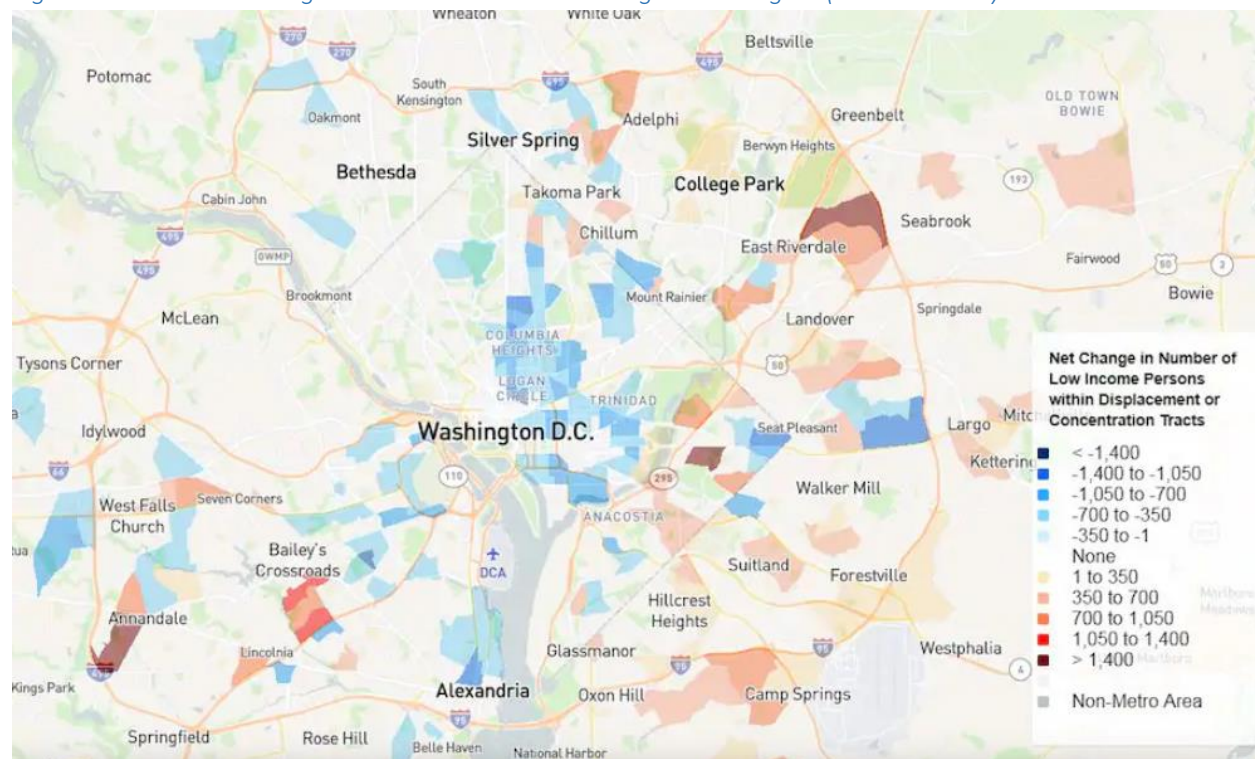
Source: Washington Post

In some neighborhoods of Washington DC, nearly 75 percent of the low-income populations have vanished. These residents that have been pushed out are predominately black and low-income. Since 2000, the overall population growth of the city was 19%, with a 202% increase in white residents in a city previously known as "Chocolate City". This has created tension between the new and historical residents, especially in terms of cultural perspective. A widespread news story circulated where new residents complained of loud go-go beats, a unique genre of music originating in DC, from the Metro PCS store in Shaw, which has been doing so for the last 20 years (Lang, 2020). A D.C. Fiscal Policy Institute reported that the number of apartments where monthly rent is below $800 has decreased from 58,000 units in 2002 to 33,000 just ten years later (Murray, 2015). Median 1-bedroom rents are

the third highest in America, only behind San Francisco and New York City. A report by Zumper indicated that the median 1-bedroom rent is $1,960 in Washington DC, even after a 1.5% due to the COVID-19 pandemic.

This hyper-inflation of rents has been largely due to the lack of housing stock, and especially affordable housing in DC. Opposed to other major cities, which embody large residential skyscrapers housing thousands of residents, Washington DC is restricted due to the 1910 Height of Buildings Act which caps the height of the building from the width of the street on which a building is situated (NPR, 2014). Congress recently considered raising that height limit and decided not to in a year-long study from the National Capital Planning Commission. The study concluded that the act preserves the historic form of the nation's capital, the civic character and open skies, and extraordinary views of DC's monuments. However, not everyone agreed, especially those in favor of affordable housing because developers cannot build up, curbing the incentives for large residential developments. This act has had more heavy opposition as of late with DC mayor Muriel Bowser expressing the need to increase the height limit in her second inaugural address in January of 2019 (Williams, 2019). Nonetheless, this opposition has not gained much traction and Washington DC must search for innovative alternatives to supply the city with the housing stock it so desperately needs.

The D.C. Policy Center has estimated that there are about 320,000 housing units spread across 116,000 buildings. But, 10 percent of these belong to foreign governments, another unique trait of DC, which leaves about 303,000 units available to the public (Taylor, 2018). Due to the aforementioned height restrictions, the land-constrained city mainly consists of low-rise, low-occupancy housing units. There were 11 neighborhoods where multi-family buildings average five units per building. In another 14 neighborhoods, the average residential unit is two per building with the remaining 32 tax assessment neighborhoods consisting of single-family detached homes, or row homes. This configuration of housing is largely due to implications of zoning and land use regulations (Taylor, 2018). Due to this low housing stock, there are only about 90,000 of the 303,000 units (29%) which are considered affordable by the District's affordable housing program.

Although the demand is extremely high, the narrative remains the same: the permitted housing units greatly deficient compared to the housing need. Forecasting by George Mason University School of Public Policy predicted that DC would need to add ~550,000 new housing units between 2012 and 2032 (Sturtevant & Chapman, 2013). This averages to ~27,500 units per year; DC has not permitted that many housing units for development since 2006. Therefore, there is a great gap in the housing needed for the city and the amount of housing supplied, generating exorbitant housing costs, expelling many of its residents. This gap is mainly due to the lack of prospective development locations because of height restrictions and build-out in the city limits, and a tedious permitting process. Two reports explain that the biggest barriers to this are finding mechanisms for reducing development costs and producing affordable housing (Hickey & Sturtevant, 2015; Jakabovics et al., 2014). Another problem is arising due to the economic and public health repercussions of COVID-19. All across the nation, permits are dropping in 2020 compared to the previous year. An indication for this is the lack of confidence for developers to build new housing units in response to a looming economic recession. This has impending effects on the housing market and will further exacerbate the housing shortage problem faced in many cities.

Evictions are on the rise due to the repercussions of the COVID-19 pandemic on economic vitality. According to Eviction Lab, there are 13 evictions per day in the district with over 27,000 eviction filings in the year. Fortunately, DC has taken action to rent hotel rooms and secure leases for facilities where people experiencing homelessness could quarantine. The economic distress, coupled with the steadily rising rental burden, has made for a large increase in homelessness in the city, which already sees a higher rate of homelessness compared to the average mid-sized city (DCist, 2020).

Although a product of unaffordable housing and displacement, Washington DC has made strides to promote affordable housing in the city. Albeit, many of them failed, were not passed, or were not utilized. DC has ushered in more than 9,000 affordable housing units (for persons making less than 80% of the area's Average Median Income (AMI)) in the last four years, according to the Deputy Mayor for Planning & Economic Development Dashboard (EMPED, 2020). In October of 2019, Mayor Muriel Bowser and Office of Planning (OP) Director Andrew Trueblood released citywide targets for affordable housing production by neighborhood planning area. Bowser has committed to building 36,000 new units by 2025, with one-third of this to be built in Rock Creek West, Near Northwest, and Capitol Hill planning areas, which has seen scant housing production (Baca, 2020). The figure below from the DC Department of Housing and Community Development (DHCD), displays the dedicated affordable housing goals through 2025. Washington has a long road ahead to supply the city with sufficient affordable housing, but one thing is clear: affordable housing is at the forefront of the mayor's plans moving forward.

*Figure 10: Washington DC 2025 Affordable Housing Production Goals*
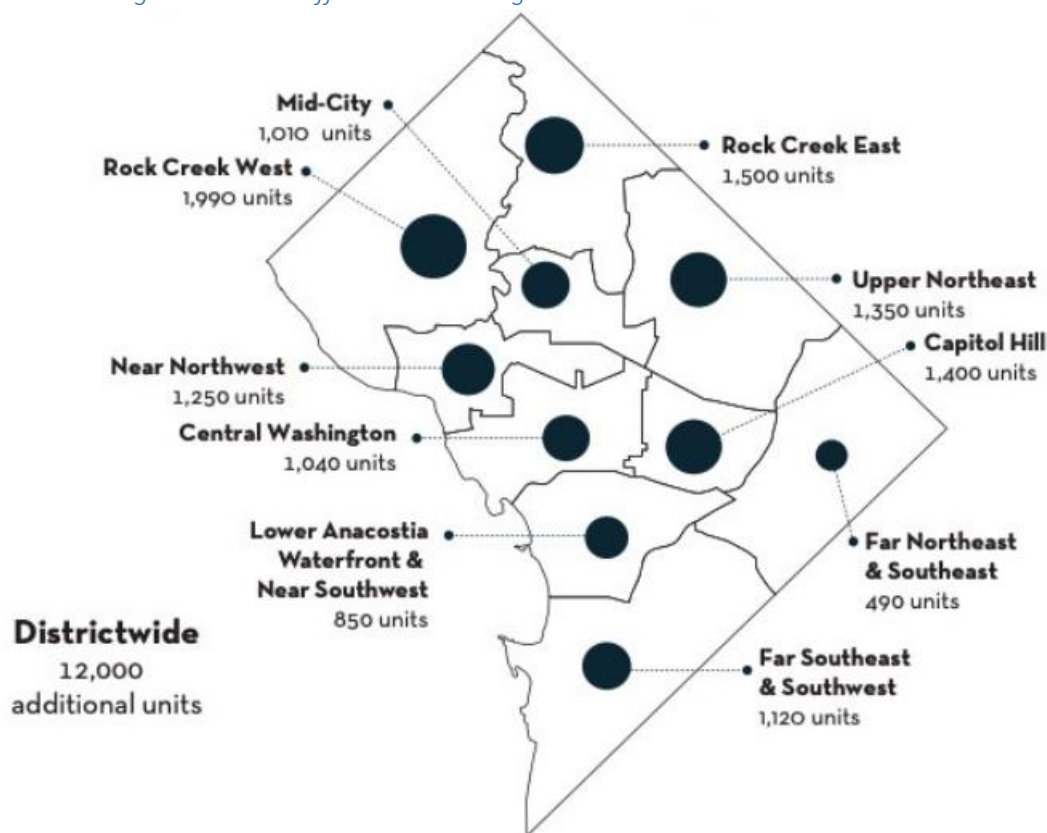
Source: DC Department of Housing and Community Development (DHCD)

Currently, there are 948 office buildings in the Washington DC market according to CoStar's database. This is not a fully-complete list, as a small percentage of brokers are not in communication with CoStar representatives. However, this is the most comprehensive database available and represents an extremely large sample size. The median square footage is 15,350. The median year built is 1950 and renovated in 2009. The annual 2020 Year to Date (YTD) asset value of the DC Office market is $178 billion within an average market sales price of $368 per square foot (SF). However, in DC office sales volume is down tremendously. The 12 month sales volume of the entire DC area office market is down 25.1% from the previous year ($6.6 billion compared to $8.9 billion in 2019). This sales growth is strikingly worse in the Central Business District (CBD – Downtown DC). The 2020 sales volume is $1.9 billion (down 58.8% from 2019), the lowest volume recorded in the last 15 years. This presents a stark contrast to the suburban office market of DC which saw a 31.1% sales growth from the previous year. The two graphs below signify this contrast of downtown office market growth (left) compared to the suburban office market growth (*right*).

Figure 11: Office Sales Volume Growth in DC Compared to the Suburbs
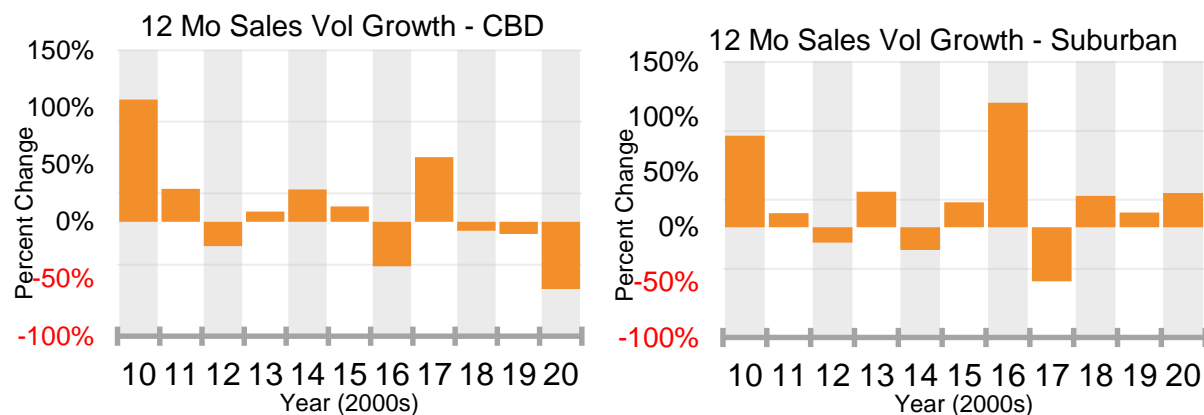
Source Data: CoStar, graphic created by: Shane Sweeney

The Washington DC market is also suffering higher vacancy rates compared to the suburban markets of Maryland and Virginia. This is likely due to companies moving their office space to a more affordable suburban alternative, as the average price per SF is roughly half ($475 per SF in CBD compared to $224 per SF in suburban). With companies choosing affordability as opposed to proximity to downtown, many of these office spaces will go underutilized, signaling the need for developers and landowners to look for alternatives. In a capitalist market, the majority of companies will lean towards the most Return on Investment (ROI). Expanding on this, the commercial and retail market is extremely high risk during this pandemic, which has seen a steep decline in retail sales volume (down 38.5% in DC from 2019) and the closing of many small businesses who cannot afford rent. This current market environment and location points to the multi-family residential market, which has seen a 9.5% increase of sales volume from the previous year in DC, according to CoStar.

The CoStar data uses a number of indicators to classify buildings that will be used in this analysis. 'Class' and 'Star Rating' determine the quality of the building (*explained in Section 2.3*). The 'Type' is an attribute which defines what the general use of the building is. The three types are "Office Only", "Office/Residential", and "Telecom/Data Hosting", however, the latter is not generally applicable to this

study, as these buildings generally do not host large amounts of employees due to the general purpose being a data center to house computer systems and associated components, such as telecommunications and storage systems. The last few are geospatial attributes such as geocordinates, city, and state, which will be used to analyze location.

Of the 917 office buildings in the DC area (not accounting for data centers), 116 were Class A, 363 were Class B, and 437 were Class C. DC held the lion's share of Class A buildings holding 43% of the total, despite making up 28% of the total market share. The suburban markets of Virginia and Maryland held 73% of the lower class B and C office buildings. Interestingly, ¾ of the total office market from CoStar's database were signified as being "Office/Residential", however, this was also largely carried by the suburban office markets, which comprised of 72% of this total. This presents an intriguing opportunity for the buildings that are used as "Office Only" in the district. The pivot table (*below*) displays the number of office buildings by type and class organized by its housed state.

Figure 12: DC Area Office Buildings by Class, Type, and State

| Office Buildings Pivot Table of Class and Type by State Location									
State	**Office Only**				**Office/Residential**				**Grand Total**
	Class			**Office Only Total**	**Class**			**Office/Residential Total**	
	A	**B**	**C**		**A**	**B**	**C**		
DC	46	21	3	70	4	83	104	191	261
MD	18	52	24	94	2	88	186	277	371
VA	39	21	2	62	7	96	115	218	280
Grand Total	103	94	29	226	13	269	408	691	917
Data Collected from CoStar Washington DC Office Market Leases, Table: Shane Sweeney									

The Star Rating System by CoStar expressed similar results with the majority of 4 and 5-star office buildings being located in DC and the lesser-quality office buildings standing in Maryland and Virginia. Since the overlap of the class and star rating system was over 80%, this analysis will use the class rating, which is the standard and most widely used classification metric for office buildings.

As mentioned before, the DC market has been hard hit by the pandemic and social distancing measures, which has transformed formerly boisterous office buildings into ghost towns. According to data provided by CoStar, Washington DC vacancy rates are higher than their adjacent markets in Maryland and Virginia. DC has a vacancy rate that is 16.5% (up ~2% from Q2), while Maryland and Virginia sit at the low to mid-teens. The graphic *below* displays the office vacancy rates by class and state from CoStar's Washington DC office market. Class A has taken the biggest hit across each state at 80% leased (20% vacancy). Surprisingly, these prime properties historically carry the lowest vacancy rates, due to their desirability. There is reason to predict that landowners of Class A buildings will reduce rents to attract companies currently situated in lower class buildings needing an upgrade or more space. This

trend is also apparent in CoStar's Washington DC Q3 2020 Office Market report where they forecast 4 & 5 star offices (Class A) reducing rents at the greatest percentage and rebounding in lease percentage greatly compared to Class B and C in the next few years. However, it must be taken into consideration whether or not this is the beginning of a new trend brought on by the office market onslaught of COVID-19.

According to CoStar's office lease database, Class A office buildings are suffering the most at an average 18.6% vacancy. The lower classes of B and C are less hard-hit comparatively, but are extremely high compared to normal market vacancy. Washington DC carries the highest vacancy rates in Class B and C, at 15.9% and 11.9%, respectively. Figure 13 shows a bar chart of the office vacancy rates by class and state, in which Washington DC outpaces vacancy rates of its adjacent counterparts by 3% overall.

Figure 13: Office Vacancy Rates by Class and State
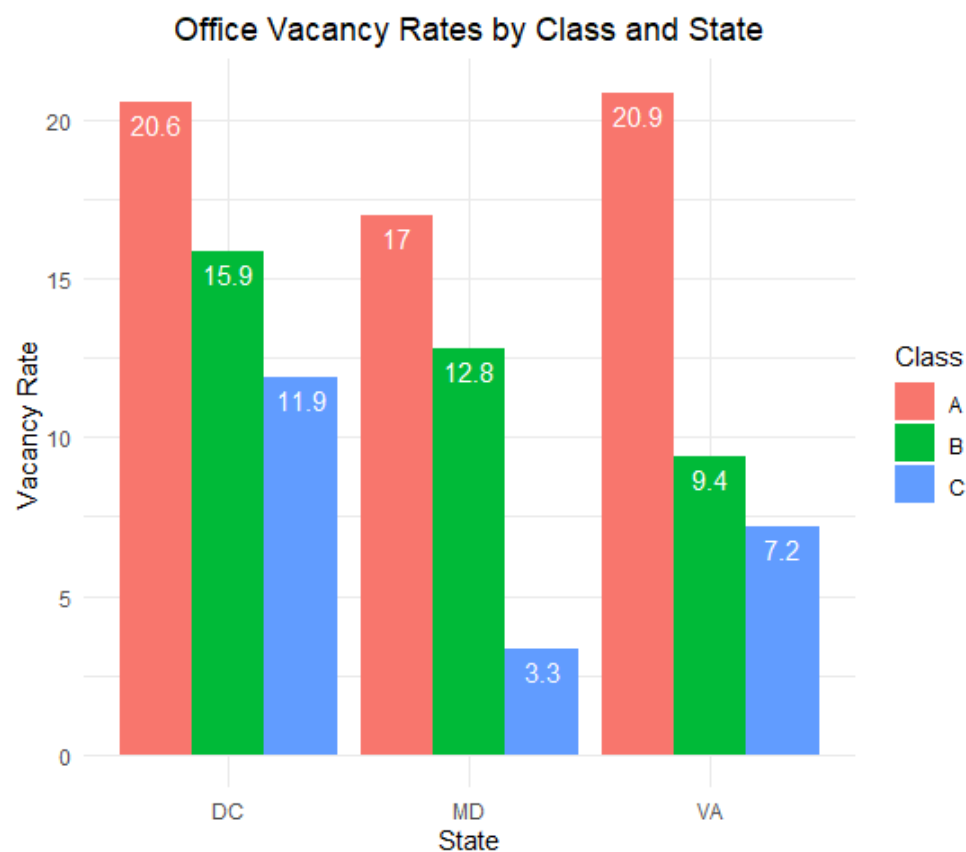
Source data: CoStar, graphic created by: Shane Sweeney

The location of these office buildings is vital in determining the optimality of adaptive reuse. An office building located in an office park that is only accessible by car is not feasible for repurposing into residential use and especially affordable housing where many lack the means of private transportation. Office buildings also have different criteria for desirability than residential, which is an important step in analyzing suitability for adaptive reuse. A map of the DC market offices and downtown DC by class can be seen *below.*

Figure 14: Spatial Orientation of Office Buildings in the DC Area by Class
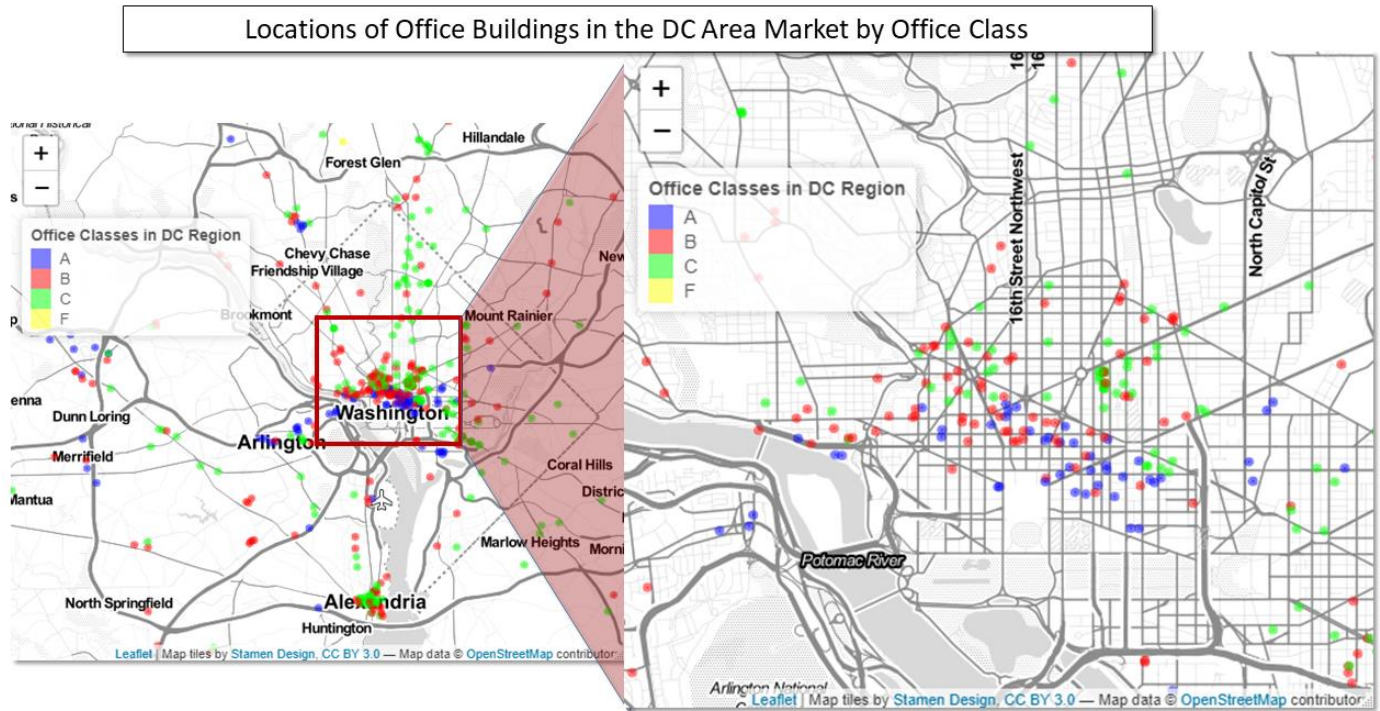
Source data: CoStar, graphic created by: Shane Sweeney

As the visual and data indicates, much of the Class A office buildings are located in downtown DC, with groups of Class B and C office buildings located just north and east of downtown in the residential neighborhoods of DuPont Circle, West End, Shaw, and NoMa. These neighborhoods have embraced rapid gentrification since 2000 and represent some of the most expensive neighborhoods of DC. There are also clusters of office buildings located in Alexandria and along the beltway (I-495) and the I-66 corridor. This begs the question of which class is most appropriate and feasible for adaptive reuse into entirely residential or part office, part residential.

To answer that question, we first need to understand the companies that occupy these office spaces. Since Class A are the newest and of the highest quality, the most prestigious firms will usually occupy them. They are also situated in prime locations, which gives the company and its clients a central and desirable meeting space. Although Class A office space in the DC market has been the hardest hit, there are many indications of why these buildings may not be best suited for adaptive reuse. Dr. Emil Malizia of the University of North Carolina at Chapel Hill expresses that Class A office space will continue to be devoted to office use for a couple of reasons. First, the tenants are larger and occupied by more established companies that desire an office address. Although remote work will likely continue after the pandemic, office workers will use the office space a couple times a week instead of five days a week, a similar trend seen in many European counties. Michael McMahon, EVP of Portfolio Management & Director of Tax at RXR Realty, says, "I think we will see outdated, obsolete assets being repurposed. For

instance, some of the older Class B office buildings might be ripe for conversion to residential—particularly if that residential includes a rent-stabilized component." (Marks Paneth, 2020)

Class A buildings are likely constructed in the last 20 years, landowners may be unwilling to give up the office market so soon and carry the burden of renovating and repurposing their structure into a residential unit. This leaves the older, lesser quality Class B and C buildings. This is likely an optimal situation anyway, as Class A building conversions would produce a much higher rental rate and only add to the housing stock, but not aid in the housing unaffordability problem in DC. The boxplot *in Figure 15* signifies the importance of diversity of use with respect to the office class with the median lease rate of Class B and C "Office/Residential" buildings higher in every state than an "Office Only" use. This discrepancy is highest in Washington DC where an additional residential use increases the lease rate by over 8%.

*Figure 15: Box Plot of Percentage Leased for Class B/C by Office Type and State*

Source data: CoStar, graphic created by: Shane Sweeney

Through these exploratory data measures, it is apparent that the most suitable offices for adaptive reuse are Class B and C offices in the Washington DC city limits. The next part of the analysis will analyze the optimal offices which exhibit high than normal vacancy rates (over 8%) in appropriate locations. These locations will contain a couple of geospatial indicators including the proximity to residential land use for rezoning purposes, proximity to amenities and transportation for accessibility purposes, and whether the property is in a heavily gentrifying area in need of housing stock. The map *in Figure 16* displays the subsetted dataset for Class B and C offices in DC that hold a lease percentage less than 80%.

There are 39 total existing offices that fit this criterion with a total square footage of over 3,000,000 square feet and an average vacancy rate of 41.9%.

Figure 16: Vacant Class B and C Office Buildings in Washington DC
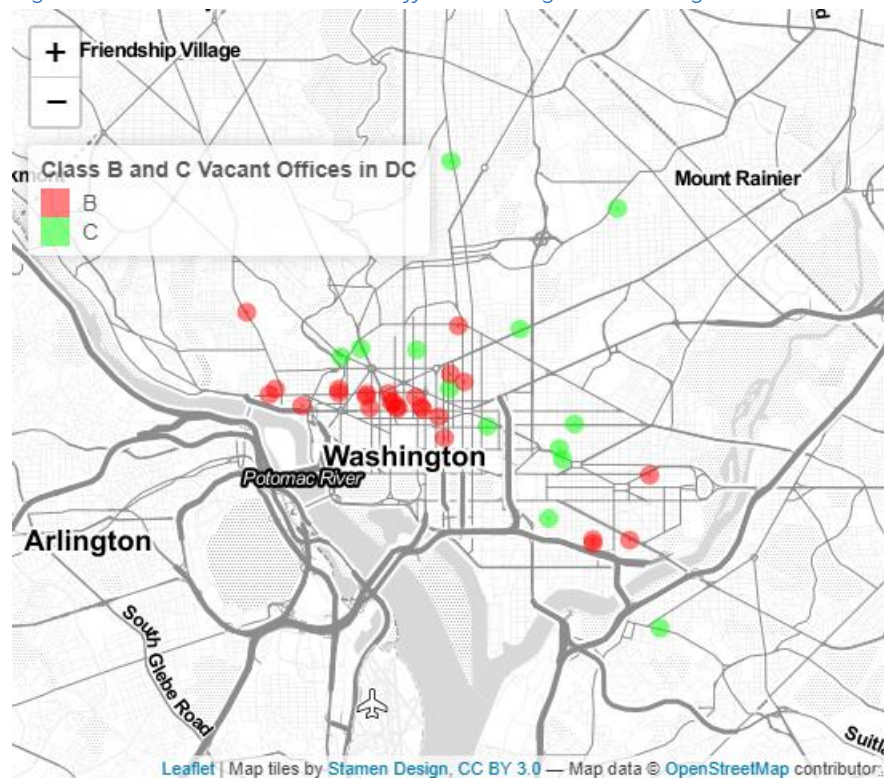
Source data: CoStar, graphic created by: Shane Sweeney

## *Accessibility and Feasibility Analysis of Potential Adaptive Reuse Sites*

In order to determine whether these Class B and C office buildings with high vacancy are best suited for adaptive reuse, it is important to check if these structures are accessible, desirable, and feasible for conversion. Accessibility is the ease of reaching destinations. There is no basic standard equation or threshold for measuring accessibility and has been a point of quarrel between many transportation and city planners. To simplify this, the analysis will take a holistic look at the amenities and transportation offered in close proximity to the structure. Walkscore, the leading accessibility metric defines close proximity is determined by a 10-minute walk, or 0.5 miles (Walkscore, n.d.). Feasibility will be concluded by overlaying the structures on the proposed DC land use map to determine whether the current zoning is amenable to residential uses, or if the zone is in close proximity to a residential use zone. If an office building was surrounded completely by office-only zoning with no residential use permitted, the rezoning of this parcel could constitute "spot zoning", which is illegal in DC.

Washington DC, like many other cities has revamped their comprehensive plan and zoning districts. In 2016, the DC Zoning Commission approved an overhaul of the former zoning code, which took nine years and spanned over three mayoral administrations (Austermuhle, 2016). The old zoning code was hopelessly out of date, a Euclidean relic dating back to 1958, comprising of a long list of zoning districts with rigid and confusing standards. The new code will allow for more flexibility within districts, more mixed-use zoning, a decrease in required parking spots for new developments, and most importantly

less limitations in residential density with allowances of renting accessory dwelling units (Austermuhle, 2016).

This revamp makes adaptive reuse much easier to enact now that uses are much more flexible and affordable housing has become a top priority. The map *in Figure 17* displays the proposed office buildings suitable for adaptive reuse and how they are positioned on DC's new zoning map. 14 of these buildings are located in the "Downtown Zone", which is characterized by "high-density mix of office, retail, service, residential, entertainment, lodging, institutional, and other uses, often grouped into neighborhoods with distinct identities." Another 15 of these buildings are located in a "Mixed Use Zone", which permits a broad range of commercial, institutional, and multiple dwelling unit residential development at varying densities. The remaining 9 buildings are located in a residential zone. The locations of these offices among the new zoning district bolsters the feasibility of adaptive reuse into a building that is either part-residential or fully-residential.

Figure 17: Proposed Adaptive Reuse Office Buildings under Washington DC's Zoning Code
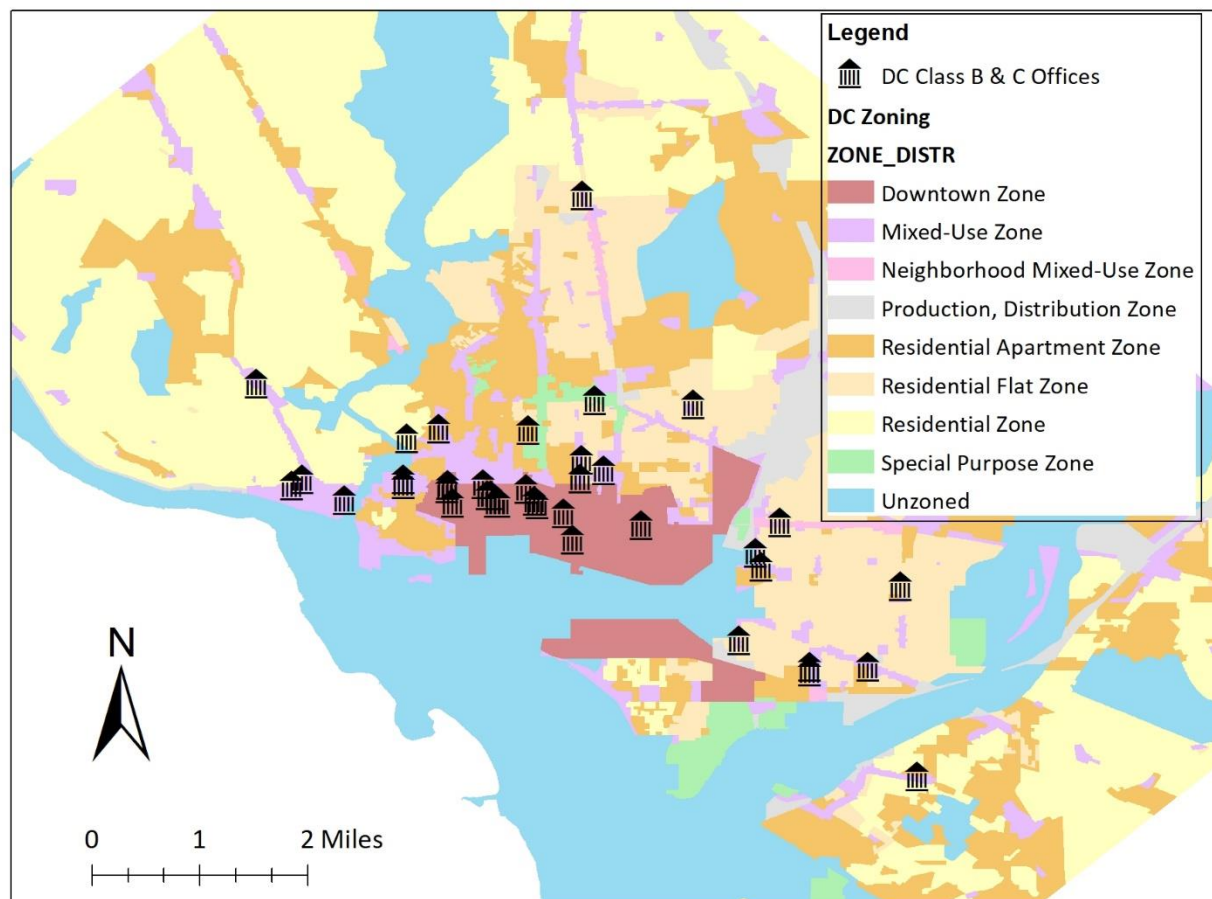
Source data: CoStar (vacant offices) and Washington DC Open Data Portal (zoning), graphic created by: Shane Sweeney

Using open sourced Open Street Map (OSM) data, it is possible to geo-locate a number of different amenities, transportation, and land uses in any city. Some of these amenities include supermarkets to ensure the structure is not located in a food desert, clinics to ensure the structure has good health accessibility, and public transit stops. After mapping the food markets, medical clinics, and public

transportation stops, it is necessary to project the coordinates into a coordinate metric system in units of kilometers. Once the Coordinate Reference Systems (CRS) are the same, a 0.5-mile buffer (0.80467 km) can be applied to each of the 39 office buildings. From there, we are able to use the *sf* package in R to determine how many amenities overlap with the 0.5-mile buffer.

Figure 18 below shows the accessibility of the vacant Class B and C office buildings. Only one building in the Northeast submarket was considered inaccessible with 0 markets and 1 transit stop located within 0.5 miles of the structure. However, this building is rather small (under 2,000 square feet) and the only 1 star rated building of the 39. The median number of food markets within the walkability buffer for the 39 buildings was 23 with a range of 0 to 64. This means that the buildings are not in a food desert and are rather accessible to shopping for basic necessities. These buildings are also high in accessibility to medical care and public transportation with the median number of these amenities at 3 clinics and 11 public transit stops. To ensure validity and accessibility, the closest distance to each amenity was examined using the *gDistance* function in R. The median distance to the closest market was 0.15 miles, with public transit being 0.23 miles, and medical clinics at 0.62 miles.

Figure 18: Accessibility of Proposed Adaptive Reuse Office Buildings in DC by Neighborhood
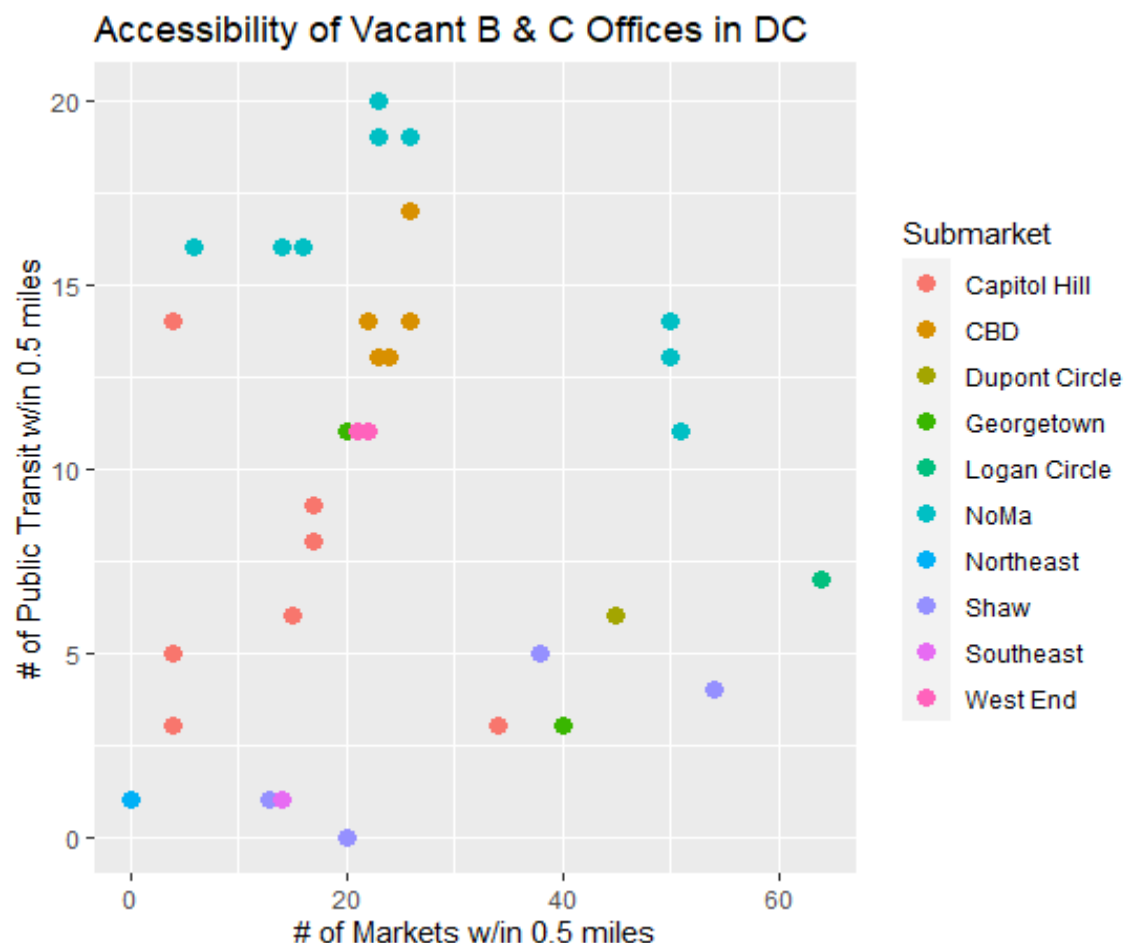
Source data: CoStar (offices), Open Street Maps (amenities and public transportation stops), graphic created by: Shane Sweeney

This essentially leaves 38 out of the 39 buildings that are accessible and desirable to adaptive reuse. The total square footage of these buildings is 3,000,816. The average apartment in DC is just 736 square feet, according to RentCafe with an average rental value at $1,944 per month. If only 40% of these building's square footage could be converted into residential units, the city could see its housing stock improve by over 1,600 units, accounting for common spaces (Brown, 2018). According to the DC Department of Housing and Community Development (DHCD), which administers the District's Inclusionary Zoning (IZ) Program, residential developments of 10 or more units (both new and rehabilitation/repurposed buildings) must set-aside 8-10 percent of the residential floor area as affordable units. Thus, a bare minimum of 160, with a range to 1,600 units (100% of created housing units being affordable), could be added to DC's affordable housing supply. Washington DC has only delivered 3,800 units for persons with 0 to 50% of the area's AMI since January of 2015 (DHCD, 2020).

There are other mechanisms that DC can use to incentivize developers to repurpose their buildings through DC's Housing Finance Agency (HFA). The multi-family housing program offers four different programs to create and preserve affordable multi-family rental housing. This program offers private for-profit and non-profit developers low-cost construction and permanent financing for construction, rehabilitation, and renovations of rental housing in order to meet the demand of quality affordable housing in the city (HFA, n.d.). DHCD also offers Low Income Housing Tax Credits (LIHTC) to provide non-competitive 4 percent or competitive 9 percent Low Income Housing Tax Credits to developers of new or rehabilitated rental housing for persons at or below 60% AMI (DHCD, n.d.).

This structured analysis can be utilized by city officials in other cities to locate and contact landowners in possession of underutilized Class B and C office buildings in their cities. Once contacted, it is necessary for these officials to provide justification and a feasible and financial enticing plan forward through the respective city's affordable housing financing incentives. This can also be met with other tools and incentives such as expedited permitting, alternative public finance mechanisms, and a number of other techniques discussed in-depth in the next section of this paper.

PLANNER'S TOOLBOX FOR ADAPTIVE REUSE

Adaptive reuse fundamentally is the process of repurposing existing structure for viable new uses and functions, other than those originally intended to address present-day needs. This section will focus specifically on office to residential adaptive reuse and the tools cities have to promote the growth trend of adaptive reuse, examples of successful projects, opportunities and challenges, and the coupling of downtown growth with office space demand decline. Some of the important parameters and questions for a planner to examine is first whether the office building is underutilized and designated as Class B or below. Second, what is the age of the building and does it have historical significance? Third, where is the building located? Is it in an empowerment zone? Is it accessible or in a distressed census tract? Once these are answered, the planner can determine the potential eligibility of the project for non-conventional funding for adaptive reuse.

Adaptive reuse is an intriguing technique for city planners, but how does the city incentivize landowners and developers that this is a feasible option? Planners carry a wide array of mechanisms and policies in their toolbox to make this a reality. A successful project requires cooperative planning between municipalities and developers. Unlike new construction, the building, location, and market are already established, and successful reuses are responsive and dependent on local market demands. The planner must thoroughly examine whether their respective market meets the need for this intervention through the identification of potential risk factors and assessment of existing conditions, regulations, market and economic conditions, neighboring land uses and lot sizes, location, access, site, structural, architectural and historical considerations, and building reuse potential (Chester County Planning, n.d.).

The original route, pioneered by Lower Manhattan in New York City, is to use historical tax credits. The Landmarks Preservation Commission (LPC) chair Meenakshi Srinivasan, expressed the monumental benefits of adaptive reuse which "effectively preserves neglected or obsolete historic resources – that might otherwise be lost and demolished – for future generations. It promotes good sustainability practices by conserving our limited environmental resources." (Bindelglass, 2015) Obviously, this tool does not suit all structures, as registering a building as a historic structure, place, or landmark is evaluated through strict criteria such as the property's significance, age, and integrity (NPS, n.d.). If the property was already deemed historic or was confirmed after suggestion, planners can incentivize rehabilitation and reuse through the Federal Historic Preservation Tax Incentive program. This program, overseen by the National Park Service, encourages private investment in the rehabilitation and re-use of historic buildings. To date, the program has leveraged over $102 billion in private investment to preserve 45,383 historic properties since 1976 (NPS, n.d.). A 20% income tax credit is available for the rehabilitation of historic buildings determined by the Secretary of the Interior, through the National Park Service. The state of the proposal will be reviewed by the corresponding State Historic Preservation Office to ensure that it complies with the Secretary's Standards for Rehabilitation. Then, the Internal Revenue Service (IRS) defines the qualified rehabilitation expenses on which the credit may be taken. Each year, the Technical Preservation Services approve more than 1,200 projects leveraging nearly $6 billion annually in private investment across the country (NPS, n.d.).

Unfortunately, a section of the Federal Historic Preservation Tax Incentive program was repealed by President Trump in December of 2017 in Public Law No: 115-97. This section allowed for any structure built before 1936, even those considered "non-historic", to receive a 10% tax credit following the rehabilitation of the structure. Rutgers University Economic Impact reports that the section of the

program generated 86,000 jobs in 2015 alone (Sisson, 2017). Though repealed, there is still reason to hope by many that this section of the program will be re-enacted by future administrations. The city planner should also be informed about any state historical tax credit that is available to provide further incentive.

A less regimented way city officials can incentivize landowners and developers is through Tax-Increment Financing (TIFs). In the U.S., TIFs are used as a public financing method by subsidizing redevelopment, infrastructure, and other community-improvement projects. Forest City Texas used TIFs from the city of Dallas to develop the project as part of a broader effort to renovate older buildings and bring more housing to downtown (Williams, 2016). Baltimore struggled for conversion deals until the city enacted targeted tax incentives for redevelopment in 2013. Since, the city has converted dozens of old warehousing and office buildings into a number of different uses. Newmark, a major commercial real estate advisory firm, analyzed a sample of four office buildings located in Baltimore's CBD that were underperforming. Using the city's tax credits, these offices were converted to multi-family housing. On average, the properties posted rents 8.19% higher than the market average, while before were averaging 10.09% below the average (*graph depicted below*) (Shirokow-Louden, 2018). With the Baltimore CBD consisting of 148 office buildings compared to 72 multi-family properties, there is an opportunity for further redevelopment and repurposing. In turn, the CBD Class B office inventory has decreased by 435,152 square feet, representing 19% of the total (Shirokow-Louden, 2018).

Figure 19: Rental Differences of Converted Office-to-Residential Buildings in Baltimore

Source: Newmark Research, Axiometrics; July 2018

Another viable option is redevelopment into affordable housing. The Century Building, a 12-story, 80,000-square-foot former office building Pittsburgh's Cultural District was redeveloped to provide 60 workforce and affordable apartments serving households earning 60 to 120 percent of the area median income. The project used an array of funding from local public agencies, federal low-income housing tax credits, and investments from the Pittsburgh Cultural Trust, the Heinz Endowment, and the Richard King Mellon Foundation (ULI, 2016). In Denver, the city converted a vacant building into affordable housing instantly through leveraging the city's $10 million Revolving Affordable Housing Loan Fund (Sukumaran, 2019). A Baltimore developer utilized the city's affordable housing subsidies to convert an abandoned

school into a 50-unit apartment for residents with incomes of up to 60 percent of the Baltimore City median income, which is about $41,000 a year (Tooten, 2014). In the midst of the Washington DC's real estate boom, Arlington County lost 86% of its affordable housing. Now, underused or abandoned religious facilities are being converted into over 173 low-income housing with ground-floor retail space (Biron, 2018). Success of these projects depend on funding and incentives. Public sector partnership provides opportunity, but depends on local tax abatements, local affordable housing programs, state and/or federal historic tax credits (in some cases), and federal low-income housing tax credits.

In actuality, non-conventional funding for adaptive reuse does not involve a "one or the other" scenario. Many projects leverage multiple public funding pools at their disposal including other alternatives such as local and federal energy grants, Housing Trust Funds, city and county grants, deferred developer fees, Housing Development Assistance Programs (HDAP), Low-Income Housing Tax Credits (LIHTCs), New Markets Tax Credits (NMTCs), and HOME funds from HUD (Goldman and Figgie, 2017). Below is an example of a 40,000 sf former factory adaptive reuse for affordable family housing in Cleveland, Ohio is shown to have leveraged funds from five different non-conventional options including a deferred developer fee ($0.3 million), federal historical tax credits ($2 million), HDAPs and LIHTCs ($7.5 million) , Housing Trust Funds ($0.9 million), and the County Brownfield Grant ($0.3 million) (Goldman and Figgie, 2017). Presenting potential landowners and developers with successful adaptive reuse projects that were able to leverage these non-conventional funding mechanisms, along with support from the city planning office, will only further enhance the possibility of making adaptive reuse happen.

Figure 20: Example Adaptive Reuse Project Financing Mechanisms

THE LOFTS AT LION MILLS
Cleveland, Ohio

Project Sector:
Affordable Family Housing
Project Attributes:
- 40,000 sf historic renovation
- Adaptive reuse / conversion of former garment manufacturing facility
- 36 affordable apartment units
- Designed and built to Enterprise Green Communities Standards

Total Development Cost:	$11M
Sources of Funds:	
• Deferred Developer Fee	$.3M
• Fed HTC	$2M
• LIHTC and HDAP	$7.5M
• Housing Trust Fund	$.9M
• County Brownfield Grant	$.3M

Source: https://www.wrlandconservancy.org/wp-content/uploads/2017/09/091217_CLE_Historic_and_New_Market_Tax_Credits.pdf

Revisions to codes and ordinances may be necessary to permit adaptive reuse and the municipality must work in partnership with landowners and developers to ensure transparency and feasibility. The use of specialized zoning districts can also specifically permit adaptive reuse or conversions to residential

buildings, as well as expedited permitting. Zoning provisions that contribute to the economic feasibility are permit higher densities, maximize use of floor space, permit home offices in multi-family dwellings, and allow flexibility in parking requirements (Chester County Planning, n.d.). Most importantly, trust must be gained between public and private partners to enable a cultivation of a development climate that promotes adaptive reuse. Lastly, support at a high government level down to local stakeholders must take place.

A paper written by Dr. Stephen Kendall, RA, CIB titled "An Open Building Strategy for Converting Obsolete Office Buildings to Residential Uses" emphasizes the architectural and engineering design methods, new business forms, supply chain and information management, trades, and construction management involved in the demonstration of successful adaptive reuse projects (Kendall, 2003). Dr. Kendall implies that the political, economic, and social pressures for the revitalization of existing infrastructure to meet the present needs of its citizens continue to grow. However, the more frequent application of repurposing and revitalization of existing, underutilized buildings, the more the strategy will become normalized, standardized, and less risky to proposed developers. This will in turn give city officials more leverage and support to offer adaptive reuse as a solution to both their problems. Federal grants, and utilizing city-led incentive programs are essential to garnering public support and reusing existing building structures to achieve a win-win outcome that can accommodate quality, much-needed housing at the lowest possible cost.

CHALLENGES

Our planning goals and strategies should continue to be as adaptive and flexible as the changing environment. The main advantage of adaptive reuse is the potential of using the built environment to adapt and change with localized needs. It is also an extremely sustainable practice because of the reduction in building materials needed to transform a space (JL Architects, 2015). Many projects have also been associated with historic preservation, saving older, under-utilized buildings from demolition. Adaptive reuse attracts and accommodates new and existing residents while reducing office vacancies (ULI, 2016).

Albeit an exciting tool, adaptive reuse has its limitations. Real estate markets are rarely stagnant or in perfect equilibrium. Getting buy-in from developers, landowners, high-level officials, and local residents can prove difficult in any large project. The loss of affordable office space in a city could also create unintended consequences such as a spike in office lease prices, companies being forced to relocate or consider alternative office markets, and a gap in occupancy. The Goldilocks Test, adapted from the children's story "The Three Bears", is a principle that applies to the viability of adaptive reuse. Essentially, there needs to be the optimal amount of excess older office space in the market for it to be able to withstand having that space redeveloped into housing to meet real residential demand, without pricing out the full range of businesses necessary for the local economy to thrive (Williams, 2016). Ultimately, the developer will attempt to convert whatever generates the highest rents through transparency of the public sector, market research, and cost-benefit analysis.

Many corporations may still hold on to their office space as a means of promoting workplace culture and innovation. This can be explained by the "Watercooler theory", a subset of economies of agglomeration that hypothesizes firms are often located next to each other to attract the greatest workforce talent, just as people in close proximity create economies of scale, discuss new ideas, and create network

effects. This theorizes that ideas are shared and talked through in public office settings such as meeting rooms, coffee lounges, etc.

The economy and development also tends to return to equilibrium as market demands and forces change. There is possibility of the slowing of office market deliveries due to the lack of demand. According to CoStar's Q3 Washington DC Office Report, more than 11.3 million SF of office space is under construction, which is the lowest total since 2016 (CoStar, 2020). If the slowing of deliveries continues and office buildings are demolished or repurposed, the office market may naturally correct itself. Essentially, less buildings will be available, driving rents up and vacancy back down.

Convincing landowners and developers is a difficult task. Many will be risk-adverse – meaning they are disinclined to take risks, especially if that risk is sinking money into repurposing and renovating their structure in hopes of possible future profits. Not every prospective office building landowner will be willing to convert their existing structure into multi-family residences. Thorough cost-benefit analyses, availability of non-conventional funding, and cooperation with public and private partnerships will be needed to incentivize most of these office landlords, a task that is not always straightforward and smooth. However, the results of successful conversions have proven beneficial for the city in terms of adding additional housing stock, providing jobs through construction, and for the landowner in gaining long-term profits.

A number of other challenges may be met in the rezoning process of the building. This includes blockages due to spot zoning, rezonings that do not comply with the city's unified development ordinance (UDO), variances, code upgrades and requirements, impact analyses, and cooperation with the municipalities' board of adjustments. These rezoning implications are discussed in more detail in the following section *Office to Residential Zoning Implications*.

OFFICE TO RESIDENTIAL ZONING IMPLICATIONS

The general theory and application of adaptive reuse indicate that a change in zoning may be required. Luckily, many cities have transformed away from strict, Euclidean zoning into more flexible zoning districts, which allow for a variety of uses. This transcendence only enables the implementation of adaptive reuse in cities. However, it is important to note that this is not the case in all cities. Some adaptive reuse projects may require rezoning, and specifically in this study; a rezoning of office to residential or mixed-use is necessary.

First, spot zoning is illegal in the United States. The classic definition of spot zoning is "the process of singling out a small parcel of land for a use classification totally different from that of the surrounding area for the benefit of the owner of such property and to the detriment of other owners" (Anderson, 1995). While it may be an argument of disgruntled neighbors of the adaptive reuse project, this refute has seldom won in the case of repurposing projects, especially ones pertaining to historic structures. Some municipalities have even made amendments to their zoning codes to allow for such projects. For example, St. Petersburg, Florida uses this justification for adaptive reuse: "If a use is proposed that is not allowed in the district or by the Reuse Chart, rezoning must be requested. A rezoning is not 'spot zoning' because the retention of a historic building is a substantial benefit to the public health, safety, and welfare." (City of St. Petersburg, Florida Adaptive Reuse of Historic Buildings Overlay). In a superior court case of Neptune Township, New Jersey, a landowner (18 Atlantic, LLC) wished to convert their vacant twenty-two room hotel into four condominium units. The land was zoned as HD-O, which did not allow for residential use and was allowed for hotel use through conditional zoning. The plaintiff argued that "The Board Did Not Have Authority To Grant The Use Variance And To Do So Constitutes Rezoning And/Or Spot Zoning." However, the judge found that the defendant "sufficiently informed the public of the nature of the application before the board," and stated that "other variances and waivers that might be requested at the hearing, thus informing the public that the application was not limited to the variances listed (*Kevin Chambers v. Zoning Board of Adjustment of the Township of Neptune,* 2009). Through a number of other cases across the United States, spot zoning was not an applicable justification to halt the rezoning and redevelopment process, signifying leeway to adaptive reuse developers.

Rezoning a project often requires a number of other formalities to be completed by the applicant. One of the most significant is an impact assessment. This often comes with transportation impact analyses, among a number of other surveys and research to ensure that the rezoning confirms with the city ordinance and goals. Since residential use has a much different traffic impact than an office use, transportation impact analyses are usually most important. Office buildings create heightened traffic volumes in the morning, as people commute to work, and in the afternoon/early evening once people return home. This differs from residential use where many of the residents may have personal vehicles which need parking or storage and create more traffic volume dispersed throughout the day, as they navigate their daily routines. Depending on where the property is located, traffic flow may prevent easy access to and from the building. This could be a problem when advertising and showing the property to potential tenants. Even if the rezoning process is approved, consider whether or not the switch makes sense for the actual location (Esajian, n.d.).

There are also different code enforcements and structural requirements needed to convert a property zoned as office or commercial to residential. This ensures safety of all the tenants residing in the

building. This may include laws around electrical and water lines, entry and exit points, and more. The conversion of a property from office to residential will depend not only on local laws, but also the developer's ability to renovate the property to meet residential standards (Esajian, n.d.).

People do not often invite change. As with most zoning adjustments, variances, and special uses, there will likely be opposition and backlash from neighbors in the rezoning process. For one, the owners of office buildings surrounding the proposed adaptive reuse into residential may fear that this rezoning could affect their future of obtain corporate tenants. They also may argue that this may lead to a transition of their office district into a more residential district and that they may have to follow suit, taking on large capital expenditures to repurpose their buildings. Lastly, adjacent property owners advocate heavily against affordable housing. The majority of these projects face hefty opposition due to arguments of crime, litter, thefts, violence, and the decrease in value and property taxes (Homeless Hub, 2019). There are a number of ways to combat this opposition through educating the community, addressing legitimate concerns, holding open houses, showcasing past work, and explaining the property management (Serlin, 2016).

The rezoning process is often a formulaic one, with purposeful steps involved. Elucidating this process can make the procedure less cumbersome. First, the developer must examine the local area, study zoning laws applicable to the development, and communicate with the neighbors. These preliminary actions will help smooth and streamline the following judicial requirements. Next is applying for the rezoning to be submitted to the city's planning department. Fees are often involved. Once submitted, the developer must conduct thorough analyses on impact, project details, and nuances corresponding with the repurposing. After being accepted, a public hearing will be held where neighbors can voice their concerns. It is important to have rebuttals or answers to assuage these concerns. Lastly, there will be a legislative body meeting where the planning commission will present their recommendations to a legislative body and a final decision will be made. If confirmed, the parcel may be rezoned accordingly. If it is not approved, then the applicant must wait a variable amount of time (according to the municipalities' laws) in order to resubmit the proposal. A typical rezoning process from start to finish may take several months.

The process of rezoning is a necessary one. It allows for the planning commission and city to fully analyze the pros and cons of the project and how these pros and cons will affect the city and the adjacent parcels. Each process is different, but most can be ameliorated through transparency with neighbors and the planning office, thorough impact analyses, and a well-designed project by the developer. All in all, thousands of adaptive reuse projects have been completed in America ranging in size from 60-story office buildings to small churches. The general consensus of the benefits that adaptive reuse has to offer has made the practice much more streamlined, and this process will only be easier as the practice becomes a norm in American cities.

RECOMMENDATIONS

In a world of finite resources, space, and time, utilizing these things takes precision and innovation. Adaptive reuse is the epitome of sustainability and in order to build resilient cities, we must first fully utilize the resources we currently have at our disposal. Market forces and dynamics change, but for the time being, the office market is being rendered obsolete, while cities are in dire need of affordable housing. This paper serves as a guide to planners, students, and citizens to elaborately define the problem at hand, present a successful example, provide a repeatable and thorough analysis, present feasible tools and policies to enact change, and discuss the challenges of doing so.

Planners must first define the problem in their city. What is our housing situation look like? Is there a sufficient housing stock, and is that housing stock suiting the needs of ALL our residents? There must also be research into the office market. Not all cities have suffered the collapse of their office markets, but most have. Once the problem has been thoroughly defined, the city must investigate whether their current unified development ordinance and development landscape is suitable or flexible enough to accommodate potential redevelopers without excessive setbacks. Exorbitant hurdles to overcome in the adaptive reuse process will be a dagger to even the most risk-neutral landowners.

Cities then have the ability to use the techniques discussed in this paper to target landowners of underutilized Class B and C office buildings. They must work in public-private partnerships to help convert these buildings into residential units, or assist in the permitting of these buildings to be used to residential purposes as well. To help assist in this process, the city planner can elucidate the historical landmark or building protections and non-conventional funds to developers who own buildings that are underutilized. They can also help with conducting cost-benefit analyses by working with consulting firms to influence landowners in the opportunity of converting some or all of their space into residential use. Another way is through expedited permitting and transparency with the redeveloper.

Big problems call for big solutions. These solutions may not always be easy, but necessary in the transcendence of their city for all citizens. Affordable housing is a crisis plaguing many cities across America. I urge planners and citizens alike to explore the problem in their respective city and find new ways to implement sustainable practices to keep the city a wonderful place to live, for all walks of life. Adaptive reuse is one of those big solutions. Innovation is here; adaptation happens now.

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