

Combatting The Inequities of Modern Urban Infrastructure in American Cities

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ABSTRACT: Urban infrastructure has long served as a tool of exclusion by reinforcing segregation through hostile design and disproportionate resource allocation. These patterns have contributed to persistent social and economic disparities across American cities. This paper analyzes these patterns and poses corresponding solutions ranging from zoning reforms to modular housing to complete streets. These comprehensive reforms in transportation, housing, and public space planning can address structural inequities, dismantle long-standing barriers, and support the creation of more inclusive and equitable urban communities.

KEYWORDS: Urban Planning, Public Policy, Transportation, Housing, Public Spaces.

■ Introduction

Social inequities in the past decades have become increasingly embedded into modern urban architecture: whether that be strategically uncomfortable park benches, uneven distribution of public amenities, public spaces inaccessible by public transportation, or scarcity of safe and well-lit gathering spaces in lower-income neighborhoods. While this infrastructure is common and appears to serve purely technical purposes, it has long acted as a tool of social organization by quietly reinforcing racial, economic, and spatial exclusion.

In cities around the world, the Great Depression had severe implications financially, culturally, and politically. As a direct result, unemployment, mass evictions, and homelessness in the 1900s skyrocketed. Millions of people were forced to resort to slum-living on the streets, sleeping in subways, or waiting all day in queues, hoping to get accepted to a public shelter.¹ Simultaneously, government funding dedicated to creating safe and upkept public spaces had plummeted. Entire neighborhoods were neglected and stripped of essential resources, and by the end of the Great Depression, living conditions were entirely inhumane: unsanitary, dangerous, and devoid of basic rights and dignity. Even so, as cities began to get back on their feet, funding was still incredibly sparse. In response to this shortcoming, government officials working to decrease home foreclosures, known as the Home Owners' Loan Corporation (HOLC), classified neighborhoods into one of four colors:²

- GREEN was the highest classification. GREEN neighborhoods housed the white affluent population; were viewed as "safe" investments due to their racial homogeneity, higher property values, and established wealth; and were HOLC's priority in receiving loans, public investment, and infrastructural development.

- BLUE was the second-highest classification. BLUE neighborhoods were "still desirable," but they perhaps bordered "hazardous" neighborhoods or consisted of older buildings, putting them at a lower property value and thus were a lower priority.

- YELLOW was the third highest classification. YELLOW neighborhoods were labeled as "definitely declining" and were often home to working-class white families or racially mixed populations. While not yet considered "hazardous," they were seen as highly risky locations for investment due to heterogeneous demographics and proximity to "hazardous" neighborhoods.

- RED was the lowest classification. RED neighborhoods were the most aid-deprived classification. Primarily inhabited by Black, immigrant, and working-class families, RED neighborhoods were subject to immense racial discrimination and were labeled as "hazardous." They also saw a constant flux of people that HOLC believed was creating unstable communities prone to crime and social disorder. With no expectations of sustaining property values, RED neighborhoods were considered unworthy of any long-term investments.

With these color classifications, HOLC created and published Residential Security Maps for cities worldwide. Known as "redlining," each city map outlined its neighborhoods in either green, blue, yellow, or red, indicating whether or not it was deserving of public investment, protection, and resources. Redlining not only reflected existing prejudices but also, as an official government policy, laid the foundation for deeper social divides by institutionalizing exclusion and embedding inequality into urban development. Systemically approved exclusion stemming from policies such as redlining is still manifested in public transportation, housing, and public spaces today.

There is an urgent need for just urban development in rapidly growing cities, where infrastructure increasingly perpetuates societal inequality. This paper examines the social disparities manifested through public infrastructure in rapidly developing, urban American cities and how civil engineering can be used to promote higher equity. Section 1 will discuss transportation: its affordability, accessibility, safety, disproportionate funding allocation, and proposed solutions. Section 2 will discuss housing: the history of gentrification and zoning laws, affordability and housing cost inflation, slum-living, and proposed solutions.

Section 3 will discuss public spaces: disproportionate distribution between neighborhoods, defensive architecture, neglect of environmental threats, and proposed solutions. By analyzing historical policy documents, various maps, and comparative case studies of urban neighborhoods outside of America, this paper will reveal how urban planning and civil engineering can be used as instruments to promote social equity in urban American cities, rather than as weapons against it.

■ Transportation

Urban cities employ public transit, highways, and street design to favor the wealthier neighborhoods while marginalizing the lower-income communities. Through examining the public spaces only accessible via highway, lack of sufficiently shaded sidewalks for pedestrians, disproportionate allocation of transit allocation, and qualifications of a “complete street,” this body section identifies the flaws in urban American cities’ transit systems and proposes solutions.

Before the invention of the automobile, transportation in cities primarily meant traveling on foot. Proximity was crucial, so schools, markets, workplaces, and homes were often all clustered together within neighborhoods. When horse-drawn streetcars, trolleys, and early rail systems began to emerge, communities first experienced racial disparities through vehicles: segregation in waiting areas for buses and trolleys became common, and faster transportation enabled wealthier populations to live further away from the lower-income families who could not afford to do the same. With increasingly more effective solutions to forced geographic intimacy, the advancement of transportation in cities quickly proved its capability to exacerbate social divisions.

The invention and mass production of cars in the 20th century, in fact, amplified this effect to an unprecedented degree. As personal car ownership skyrocketed, America’s priorities shifted to accommodate this new surge of needs, evident through the 1956 Federal-Aid Highway Act, which re-appropriated billions of dollars from public transportation funds to support the construction of highways. Not only did this mean that widely accessible transportation was receiving less funding from the government, but that money was now for highways: only a usable form of transportation for the small percentage of Americans who were wealthy enough to afford their own car. In fact, approximately 20% of funding for surface public transportation is allocated towards public transit, while the remaining 80% is earmarked for highways.³

Although they were marketed as symbols of modernity and economic progress, highways directly reinforced racial segregation and economic stratification. City planners deliberately routed major expressways through Black, immigrant, working-class, and redlined neighborhoods, displacing thousands of residents who were already politically disadvantaged. These highways, additionally, were used as tools of division and physically divided cities into fragments. Highways ensured that cities were entirely un-navigable by those without cars, by excluding them from supposedly public spaces. Robert Moses, an urban planner in New York City, for example, designed many parks and highways with intentionally limited access.

His highways leading to his parks included many low bridges that could not accommodate public buses, suggesting that he did not want those without their own car to access his parks.

HOLC’s redlined maps further enabled the exclusive nature of highways. Green and yellow outlined neighborhoods reaped the benefits of the increased transportation opportunities and large investments. Meanwhile, red and yellow neighborhoods were severely underfunded and often forced to remove public transportation altogether. This ultimately left them with inadequate transit options, cutting them off from parts of the city with abundant job opportunities, schools, and healthcare services. This lack of connectivity further entrenched socioeconomic inequalities, as residents in redlined areas were unable to take advantage of the growing economic opportunities that highways and better transportation options provided to wealthier, predominantly white communities.

Beyond highways, the design of streets in urban cities has historically been centered around accommodating automobiles, often at the expense of pedestrians and cyclists. Roads were widened, streets were straightened, and public spaces were redesigned to prioritize the movement of vehicles. These decisions were made with little regard for pedestrians or cyclists, creating urban spaces that are often inhospitable to those who don’t own or drive a car. Sidewalks became narrower, bike lanes virtually nonexistent, and pedestrian crossings were rarely prioritized. This car-centric focus in city planning created environments that were often uncomfortable and unsafe for those without cars, particularly in lower-income neighborhoods. As highways and major roads frequently divided communities, it became increasingly difficult to navigate the city without a car, perpetuating the cycle of inequality. Yet in redlined and underfunded areas, this unsafe street design, coupled with a lack of accessible, well-funded public transportation, further isolates residents, deepening existing socioeconomic disparities.

To address these issues, urban planners and civil engineers should advocate for the concept of “complete streets”: a framework that seeks to design streets that are safe, accessible, and inclusive for all users, regardless of their mode of transport. Complete streets incorporate features like wider sidewalks, dedicated bike lanes, safer pedestrian crossings, and better access to public transportation. By reimagining street design to serve not just cars, but also pedestrians, cyclists, and transit riders, cities can reduce the physical and social barriers that segregate communities and promote more equitable urban development.⁴ Complete streets can ensure that redlined neighborhoods receive the same level of infrastructure upgrades and resources as wealthier green and yellowlined communities. Features such as wide, well-lit sidewalks, safe pedestrian crossings, dedicated bike lanes, and traffic-calming measures (e.g., speed bumps, raised intersections) not only will enhance mobility and safety but also foster greater inclusion. Complete streets will cater to all individuals, including children, the elderly, people with disabilities, and those without access to cars, thus reducing the marginalization of lower-income or historically underserved populations. Additionally, complete streets address these issues by shrinking the car-centric ideal. Designing streets that are not only safe

for pedestrians and cyclists but also have easy access to public transit will help cities provide more equitable mobility options for all residents. Features like bus lanes, transit stations, and bike-sharing programs integrated into street design make it easier and more affordable for people to travel without relying on their car. Complete streets will work to break the social cycle of car dependence by enhancing the pedestrian and bicyclist experience through higher safety and comfort.

From highways that cut through and displaced lower-income neighborhoods to the lack of investment in public transit for those who need it most, the way America has organized its transportation systems has severely exacerbated existing social inequities. Redlining, coupled with car-centric street designs, makes it nearly impossible for many people without cars to access the workplaces, schools, and public spaces. Implementing more complete streets can help reconnect neighborhoods and give all residents equal access to the city.

■ Housing

Housing should provide the foundation for stability, social and economic opportunity, and help foster community. Yet in many American cities, housing policies and market forces have perpetuated inequality through exclusionary zoning, gentrification, and the neglect of affordable housing needs. In fact, the American housing crisis is rooted in decades of biased policies that have systematically restricted access to affordable, adequate, and secure housing for marginalized communities. These dynamics have created a system where the ability to live in a safe, stable, and well-connected neighborhood is increasingly reserved for the wealthy. This body section examines the roots of inequitable housing policy, the modern consequences of rising costs and displacement, and potential solutions that reframe housing as a human right rather than a market commodity.

Exclusionary zoning laws are local regulations dictating what forms of housing can be built in specific neighborhoods. Practiced in almost every American community, these laws have played a central role in shaping the economic and racial geography of American cities. Its discriminatory regulations create invisible entry barriers for certain demographics; limit housing diversity and affordability; ban multifamily dwellings; and impose large minimum lot sizes. Exclusionary zoning, similar to many aspects of public transit systems, legally reinforces racist ideologies and limits lower-income families' access to high-opportunity districts with more places of work, higher education, safer streets, and greater public investment.

Alongside zoning restrictions, gentrification has emerged as one of the most prevalent forms of displacement in American cities. As a “profit-driven race and class reconfiguration of urban, working-class communities of color that have suffered from disinvestment,” gentrification transforms neighborhoods by forcefully removing the low-income community residing in the area due to the influx of wealthier and higher-prioritized populations.⁵ Gentrification often begins when older buildings are refurbished into modern apartments, upscale cafes, or boutiques, and neighborhoods begin catering to the tastes of their new audiences. Newcomers are attracted to this cultur-

ally-rich yet refurbished and modern space, and increasingly drive up demand for housing, art, and other goods. Accordingly, property values and rents increase significantly. Then suddenly, residents can no longer afford to live in their own neighborhoods. Gentrification reveals how housing systems in American cities prioritize economic gain over residential stability in lower-income communities—how they can harm without even a second thought.

Historically, through exclusionary zoning, gentrification, and redlining, low-income Americans in quickly developing cities have been forced to resort to living in slums: overcrowded, dilapidated, unsanitary, and crime-infested residential areas used by those experiencing extreme poverty.⁶ Even where housing exists in sufficient numbers, it often remains financially out of reach for the majority of residents. So ultimately, the government fails to support citizens' housing needs. Yet, instead of working to lessen the urban American housing crisis, city planners have continued to primarily develop higher-income segments, exponentially expanding the void of equity in the housing options. As a result, slums have grown increasingly common. After all, they provide solutions: slums satisfy bare-minimum living conditions, are affordable for low-income families, and, above all, can be conveniently proximate to work and social infrastructure.⁶

The history of gentrification, exclusionary zoning, and the growth of slums in American cities reveals the deeply-rooted neglect and discrimination against marginalized communities. Exclusionary zoning laws have restricted access to opportunity, while gentrification forces low-income residents out of once-affordable neighborhoods. Leaving unsanitary, dangerous, and substandard slums as the last refuge for many. Together, these forces illustrate how housing in American cities echoes the prioritization of wealthy populations and the neglected needs of marginalized communities.

To address these issues, zoning reform is critical. Zoning reform is one of the most powerful ways cities can dismantle the legal barriers perpetuating housing inequality. Traditional exclusive zoning dictates the number and types of houses that can be built in certain neighborhoods. It is rooted in exclusionary practices designed to keep out renters, immigrants, and people of color. This type of zoning significantly limits housing supply, drives up prices, and concentrates wealth and opportunity in already advantaged areas. Reforming these regulations is essential for creating more inclusive and just communities. The Minneapolis 2040 Plan is an example of a zoning reform working to close housing disparities. One of its primary goals is to eliminate single-family zoning citywide to allow for duplexes and triplexes in all residential neighborhoods. This will increase housing supply and also diversify the types of housing available, thus enabling more people to live in high-opportunity areas, which were once reserved solely for wealthy and predominantly white communities.⁷ While Minneapolis 2040 was implemented in 2020, it is not too late for other states to support their cities. Mainstreaming similar reforms across more American cities would help begin reversing centuries of exclusionary practices and foster more racially and economically integrated communities. Reforming zoning, which can

look like reducing minimum lot sizes, removing parking minimums, and permitting mixed-use developments, has the power to and should be utilized as a tool for inclusion.

In addition to Project Minneapolis 2040, American cities can look to Vienna, Austria, for housing inspiration. These large-scale social housing programs have successfully implemented municipally owned and subsidized housing options for residents of all incomes. They are also located in desirable areas, often within walking distance from cinemas to bars; highly affordable, “a fraction of typical rents for similarly sized and similarly located apartments in other major European cities,” and offer very enjoyable living conditions. This is all attributable to the fact that the majority of apartments and homes in Vienna are owned by the city.⁸ This ensures long-term affordability and dependability. By adopting a similar approach, American cities too could create stable, high-quality housing for all residents while combatting pressures of rapid development and gentrification.

Lastly, another promising solution to the American housing crisis could be the implementation of modified modular housing. Modular homes are prefabricated units that are constructed in factories, transported to their final destination, and then become liveable spaces upon a few minor assemblies. By being constructed in factories rather than on-site, modular homes eliminate construction delays caused by weather and benefit from precision machinery, making them some of the most efficient, cost-effective, and high-quality housing options available. Additionally, the production of modular homes is flexible and can be designed to accommodate different family sizes, income levels, and more personal needs.

Because these homes can be personalized, mass-produced, and delivered quickly, they offer a viable solution to the American housing crisis. Modular housing can ameliorate zoning bottlenecks, support mixed-income neighborhoods, and make high-quality housing more accessible and affordable for all communities.

Exclusionary zoning laws, the gentrification of low-income neighborhoods, and the normalization of slum-living have all perpetuated the American housing crisis of largely unaffordable, segregated, or unsafe living options. However, reformed zoning policies, social housing, and increased use of modular housing have the power to create cities that offer inclusive, high-quality, and accessible housing.

■ Public Spaces

Public spaces, in their name, are supposedly meant for the entire public population to enjoy. However, in reality, they consist of hostile defensive designs, uneven distribution of amenities, and varying levels of upkeep across different neighborhoods. Thus, public spaces, much like urban American transportation and housing systems, exclude lower-income areas and contradicts its alleged purpose. This body section examines how public spaces have historically catered to or excluded certain demographics and suggests ways these spaces can be reimagined through inclusive design.



Figure 1:



Figure 2:

Defensive architecture can look like benches segmented by armrests to prevent lying down, metal spikes embedded into flat surfaces, or sloped window sills that make it impossible to comfortably sit there. (Figure 1) is pictured to the left. I captured this image. (Figure 1) depicts a common bench in New York City, an American city ranked among the greatest homeless populations. This bench offers comfortable temporary seating, but, obstructed by armrests, is intentionally not long enough to allow someone to lie down. The photo of this bench was taken in the Upper West Side in Manhattan, a particularly wealthy neighborhood within New York. Its placement and design are very intentionally exclusive. (Figure 2) is pictured to the right.¹⁰ This image is from The Neighborhood Design Center. (Figure 2) depicts a series of large boulders in the shoulder of grass next to a larger road.¹⁰ At first glance, these boulders may simply appear as a strange stylistic decision. In reality, they serve as another form of hostile architecture meant to deter homeless individuals from camping out on these grassy patches.

While it is often justified as improving public safety and reducing maintenance, defensive architecture very directly targets the homeless populations by making public spaces uninhabitable for them.¹¹ The intent is not to create supportive environments for entire neighborhoods to share, but rather to discourage certain individuals from resting in and finding refuge in these shared areas. Defensive architecture treats the homeless population as a nuisance that should be removed rather than recognizing that they are people who need extra supportive infrastructure, social services, and a more inclusive housing system. Defensive architecture criminalizes the homeless population seeking rest and shelter in public spaces and implements “solutions” that ultimately reinforce the invisibility of marginalized groups and push them further out of spaces that should belong to everyone.

Exclusion can also occur through the uneven distribution of public amenities. Often, wealthier neighborhoods enjoy well-maintained parks, beautiful libraries, elaborate sports facilities, many public restrooms, and shaded sidewalks, while lower-income areas often lack these amenities completely. Having public access to restrooms, safe and well-lit streets, and clean drinking fountains are basic human right. City planners’ decisions to limit lower-income communities’ access to these rights indicate that they don’t have a standing regarding public spaces.¹² Even when public amenities do exist in low-income neighborhoods, they are often subject to neglect and don’t receive proper upkeep. These conditions are another indication that public spaces in low-income neighborhoods are not a pri-

ority for investment or care, reinforcing the message that those neighborhoods are less deserving of safe and well-maintained environments.

To address these issues, equal distribution of public amenities must become a mandate rather than an afterthought. Stricter guidelines should be present when civil engineers and urban planners design cities to ensure that every neighborhood, regardless of its income level, racial composition, or historical redlining status, has equal access to high-quality public spaces and amenities. Official access standards should be implemented and passed before construction can begin. Some of their requirements could include that all residents live within a certain distance (perhaps half a mile or less) from public parks, libraries, drinking fountains, and restrooms. These stricter guidelines should also ban the use of defensive architecture. Especially in rapidly developing urban cities, the number of Americans experiencing homelessness is skyrocketing—increasing as much as a 12% increase every year.¹³ As devastating and shocking as this statistic may be, it is the harsh reality of our world. Homeless response systems are doing their best to accommodate as many people as possible, but time and time again fall short. Simultaneously, defensive architecture eliminates the remaining public spaces that offer comfort, safety, and refuge for these populations. Public spaces should support all members of a community: privileged and vulnerable. By redesigning urban infrastructure with inclusivity and empathy at its core, cities can begin to restore dignity and security to those experiencing homelessness. Rather than pushing vulnerable populations further into the margins, we must create environments that offer access to basic needs, such as shelter, hygiene facilities, and rest areas, in public spaces. A truly equitable city uplifts every individual through compassionate policies, thoughtful design, and community-driven solutions.

Much like the social housing solutions inspired by Vienna, Austria, public spaces can promote higher inclusivity by observing other countries. Superkilen park in Copenhagen is a large public park spanning 750 meters throughout the city. Adorned with neon signs representing every nationality of its residents, Superkilen was constructed with the hope that it would foster social integration and celebrate cultural diversity within the community.¹⁴ The Superkilen park demonstrates how public spaces can celebrate diversity and encourage interaction among all members of a community. By taking inspiration from Superkilen, urban American cities can reimagine their public spaces to prioritize inclusivity, cultural representation, and community engagement.

Public spaces in many American cities have historically excluded marginalized communities through defensive architecture and unequal access to amenities. Instead of defensive architecture and uneven distribution of amenities, parks and plazas could feature flexible seating, accessible facilities, public art, and athletic facilities. Additionally, by taking inspiration from Superkilen, American cities can reimagine public spaces as inclusive, welcoming environments rather than sites of exclusion. Designing with empathy transforms public spaces into platforms of equity, dignity, and shared enjoyment, ensuring

that all residents can feel a sense of belonging in and respect from their environment.

■ Conclusion

The history of American urban infrastructure reveals how transportation, housing policies, and public spaces are wielded as tools that deliberately exclude vulnerable populations. These inequities are not remnants of the past, but active realities that continue to shape cities today. However, these systems can be reimagined as tools for equity. Complete streets can combat car-centric and divided neighborhoods; zoning reform can prioritize residents' stability over profit; and inclusive public spaces can serve and celebrate all members of communities. With a framework built on empathy and equity, urban planning and civil engineering can be reoriented to prioritize accessibility, equity, and inclusive communities.

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