Analysis of Green Roofs and Tree Planting as Effective Solutions to Health Issues in Formerly Redlined Communities

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Redlining is the historical practice of downgrading communities of color based on "creditworthiness", however, this term is a smokescreen for racial segregation. It has not only led to the government barring underprivileged groups from purchasing housing in affluent neighborhoods, but to the deterioration of the health of these residents as well. This is evident in a city influenced by redlining, Chicago, where redlined areas have a higher exposure to air pollution and hazardous waste treatment. They also generally have a higher risk of developing diseases such as asthma or cancer (City of Chicago, 2020). The reasons for this are rooted in this practice--the maps that "redlined" communities of color informed local land use decisions which then placed hazardous industries in and near redlined, or "D rated" neighborhoods (The Economist, 2021). Through a futuristic lens, another important factor influencing the health of residents in these neighborhoods is global warming. In urban areas, a phenomenon known as the urban heat island effect (UHI) causes higher temperatures due to higher concentrations of concrete absorbing heat. In redlined communities, there is a disparity in recorded temperatures between redlined and non-redlined neighborhoods due to the lack of greenspaces in non-redlined neighborhoods--which essentially means the urban heat island effect is more extreme. (Shandas, 2020). The severity of the environmental impacts that are already degrading the health of residents in redlined communities will continue to worsen. Through an ethical lens, it is imperative that a realistic solution is applied to ensure the safety of residents in these communities, however, history that reinforces segregation in major cities makes it challenging to implement substantial change. An effective solution is to increase vegetation. Greenery can be useful in both reducing pollution (Currie, 2008) as well as the heat island effect in redlined neighborhoods (Yang, 2008). Some researchers argue that a better potential option for increasing greenery in redlined areas are through increasing the urban canopy by planting more trees (Wang, 2016) whereas other perspectives argue that due to the spatial difficulties of planting trees, green roofs are a more effective and feasible solution in urban areas (Yang, 2008), despite the expenses. This paper considers the benefits and drawbacks to the different ways of increasing greenspaces in addressing the impacts of pollution and heat on the health of residents in redlined neighborhoods.

Analysis of Tree Planting as UHI and Pollution Mitigation

Many researchers claim that planting trees is one of the best ways to reduce both pollution and heat in urban areas. The reduction in pollution and heat when increasing the urban canopy is undeniable: urban trees are estimated to remove a total of 711,000 metric tons of CO2 and air pollution annually in the U.S, and "the shade they provide also intercepts solar energy and reduces the temperature of surfaces below." (Nowak, 2006). Research on the benefits to urban canopy was conducted through evaluating environmental conditions simulated in Montreal, Canada. The simulation had realistic parameters installed and attempted to accurately gauge the effectiveness in UHI (urban heat island effect) mitigation of trees. The conclusion of the study was that shading from trees successfully contributed to reducing the

absorption of solar radiation and therefore contributed to UHI mitigation. Additionally, researcher Vivek Shandas, specifically dedicated to researching the history of environmental racism as well as heat mitigation methods, stresses the importance of community-based organizations in planting more trees, despite the higher cost of planting trees in C and D rated communities by HOLC grading maps making it more difficult to do so (Shandas et al, 2020). Trees are not just useful in mitigating UHI and pollution--trees can also increase the aesthetic appeal of neighborhoods, something lacking in most redlined neighborhoods. For example, writer Alejandra Borunda for National Geographic details how the effect of walks in nature led to people with clinical depression feeling happier than they did before. Another noteworthy study, contributed by The Trust for Public Land, estimates that the health benefits of natural spaces in just 10 U.S. cities combined could be valued as high as $69 million each year. Trees are clearly effective means to mitigate heat, however, some limitations to the perspective are explored by other experts. For example, at least one meter of subsoil between concrete structures and the ground is required, making it difficult to plant a large number of trees (Hernández-Morales, 2022). Increasing trees can also increase gentrification, such as in New York, for example, when “an elevated park called the High Line that was built in 2009 raised nearby property values by 35 percent, displacing residents from the area” (Purtell, 2021) which led to some critics to consider increased greenery, such as a park, as less beneficial for residents that had previously been a target for redlining.

Analysis of Green Roofs as UHI and Pollution Mitigation

Researchers have also begun exploring other options when considering redlining heat and pollution mitigation. For example, some people have considered installing green roofs in redlined communities. Green roofs provide numerous benefits, such as lowering surface and air temperatures, absorbing pollutants and carbon dioxide, and even reducing and filtering stormwater runoff. (EPA, 2022) In metropolises or urban areas, green roofs are ideal because they do not occupy extra space on streets or sidewalks, making them much easier to construct. Specifically, In Chicago, rooftops account for 25% of land cover. Chicago has been experimenting with green roof installation, and the cooling benefits of the green and cool roof initiatives have already been noted via remote sensing. (Sharma, 2016). Compared to increasing urban tree canopy, green roofs have the advantage of being the easiest to implement. Increasing the urban tree canopy, at least on the federal level, takes much more time and planning to properly install. (Antonucci, 2022). In terms of specifically addressing the effects of redlining and using green roofs as a mitigation strategy, some researchers have explored green roofs as an alternative or addition to tree planting. For example, several researchers at the University of Maryland and Towson University have evaluated the disadvantages of urban tree canopy and green roofs in the City of Baltimore, while taking into consideration redlined communities that may need more mitigation. Their research concluded that green roofs are the most effective and efficient strategy for the city, since it was too difficult and time-consuming to implement a more extensive urban canopy in Baltimore.

Although this is a well intentioned strategy that a lot of other cities (e.g. Chicago) are planning to implement, there are some drawbacks to this solution. For example, although researchers consider green roofs to be a good potential solution to health impacts on redlined communities, when governmentally implemented, there can still be discriminatory practices. For example, in New York City, conservation biologists and researchers from Columbia University

observed the trend that neighborhoods with populations identified as most heat vulnerable were generally not being well served by green roofs (Treglia et al, 2022). This trend is not always observed in community-based organizations that work to solve this issue through increasing greenspaces and tree canopy in historically redlined neighborhoods. The major difference between these initiatives is the motive--people implementing green roofs generally aim to tackle the larger issue of UHI effect, whereas organizations dedicated to supporting redlined communities aim to plant trees or build parks, something more readily attainable than constructing green roofs.

For an effective solution to be implemented, people who control government action must understand the history of redlining and environmental racism: If either green roofs and/or tree planting are initiated to mitigate the effects of global warming, the government must understand the disparities in its historical treatment of underprivileged communities compared to others. To ensure that history does not repeat, reparations are necessary. Communication between the government and the interests of the community, specifically the voices within communities faced with environmental racism, is essential to effect action. Consideration of formerly redlined communities in future governmental planning, especially in the context of climate change, requires evolution of the government to remove racial bias to ensure the health and safety of residents of formerly redlined communities.

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