GENTRIFICATION AND ITS IMPACT ON THE CLIMATE CRISIS: A COMPREHENSIVE ANALYSIS

Climate Change Law, Research & Writing (Spring 2024): Final Paper

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TABLE OF CONTENTS

I. Introduction

Since at least the 1980s, gentrification has worked to reshape the landscapes of urban areas across the western world. Charecterized by the influx of wealthier individuals or groups into previously lower-income neighborhoods, gentrification is often a highly controversial subject. On one hand, urban renewal projects have been shown to expedite the economic development of areas that are often devoid of financial resources and financial investment. Conversely, critics of gentrification argue that it negatively affects communities by facilitating the displacement of incumbent, lower-income residents and leads directly to the erasure of history and culture in the communities that it affects.

While most people who study and research gentrification are more inclined to focus on the negative socio-economic, cultural, and physical aspects of the phenomenon, gentrification is rarely discussed in terms of how it affects the environment. Similarly, those involved in climate change discourse rarely point to gentrification as a contributing factor in the environmental crisis the world is currently experiencing. The aim of this paper is to shed light on the under-discussed intersections between these issues, specifically how the phenomenon of gentrification works to exacerbate global environmental challenges. The paper will explore local ordinances designed to combat climate change, address legal realities that contribute to both phenomena, and suggest potential legal solutions to these growing problems.

A. Gentrification Contextualized

Before addressing the environmental impacts of gentrification, it is important to define and understand the meanings of these terms. For its part, the term gentrification was coined by sociologist Ruth Glass to describe the entrance of an urban "gentry" to, and subsequent transformation of, working-class areas of London during the 1950s and 1960s.[1] Today, the term has expanded well outside of England and is now used to refer to the transformation of urban areas in the Western world generally. [2] While there are certainly global connotations tied to the phenomenon of gentrification, this paper will primarily examine and dissect instances of the phenomenon that occur within urban areas in the United States of America.

Defined as "the process by which central urban neighborhoods…experience a reversal, reinvestment, and the in-migration of a well-off middle and upper-middle-class population," American gentrification is a cyclical phenomenon characterized by rising property values, increased rent, and the displacement of longstanding, lower-income communities.[3] Irrespective of region or specific geographic location, gentrification in America almost always occurs in urban areas with relatively affordable housing stock.[4] Once such an area is identified by wealthy residents developers, these individuals buy property in the area and begin to invest capital in the development of the surrounding community, which often coincides in the physical renovation of

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[1] Schnake-Mahl, Alina S et al. "Gentrification, Neighborhood Change, and Population Health: a Systematic Review." Journal of urban health : bulletin of the New York Academy of Medicine vol. 97,1 (2020): 1-25. doi:10.1007/s11524-019-00400-1

[2] Glass RL. London: aspects of change, vol. 3. London: MacGibbon & Kee; 1964

[3] Smith N. Gentrification. In: Vliet WV (ed) The encyclopedia of housing. London: Sage;1998;198–199.

[4] Hamnett 1984; Lees, Slater, and Wyly 2008.

deteriorated housing and infrastructure.[5] The developments and new amenities resulting from this process cause the affected area to become more expensive to live in for the individuals who inhabited the area prior to the developments, and some of them are no longer able to afford to rent or own property in the area as a consequence.[6] From there, individuals who have the money to rent or own the revitalized property move into the area, which often coincides with the addition of newer developments and amenities, which raise property values and rents even more for individuals already living in the affected communities. Over time, the longstanding residents of gentrified communities are "priced out" of their communities because of the abrupt increase in the cost of living in the area, replaced entirely by a wealthier and whiter population of residents.[7]

While some scholars point to gentrification as a means to spur economic development in neglected neighborhoods, reduce crime rates, and stimulate demand for local amenities such as parks, restaurants, and cultural institutions, gentrification is more commonly associated with its tendency to displace the long-term residents of an affected community.[8] The process of gentrification works to make housing unaffordable for current residents, and the pattern of forced displacement that coincides with gentrification disrupts social networks, severs ties to community resources, and exacerbates inequalities, pushing residents farther away from job opportunities and essential services. Victims of this vicious cycle are often lower-income families, residents of color, or other vulnerable and marginalized populations. These individuals make up the character of their communities, and their effective removal from their communities through gentrification leads directly to the erasure of neighborhood identities. As investors, politicians, and other neighborhood stakeholders cater to the preferences of affluent newcomers, local businesses, cultural institutions, and longstanding residents who contribute to the area's unique character and heritage become increasingly marginalized in the civic discourse of the community. This process of cultural displacement undermines social cohesion and diminishes the diversity that enriches urban life.

On balance, it is clear that the negative connotations associated with gentrification substantially outweigh its benefits from a social, economic, and cultural perspective. This sentiment is only exacerbated when accounting for environmental considerations, but like gentrification, the global environmental challenges referenced must be understood and contextualized before they can be properly addressed.

B. Climate Change Contextualized

The global climate change crisis is one of the most pressing challenges facing humanity in the 21st century. Specifically, human-driven global warming is causing widespread and unprecedented changes to the Earth's climate system. According to research conducted by the National Oceanic and Atmospheric Administration (NOAA), the combined land and ocean temperature of the Earth has increased at an average rate of 0.11° Fahrenheit (0.06° Celsius) per decade since 1850.[9] Alarmingly, the rate of warming since 1982 is more than three times as fast.[10]

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[5] Hamnett 1984; Lees, Slater, and Wyly 2008.
[6] *Id.*
[7] *Id.*
[8] O'Sullivan, A. (2005). Gentrification and crime. Journal of Urban Economics, 57(1), 73-85.
[9] *Id.*
[10] *Id.*

Such unprecedented changes to the Earth's climate is projected to have devastating global consequence, including more intense natural disasters, increased droughts and heat waves, longer wildfire seasons, and changes in precipitation patterns.[11] Equally concerning, scientists project that the global sea level will rise by 18 to 59 centimeters by 2100, which will lead to the degradation of coastal ecosystems, beach erosion, and the possible inundation of populated land.[12]

The overwhelming majority of scientists in this field understand the climate crisis to be caused primarily by human activity, such as the burning of fossil fuels, transportation, deforestation, and industrial processes.[13] Each of these undertakings causes the accumulation of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), into the Earth's atmosphere. Rather than reflect solar energy back into space, which does not warm the earth, these gases, known colloquially as greenhouse gases, trap solar energy, absorb it, and release it into the atmosphere as heat, leading to a phenomenon known as the greenhouse effect, which works to warm the planet's surface.[14]

II. History of the Climate Crisis and Urbanization

Prior to the 18th century, there were few methods by which humans could introduce greenhouse gases into the atmosphere.[15] Societies were based on agriculture, there was no electricity, and humans used animals like horses to move across far distances. Beginning around 1750, however, laborers in Britian began to manufacture and use machines to perform tasks that would have otherwise been done by hand.[16] The use of energy sources like petroleum, steam, and coal gave rise to new inventions that allowed for increased production with a smaller expenditure of human energy. These inventions, in many cases, emitted greenhouse gasses into the atmosphere, though very little was known at the time about the greenhouse effect or how it would impact the climate.[17]

Over time, these technological advancements spread to other parts of Europe, and before long most of the world saw their agriculture-based societies change evolve into those based around industry and machine manufacturing.[18] This process, known in modern times as the industrial

[11] IPCC 2021, Climate Change 2021: The Physical Science Basis, the Working Group I contribution to the Sixth Assessment Report, Cambridge University Press, Cambridge, UK.
[12] MIMURA, N. (2013). Sea-level rise caused by climate change and its implications for society. Proceedings of the Japan Academy. Series B, Physical and Biological Sciences, 89(7), 281-301. https://doi.org/10.2183/pjab.89.281
[13] Ramanujan, K. (2021, October 19). More than 99.9% of studies agree: Humans caused climate change. The Cornell Chronicle.
[14] National Academy of Sciences. (2020). Climate change: evidence and causes: Update 2020. The National Academies Press, Washington, DC, p 5. doi: 10.17226/25733
[15] Wadanambi, R., Wandana, L., Chathumini, K., Dassanayake, N., Preethika, D. (2020, October). The effects of industrialization on climate change. JOURNAL OF RESEARCH TECHNOLOGY AND ENGINEERING, 1(4).
[16] *Id.*
[17] *Id.*
[18] Britannica, T. Editors of Encyclopaedia (2024, April 5). Industrial Revolution. Encyclopedia Britannica. https://www.britannica.com/event/Industrial-Revolution

revolution, caused stark socioeconomic, cultural, and environmental changes worldwide.[19] Within a century, the use of machines and the mechanization of processes began to take over the world's economies. The steel, locomotive, and manufacturing industries burgeoned during the industrial revolution, and items like shoes, clothing, weapons, household goods, and tools were being mass produced in large factories for the first time.[20] While the world's economies certainly benefitted from these new technologies and innovations, the climate certainly did not, as these industries and factories emitted greenhouse gases into the atmosphere, leading to air pollution, reductions in biodiversity and wildlife habitats, and the warming of the earth's atmosphere.[21]

The industrial revolution, in addition to serving as the genesis of the climate crisis, also facilitated the social conditions that have resulted in the American gentrification issue. Prior to the American industrial revolution, most Americans were lived in largely isolated agricultural households and small towns that were linked to the external world by horse drawn wagons.[22] The small industries that did exist, such as grain mills and sawmills, were often located in rural areas close to flowing rivers in order to power machinery.[23] This situation changed during the revolution, as manufacturing plants, industrial production, and workers in industry all more than doubled between 1878 and 1900. The workshops and small foundries of yesteryear were supplemented by large factories engaged in mass production.[24] This rapid level of industrialization, along with technological strides that were being made in railroad transportation during the revolution, facilitated the growth and urbanization of cites across the United States.[25] By 1900, the number of Americans living in cites doubled, and by 1920, the majority of Americans lived in cities.

This geographical shift was made possible by both foreign immigration and the Great Migration. Between 1861 and 1890, 10.4 million immigrants arrived in the United States, primarily from Southern and Eastern European countries like Italy, Russia, Poland, Greece, and Ireland.[26] Many Chinese immigrants entered the United States at this time as well. There was a high demand for labor during this period in American history, and many immigrants came in search of better economic opportunities and higher wages than they could find in their home countries. The cities of New York, San Fransico, Chicago, and Boston saw particularly large influxes of immigrants. At the same time, African Americans living in the Jim Crow south began to leave the region in droves, searching for economic opportunity and political enfranchisement that they had been long denied. During this period of mass migration, known today as the Great Migration, approximately six million Black people moved from the American south to northern, midwestern, and western

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[19] *Id.*
[20] Rafferty, J. P. The Rise of the Machines: Pros and Cons of the Industrial Revolution. Encyclopedia Britannica.
[21] Rafferty, J. P. The Rise of the Machines: Pros and Cons of the Industrial Revolution. Encyclopedia Britannica.
[22] Hirschman, C., & Mogford, E. (2009). Immigration and the American industrial revolution from 1880 to 1920. Social science research, 38(4), 897–920. https://doi.org/10.1016/j.ssresearch.2009.04.001
[23] *Id.*
[24] *Id.*
[25] *Id.*
[26] Baxter, A. M., & Nowrasteh, A. (2021, August 3). A Brief History of U.S. Immigration Policy from the Colonial Period to the Present Day. The Cato Institute. https://www.cato.org/policy-analysis/brief-history-us-immigration-policy-colonial-period-present-day

states.[27] Specifically, these African Americans flocked to cities like New York, Chicago, Detroit, Pittsburgh, Oakland, Los Angeles, San Francisco, Portland, and Seattle.[28] Like foreign immigration, the Great Migration contributed significantly to the population growth of cities within the United States, while leading to the development of diverse and vibrant communities within those cities. And while the industrial revolution and the degree of population growth it facilitated is an overwhelmingly positive development, these changes to the status quo certainly have their downsides as it relates to the climate and environment.

Urbanization, both during the industrial revolution and in general, is intricately linked to climate change. The growing population of cities between 1880 and 1920 created new and more intense heat islands, urbanized areas that experience higher temperatures than outlying areas.[29] Buildings, roads, and other structures commonly found in cites absorb and re-emit the sun's heat at a rate higher than that of natural landscapes, and thus urban areas typically have higher temperatures compared to surrounding rural areas.[30] Because of this phenomenon, which is known as the urban heat island effect, cites have to use more energy to keep cool than rural areas do, resulting in urban areas having even higher rates of greenhouse gas emissions.[31] Additionally, urbanization leads to increased energy demand and emissions related to transportation, facilitates the energy-expensive conversion of natural landscapes into built environments, and generates waste that is either burned or allowed to decompose into methane, a potent greenhouse gas. Finally, and most importantly as it relates to the discussion of gentrification, urban populations are not stagnant, and the demographic histories of American cities indicates that they have been segregated to the detriment of both marginalized populations and the environment at large.

While foreign immigration and the Great Migration offered opportunities for economic advancement and greater political freedom, these groups still faced discrimination and housing disparities in northern cities. Beginning in the 1930s, local governments began to enact policies and procedures designed to separate immigrants and Black migrants from the white people within urban areas. Unspoken discriminatory hiring practices caused African Americans to have disproportionately high unemployment rates, while unequal access to education and healthcare persisted, contributing to ongoing inequality.[32] Most harmful, local governments and agencies began to systematically deny home loans and insurance to Black and immigrant families, a practice that has been defined as redlining.

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[27] The National Archives. (n.d.). The Great Migration (1910-1970). The National Archives. https://www.archives.gov/research/african-americans/migrations/great-migration#:~:text=The%20Great%20Migration%20was%20one,the%201910s%20until%20the%201970s.

[28] *Id.*

[29] Heat Island Effect. (n.d.). U.S. Environmental Protection Agency. https://www.epa.gov/heatislands#:~:text=Heat%20islands%20are%20urbanized%20areas,as%20forests%20and%20water%20bodies.

[30] *Id.*

[31] *Id.*

[32] Sundstrom, W. A. (1992). Last Hired, First Fired? Unemployment and Urban Black Workers During the Great Depression. The Journal of Economic History, 52(2), 415–429. http://www.jstor.org/stable/2123118

A. Redlining and Its Impact on Gentrification

The early 1930s marked an era of economic depression across the globe, and the United States was not immune from the impacts of this phenomenon. American unemployment rates skyrocketed during this period, and, because of the sentiments and stereotypes of the time, black workers on average fared much worse than their white counterparts when it came to getting and keeping jobs.[33] In an effort to combat the economic hardships of the time, President Franklin Delano Roosevelt created the Home Owners' Loan Corporation (HOLC) in 1933 to bolster the struggling housing market and prevent home foreclosures. [34] In 1935, the HOLC began sending real estate appraisers to major cities across the United States to evaluate homes and neighborhoods and determine their credit worthiness and mortgage security risk.[35] The appraisers' job was to grade areas, take note of their findings, and report them back to the HOLC, who then created colored maps based on the appraiser's grades.[36] Parts of the map lined in green, were deemed to have a low perceived risk for lenders, while those lined in red were considered "hazardous," and came with a high perceived risk for lenders.[37]

After publishing, The HOLC made their maps available to public and private entities across the country. Government organizations like the Federal Housing Administration (FHA) adopted the maps to create their own discriminatory programs and guidelines, and they became an essential tool for private lenders to decide whether to grant or deny loan applications.[38] When an individual or family applied for a mortgage for a home in a redlined area, lenders were far more likely to deny the loan than if the mortgage was applied for in a non-redlined area. The theory behind the HOLC's system was that people in redlined areas were less reliable and thus less likely to pay than people in non-redlined areas.

The issue with the HOLC's system, like many other systems designed and implemented by human beings, was implicit bias. When classifying neighborhoods, evaluators didn't just look at current housing quality and rent and sale values, but also the color of the residents' skin.[39] As a result, neighborhoods with predominantly Black and immigrant populations were disproportionately redlined and designated as hazardous compared to their predominately white counterparts.[40] This made it more likely that residents of these areas would be denied mortgage loans and other financial services, while residents of predominantly white neighborhoods received more favorable treatment.[41]

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[33] *Id.*

[34] De los Santos, PhD, MS, H., Jiang, MPH, K., Bernardi, BS, J., Okechukwu, ScD, MSN, MPH, C. (2021, May 26). From Redlining to Gentrification: The Policy of the Past that Affects Health Outcomes Today. The Harvard Medical School Center for Primary Care. https://info.primarycare.hms.harvard.edu/perspectives/articles/redlining-gentrification-health-outcomes#:~:text=Redlining%20also%20creates%20conditions%20for,on%20the%20health%20of%20residents.

[35] *Id.*

[36] *Id.*

[37] *Id.*

[38] *Id.*

[39] *Id.*

[40] Nelson, Robert K. "Mapping Inequality". Mapping Inequality. University of Richmond.

[41] De los Santos, PhD, MS, H., Jiang, MPH, K., Bernardi, BS, J., Okechukwu, ScD, MSN, MPH, C. (2021, May 26). From Redlining to Gentrification: The Policy of the Past that Affects Health Outcomes Today. The Harvard Medical

The HOLC redline classification effectively barred Black and immigrant communities from home ownership and the wealth building opportunities associated with it. African Americans, most of whom were the descendants of slaves and children of migrants, had little collective wealth during the 1930s, and without access to mortgages, were unable to pass wealth on to their children and descendants as effectively. When Black people sought to buy homes in non-redlined areas, white residents of these communities began to pass racially restrictive covenants, clauses that were added to deeds to prevent people of color from owning property.[42] These covenants and other regulations were often used to force community segregation along racial lines and form racially homogenous neighborhoods, which in turn made it easier to perpetuate inequality.

This segregation also worked to establish the contours of gentrification, laying the groundwork for the socioeconomic conditions that make neighborhoods vulnerable to the phenomenon. [43] Levels of housing vacancy and abandonment were much higher in redlined areas, and decades of disinvestment and neglect resulting from redlining left many urban neighborhoods with aging infrastructure, limited economic opportunities, and a lack of amenities. [44] Such conditions made these neighborhoods and areas ripe for gentrification in the eyes of investors and developers, as the land and property within is cheaper than in areas with lower abandonment rates.

B. Zoning and Gentrification

To truly understand this claim, it is important to understand zoning ordinances and how they can, intentionally or unintentionally, exclude lower-income groups and foster gentrification. Zoning ordinances are local rules meant to regulate land use and development within a municipality.[45] These ordinances divide the regions of land into different zones, with each being subject to their own specific rules based on their zoning classification.[46] Things like permissible uses, building heights, lot sizes, and other development standards are aspects of land use and development that are commonly governed by zoning ordinances, and every major city in the United States has implemented them as a tool for urban planning, growth management, and general welfare.

Unfortunately, zoning ordinances can indirectly contribute to gentrification in many cases. For example, zoning ordinances that exclude certain types of housing from specific areas can limit

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School Center for Primary Care. https://info.primarycare.hms.harvard.edu/perspectives/articles/redlining-gentrification-health-outcomes#:~:text=Redlining%20also%20creates%20conditions%20for,on%20the%20health%20of%20residents.

[42] City of St. Paul, Minnesota. (n.d.). DISCHARGING RACIAL COVENANTS. https://www.stpaul.gov/departments/city-attorney/civil/discharging-racial-covenants#:~:text=Racial%20covenants%20are%20clauses%20that,from%20buying%20or%20occupying%20land.

[43] De los Santos, PhD, MS, H., Jiang, MPH, K., Bernardi, BS, J., Okechukwu, ScD, MSN, MPH, C. (2021, May 26). From Redlining to Gentrification: The Policy of the Past that Affects Health Outcomes Today. The Harvard Medical School Center for Primary Care. https://info.primarycare.hms.harvard.edu/perspectives/articles/redlining-gentrification-health-outcomes#:~:text=Redlining%20also%20creates%20conditions%20for,on%20the%20health%20of%20residents.

[44] C.S. Meier, H., & Mitchell, B. C. (2022, February). Tracing the Legacy of Redlining: A New Method for Tracking the Origins of Housing Segregation. National Community Reinvestment Coalition.

[45] Will Kenton, ZONING ORDINANCE: DEFINITION, TYPES OF REGULATIONS, PROS AND CONS INVESTOPEDIA, https://www.investopedia.com/terms/z/zoning-ordinance.asp (last visited Apr 24, 2024).

[46] *Id.*

housing diversity and affordability in those areas, making it difficult for lower-income residents to find housing options. Similarly, ordinances that exclusively allow for high-end development, such as luxury condos, upscale retail, or commercial spaces, restrict the construction of affordable housing options while simultaneously driving up property values, rental prices, and the general cost of living, making it unaffordable for members of the community who lived in the area prior to development.

In many cases throughout the country, developers have petitioned urban municipalities to rezone targeted areas as mixed-use developments.[47] Mixed use developments combine residential and commercial spaces to create communities designed to attract young professionals and families to the area and, by extension, the city.[48] Whether by design or neglect, mixed use zoning tends to reduce housing affordability in neighborhoods, leading to the displacement of existing residents and small businesses as new investment and development makes the area more desirable for wealthier newcomers.[49]

In Pittsburgh, Pennsylvania, major mixed-use projects are zoned as (SPs).[50] Intended to create efficient, functional, and attractive urban areas, zones subject to this SP designation are afforded "a substantial amount of flexibility" in site planning because of their large size and relative isolation from any neighborhood context.[51] Absent any official regulations aimed at combating gentrification, developers in SP zones have operated with relative impunity. There is perhaps no better example of how this zoning operates than the development of Bakery Square in Pittsburgh's East Liberty neighborhood. Originally a Nabisco factory that was abandoned in the late 1990s, Bakery Square has been transformed in recent years into a mixed-use development that houses a series of offices, stores, and restaurants. It also caused rents to triple in the surrounding area upon its creation, coinciding with major residential and business casualties.[52] And while the developers of Bakery Square made efforts to mitigate their greenhouse gas emissions during the construction process, they did not work to address the gentrification caused by the project, nor did they address the subtle ways in which that gentrification increased greenhouse gas emissions in the area.

III. Gentrification Impacts Climate Change because Construction Is a Major Greenhouse Gas Emitter

While gentrification itself has yet to be widely identified as a direct cause of global warming, it is clear, when evaluating the evidence created by decades of urban renewal projects

[47] Moos, M., Vinodrai, T., Revington, N., & Seasons, M. (2018). Planning for Mixed Use: Affordable for Whom? *Journal of the American Planning Association*, *84*(1), 7–20. https://doi.org/10.1080/01944363.2017.1406315
[48] *Id.*
[49] *Id.*
[50] Pittsburgh, Pa., Code of Ordinances § 909 (2022).
[51] *Id.*
[52] Christine H. O'Toole, *Slumbering Pittsburgh Neighborhood Reawakens*, THE NEW YORK TIMES, March 2, 2010.

across the United States, that the climate crisis is being fueled, at least in part, by the vicious cycle that is gentrification.

The primary way that gentrification has contributed to climate change is in the construction that the former necessitates. The first stage of gentrification, in most instances, is the individual renovation of homes and buildings in an underserved area.[53] From there, developers and investors come into the area, adding new residential and commercial developments, updating area amenities, and improving the general infrastructure. On top of driving up property values and rental rates in surrounding areas, the construction required to build and renovate structures in this way is taxing on the environment. From the extraction and manufacturing of raw materials like steel, glass, and cement, to the transportation and assembly of those materials into complex structures, to the use of diesel and gasoline-powered equipment like excavators, bulldozers, cranes, and trucks, each stage of the construction process involves activities that require the emission of fossil fuels into the environment. [54] As a result, construction is one of the leading energy-emitting industries in the world today, with nearly 2 percent of total U.S. energy consumption coming from the sector.[55]

Nearly every aspect of gentrification involves at least some construction, and most projects require extensive amounts in order to create an area catered to wealthier residents. As an example, lets again turn to Pittsburgh's East Liberty neighborhood. Located roughly five miles east of downtown Pittsburgh, the area was Pennsylvania's third-most active business district behind only the downtown areas of Philadelphia and Pittsburgh in the 1950s and 60s.[56] Since that time, East Liberty has twice experienced the cycle of gentrification, resulting in the razing of over 1,200 homes, the displacement nearly 4,000 residents, and the dislocation of roughly 600 businesses.[57] In their place, city planners developed an outdoor mall that ultimately failed to attract middle-class residents to the area, causing investors to flee. This project, aside from its soullessness and lack of commercial success, was an extensive constructional undertaking that required millions of dollars' worth of manpower, equipment, and, by proxy, greenhouse gas emissions.

Worse yet, nearly all of the construction in East Liberty occurred before the creation of the U.S. Green Building Council (USGBC), an organization that sets environmental standards for building design, construction, and operation.[58] The USGBC is a non-profit organization and not a government agency, thus it cannot require developers or companies to follow any of its

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[53] Marisa Twigg, REVITALIZATION OR DISPLACEMENT: WHAT IS GENTRIFICATION REALLY? MATTER NEWS, https://www.matternews.org/community/developus/gentrification-explained#:~:text=STAGE%201%20%E2%80%94%20INDIVIDUAL%2C%20LOWER%2D,and%20fix%20up%20area%20homes. (last visited Apr 17, 2024).

[54] Aurora L. Sharrard, H. Scott Matthews & Michael Roth, ENVIRONMENTAL IMPLICATIONS OF CONSTRUCTION SITE ENERGY USE AND ELECTRICITY GENERATION1 | JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT | VOL 133, NO 11, https://ascelibrary.org/doi/10.1061/(ASCE)0733-9364(2007)133:11(846) (last visited Apr 21, 2024).

[55] *Id.*

[56] John Tierney, A RENAISSANCE RUNS THROUGH IT CITY JOURNAL (2023), https://www.city-journal.org/article/a-renaissance-runs-through-it (last visited Apr 23, 2024).

[57] *Id.*

[58] About the U.S. Green Building Council, PRESS: ABOUT USGBC | U.S. GREEN BUILDING COUNCIL, https://www.usgbc.org/press/about-usgbc#:~:text=The%20U.S.%20Green%20Building%20Council%20(USGBC)%20is%20a%20nonprofit%20organization,transformation%20of%20the%20built%20environment. (last visited Apr 23, 2024).

guidelines.[59] Its existence, however, ensures that there is an organization promoting sustainability in the building and construction industry, which is not something that can be said about the previous 200 years of American industrialism. Before the USGBC was founded in 1993, for example, developers did not have to concern themselves with things like effective wastewater management and recycling infrastructure on construction jobs, both of which are standards that USGBC approved buildings must meet.[60] Without having to abide by these and other USGBC guidelines, the construction in East Liberty, like most construction prior to 1993, was likely conducted in an environmentally ineffective manner.

By 2000, East Liberty was again one of Pittsburgh's poorest neighborhoods, only now the lack of economic opportunity in the area caused it to become notorious for drug-dealing and other crime.[61] These conditions made East Liberty ripe for a second attempt at gentrification, and it did not take long for developers and city planners to pounce. Since the turn of the 21st century, developers have replaced 1,400 high-rise public housing units in East Liberty with 450 newer mixed-income units, and large retailers like Whole Foods and Trader Joes have put stores in the area.[62]

Most recently, a company called Walnut Capital took advantage of Pittsburgh's Specially Planned District zoning designation to build an open-air shopping and office development in East Liberty. This project, the aforementioned Bakery Square, involved three years of heavy construction and development, costing the developers and the city $135 million dollars in total.[63] Unlike the first attempt at gentrification, Bakery Square was created with the environment in mind, earning the USGBC's platinum certification under its Leadership in Energy and Environmental Design (LEED) Rating System.[64] This rating was granted in part because the developers were able to complete the project while only demolishing a section of the original Nabisco factory's three-story structure and because they used on-sight technologies like photovoltaic panels for renewable energy harvesting.[65] While it is important that developers consider ways to limit the emissions generated by construction projects, the emissions prevented at the Bakery Square development were incidental in the context of the emissions that were generated. Additionally, due to the fact that green construction projects are usually 3-5% more expensive to build than conventional construction projects, and because the developers do not suffer financial harm by opting not to build in an environmentally friendly manner, it is rare for developers to take even these incidental steps to reduce emissions.[66] As of today, new home construction in the US, including construction

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[59] *Id.*
[60] *Id.*
[61] John Tierney, A RENAISSANCE RUNS THROUGH IT CITY JOURNAL (2023), https://www.city-journal.org/article/a-renaissance-runs-through-it (last visited Apr 23, 2024).
[62] Christine H. O'Toole, *Slumbering Pittsburgh Neighborhood Reawakens*, THE NEW YORK TIMES, March 2, 2010.
[63] *Id.*
[64] Schooley, Tim. "Bakery Square achieves LEED platinum certification." Pittsburgh Business Times. 28 Oct. 2010.
[65] *Id.*
[66] About the U.S. Green Building Council, PRESS: ABOUT USGBC | U.S. GREEN BUILDING COUNCIL, https://www.usgbc.org/press/about-usgbc#:~:text=The%20U.S.%20Green%20Building%20Council%20(USGBC)%20is%20a%20nonprofit%20organization,transformation%20of%20the%20built%20environment. (last visited Apr 23, 2024).

related to gentrification, creates over 50 million tons of embodied carbon emissions annually, equivalent to the yearly emissions from entire countries such as Norway, Peru, and Sweden.[67]

IV. Gentrification Impacts Climate Change because Energy Consumption is Greater in Gentrified Areas

Another, more subtle way in which the cycle of gentrification contributes to climate change is that it tends to increase greenhouse gas emissions in affected communities. There are several reasons that this rise in emissions occurs in gentrified communities, the first having to do with changes in home infrastructure. Gentrification is meant to attract wealthier residents to previously underdeveloped urban areas, meaning that developers have to either renovate the homes and apartment complexes that already exist in the area or build new ones that cater to the interests of the desired populations. [68] Because of this reality, one of the first steps in the gentrification process involves the remodeling and renovation of a large number of homes in urban areas.[69] It is common for utility use, which is a well-established generator of greenhouse gas emissions, to spike during this process.[70] Once refurbished, these homes are more energy efficient than they once were prior but are also capable of using more energy due to updated infrastructure, modernized utilities, and improved access to energy sources.[71]As new residents move into these homes, the issue is exacerbated by the fact that they, on average, are more likely to consume higher amounts of electricity, more water, and additional sewage services compared to the longstanding residents that populated the communities before them.[72]

Finally, in addition to attracting higher-emitting residents, gentrification works to facilitate the introduction of higher-emitting buildings and structures into gentrified areas. These structures, oftentimes large office buildings or live-work environments, substantially increase greenhouse gas emissions in the places where they are located. In Pittsburgh's East Liberty neighborhood, for example, the gentrification cycle was ignited by the development of Bakery Square, which emitted 3,904.6 tons of C02E into the atmosphere by itself during 2020.[73] By comparison, 153 structures owned by the city collectively emitted around 17,000 tons of greenhouse gases during the same

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[67] Chris Magwood and Tracy Huynh, The Hidden Climate Impact of Residential Construction, RMI, 2023, https://rmi.org/insight/hidden-climate-impact-of-residential-construction/.
[68] Ashley Watters, HOW DOES GENTRIFICATION AFFECT OUR UTILITIES? SCADATA (2019), https://scadata.net/gentrification-affect-utilities/#:~:text=Once%20new%20families%20are%20settled,water%2C%20and%20additional%20sewage%20services. (last visited Apr 24, 2024).
[69] *Id.*
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] Oliver Morrison, Which Pittsburgh buildings emit the most greenhouse gases? see how they compare. PublicSource (2021), https://www.publicsource.org/which-pittsburgh-buildings-reported-the-most-greenhouse-gas-emissions/ (last visited Apr 25, 2024).

year.[74] Energy use intensity, or EUI, is a measurement of a structure's energy efficiency.[75] Taking account for size and other characteristics, EUI is calculated by dividing the total energy consumed by the structure in one year by its total gross floor area.[76] In 2020, the Bakery Square property maintained an EUI of 241.9, making it one of the more energy intensive buildings in the city of Pittsburgh.[77]

Building emissions in Pittsburgh are not an issue exclusive to Bakery Square, as buildings in the city produce four times as many emissions as vehicles.[78] Other structures associated with gentrification, like hotels, parking garages, and higher-emitting grocery and department stores also contribute greatly to emissions. The city's median hotel and median parking garage by EUI are both several points higher than the national median.[79]

A. Combating Building Emissions

Pittsburgh's leadership has sought to combat this building emission crisis through local legislation. In 2016, for example, the city enacted an ordinance requiring owners of non-residential buildings fifty thousand square feet or more of indoor floor space to submit complete energy and water use statistics to the city.[80] The goal for this law, which has become known colloquially as the Pittsburgh Building Benchmarking Ordinance, is to encourage private building owners to reduce their energy use.[81] In the years since the ordinance has been in effect, the city has released the statistics to the general public in an effort to increase transparency and place public pressure on high-emitting and noncompliant organizations.

While the Building Benchmarking Ordinance and the publication of the statistics has increased transparency about building emissions, it has not gone far enough to curb such emissions in a substantial way or allow the public to truly evaluate the impact of gentrification on greenhouse gas emissions. First, although the ordinance is designed to have private entities report their emissions, it is underinclusive in attempting to achieve that goal. This is, in part, because the city does not require residential complexes of any size to report their emissions. Walnut Capital, the company who developed Bakery Square, also owns thirty five rental properties with 2,500 total units in close proximity to the Bakery Square development.[82] With the least expensive of these

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[74] *Id.*
[75] What is energy use intensity (EUI)?, ENERGY STAR, https://www.energystar.gov/buildings/benchmark/understand-metrics/what-eui (last visited Apr 30, 2024).
[76] *Id.*
[77] Oliver Morrison, Which Pittsburgh buildings emit the most greenhouse gases? see how they compare. PublicSource (2021), https://www.publicsource.org/which-pittsburgh-buildings-reported-the-most-greenhouse-gas-emissions/ (last visited Apr 25, 2024).
[78] *Id.*
[79] Oliver Morrison, HOW MUCH PITTSBURGH'S LARGEST BUILDINGS CONTRIBUTE TO CLIMATE CHANGE IS PUBLIC PUBLICSOURCE (2021), https://www.publicsource.org/pittsburgh-climate-change-emissions-buildings-benchmark-greenhouse-gases-energy/ (last visited Apr 30, 2024).
[80] Pittsburgh, Pa., Code of Ordinances § 629 (2016).
[81] Oliver Morrison, HOW MUCH PITTSBURGH'S LARGEST BUILDINGS CONTRIBUTE TO CLIMATE CHANGE IS PUBLIC PUBLICSOURCE (2021), https://www.publicsource.org/pittsburgh-climate-change-emissions-buildings-benchmark-greenhouse-gases-energy/ (last visited Apr 30, 2024).
[82] Find your happy place, WALNUT CAPITAL, https://www.walnutcapital.com/apartment-for-rent-in-pittsburgh (last visited Apr 30, 2024).

housing options being a one-bedroom apartment listed at $1,475 per month, these complexes are very obviously an incident of gentrification, but because the city does not require them to report their emissions, it is difficult to gauge Walnut Capital's total emissions in Pittsburgh.[83] This concept applies to the city's other large apartment complexes as well, many of which were created during some point in the gentrification cycle.

Another problem with the Building Benchmarking Ordinance is that there is no legal mechanism to compel compliance. According to the ordinance, an owner of an effected building who successfully complies with the benchmarking requirements is publicly classified as "participating," while owners who fail to comply are publicly classified as "eligible and non-participating."[84] Outside of this classification, there is punitive action taken against noncompliant building owners, nor is there any benefit incurred by complying with the ordinance. In this way, the ordinance reads more like a suggestion than a legally binding order, and as a result many buildings subject to the ordinance are noncompliant to this day. Some of Pittsburgh's largest structures, like Acrisure Stadium, PNC Park, and PPG arena did not comply with the ordinance and hardly received any recourse from the city for their noncompliance.[85] Without more aggressive methods of enforcement, it is impossible for the city to compel full compliance with the ordinance, and without full compliance it is impossible to capture the exact emission levels of the city and work to determine a more concrete plan of action.

V. Gentrification Impacts Climate Change because Displaced Residents Are Forced into Energy-Inefficient Housing

The most nefarious way in which the cycle of gentrification contributes to climate change is that it forces displaced individuals and families into energy inefficient communities. When a community is gentrified and its prior inhabitants are forced to move elsewhere as a result of increased housing costs, those individuals oftentimes relocate into socioeconomically disadvantaged neighborhoods.[86] This kind of transition, aside from making people distant from important personal networks and social resources, also causes lower income families to live with declining physical infrastructure, which has a substantial negative impact on energy inefficiency. Homes and apartment complexes in lower income areas tend to be older, and thus they are regularly associated with having structural issues like outdated water pipes, obsolete electricity wiring, and derelict materials.[87] Each of these conditions causes energy inefficiency in that they

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[83] *Id.*
[84] Pittsburgh, Pa., Code of Ordinances § 629.07 (2016).
[85] Oliver Morrison, Which Pittsburgh buildings emit the most greenhouse gases? see how they compare. PublicSource (2021), https://www.publicsource.org/which-pittsburgh-buildings-reported-the-most-greenhouse-gas-emissions/ (last visited Apr 25, 2024).
[86] Freeman, L., Hwang, J., Haupert, T., & Zhang, I. (2024). Where Do They Go? The Destinations of Residents Moving from Gentrifying Neighborhoods. Urban Affairs Review, 60(1), 304-348. https://doi.org/10.1177/10780874231169921
[87] Ashley Watters, HOW DOES GENTRIFICATION AFFECT OUR UTILITIES? SCADATA (2019), https://scadata.net/gentrification-affect-

allow energy to escape from the home or building before it can be properly accessed by the inhabitants. Old pipes and wires, for example, allow water and electricity to leak out while it is being transported. Similarly, older, more dilapidated homes and buildings are made of decaying materials that allow energy like heat to seep out of its intended space. As a result of these and other structural issues, lower-income households experience a median energy burden nearly seven times higher than that of their wealthier counterparts.[88] This occurs because inefficient energy usage requires a greater output of energy to achieve the same output of service, meaning that lower-income residents must use more energy to adequately meet their needs than residents whose housing is more energy efficient. This efficiency gap essentially negates the usage gap that exists between wealthier and low-income households and makes it virtually impossible for energy insecure communities to consider the environment when making decisions about their energy use. Inefficient energy consumption exacerbates environmental degradation, including air and water pollution, deforestation, and habitat destruction.[89]

A. Energy Inefficiency Perpetuating Energy Insecurity & Health Concerns Arising from Energy Inefficiency

Energy inefficiency is harmful to the environment because it allows unnecessary greenhouse gas emissions to be generated and pushed into the atmosphere. It is also harmful to the people living in energy-inefficient communities, as perpetuates energy insecurity and makes it more difficult for people to combat the negative health repercussions of climate change.

Defined as the inability to adequately meet basic household energy needs, a household is considered to be energy insecure when more than 6% of the household's income is being used on energy.[90] In Los Angeles County, one of the only municipalities in the nation that has released data on the subject of energy insecurity, the average energy burden grows dramatically as household income declines, with households earning 30% or less of California's median income spending more than 10% of their income on energy.[91] This situation works to further drain the already-limited resources of populations effected by energy insecurity and put them at risk of significant health issues. Energy inefficiency is tied to adverse temperature-related health issues such as hypothermia and heat stress.[92]

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utilities/#:~:text=Once%20new%20families%20are%20settled,water%2C%20and%20additional%20sewage%20services. (last visited Apr 24, 2024).

[88] Jessel S, Sawyer S, Hernández D. Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature. Front Public Health. 2019 Dec 12;7:357. doi: 10.3389/fpubh.2019.00357. PMID: 31921733; PMCID: PMC6920209.

[89] Environmental impact of energy, European Environment Agency (2017), https://www.eea.europa.eu/help/glossary/eea-glossary/environmental-impact-of-energy (last visited May 2, 2024).

[90] Dan Oberle & Aileen Qin, Energy burden and weatherization across Los Angeles County Neighborhood Data for Social Change, https://la.myneighborhooddata.org/2021/10/energy-burden-and-weatherization-across-los-angeles-county/ (last visited April 25, 2024).

[91] *Id.*

[92] Jessel S, Sawyer S, Hernández D. Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature. Front Public Health. 2019 Dec 12;7:357. doi: 10.3389/fpubh.2019.00357. PMID: 31921733; PMCID: PMC6920209.

Ironically, climate change, driven in part by inefficient energy use and resulting greenhouse gas emissions, increases the frequency and severity of extreme weather events, which can damage energy infrastructure, cause energy inefficiency, and lead to health issues. A 2019 polar vortex that occurred across the United States, for example, caused some parts of the Midwest reached temperatures as low as minus 38 degrees Fahrenheit, leading to gas and energy shortages in many cities.[93] It is estimated that 21 people died across the country from causes directly related to the polar vortex, such as death by hypothermia while indoors, with at least one death occurring after a thermostat malfunction.[94] As weather patterns become more extreme as a result of climate change, it is anticipated that energy insecure communities will have to face an even greater burden.

VI. Conclusions

Addressing climate change at its intersection with gentrification will require a multifaceted approach that prioritizes regulatory oversight, transparency at the local level, and community-centered solutions. Specifically, gentrification-related climate change can be combated through (1) the increased regulation over the character and manner of construction projects that may cause gentrification, (2) the enacting of local energy transparency ordinances that have strong mechanisms for ensuring compliance, and (3) a focus on gradual improvements to the infrastructure of lower-income communities as opposed to complete overhauls of longstanding communities and their residents.

First, increased regulation over construction projects susceptible to gentrification can help to mitigate the environmental impact of such projects by safeguarding against excess greenhouse gas emissions. Creating and mandating a certification system similar to LEED at the local level of government would establish a standard for energy efficiency and resource conservation in the construction industry and ensure that all future construction projects live up to that standard. Maintaining such requirements would serve the dual purpose of raising the price of developing in urban areas, thus reducing the number of developers seeking to undertake projects in low-income communities and potentially slowing the cycle of gentrification as a result.

Second, the implementation of local energy transparency ordinances with robust compliance mechanisms would ensure accountability and foster sustainable development practices. Here, while cities like Pittsburgh have local ordinances that require private companies and buildings to report their emissions, such laws have been written without providing the city with any means of mandating that the building owners follow the law. And while the current punishment for noncompliance, being listed on the city's website as a noncompliant entity, does put some level of public pressure on organizations to report, it has not been enough to compel

[93] *Id.*
[94] *Id.*

some of Pittsburgh's largest property owners. Strengthening the enforcement mechanisms of the ordinance is essential to hold those who disregard environmental regulations accountable. Further, once stronger enforcement methods are implemented, the ordinance should be expanded to apply to owners of large residential complexes as well. If the goal of the ordinance is to identify and address the emissions of large buildings across the city of Pittsburgh, then all large buildings, regardless of their commercial purpose, should be subject to the law.

Finally, efforts to improve the energy efficiency of low-income areas, as opposed to creating new, higher income areas, present a more sustainable and socially responsible alternative to gentrification. Such efforts help mitigate the environmental and social consequences of gentrification while promoting equitable access to energy-efficient solutions. With this in mind, city planning ordinances and government project funding should cater towards gradual infrastructure improvements in lower-income communities instead of wholesale redevelopment of such areas. Unlike the sudden changes to the demographics and character of neighborhoods brought on by gentrification, a slower, more methodical approach to urban development can see the establishment of intentional communities, where residents of different economic and financial means live comfortably amongst each other. Not only would such arrangements be better for the environment, but they would allow policymakers to protect their urban environments and the people who inhabit them from adverse health risks associated with poor housing infrastructure.

In sum, gentrification is a socioeconomic phenomenon that, even without accounting for its environmental impact, is detrimental to vulnerable populations and society as a whole. Considering the ways in which gentrification fuels climate change, one of the most pressing issues in the world today, it is clear that the cycle of gentrification is one that leaders on all levels of government should be working to curb. Prioritizing the outlined actions on a local level would serve as a tremendous step in the right direction as it relates to reducing both gentrification itself and the greenhouse gas emissions that are direct and indirect products of gentrification. By integrating these ideas into urban planning and policy frameworks, local leaders and policymakers can contribute to creating communities that are both environmentally sustainable and socially just, paving the way for a more resilient and equitable future.