

**The Impact of Environmental Issues in Urban Areas and How Trees Can Solve Them**

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Did you know that trees can help reduce crime rates in urban areas? Trees have been known to play key roles in ecosystems and benefit both animals and their environment, but the exact benefits trees offer to our own environments, or in other words, the cities we live in, is not widely known. Everywhere that we live has its own environment and issues that impact it. Urban areas, such as Hartford, Connecticut, face a larger amount of environmental issues than areas that are more rural. Urban areas have a relatively higher population density, higher amounts of buildings, and higher rates of vehicle transportation. These characteristics of urban areas cause them to have to encounter several environmental issues, which in turn impact the residents living in those urban areas in many ways. There are many different solutions to these issues, but trees might be the best one. Urban areas face many environmental issues like rising temperatures and air pollution that impact their residents both physically and mentally, but trees can help directly and indirectly act as a solution to all of these issues.

One thing that practically everyone living in an urban area can complain about is the high temperatures. Urban areas suffer from these high temperatures because of the way they are structured. The sun is constantly emitting heat and some of that heat is absorbed by our environment. However, structures like buildings and roads do not absorb the sun's heat well. Instead, they reflect most of the heat back into the environment surrounding them. Since the majority of urban areas are made up of buildings and roads, the sun's heat is constantly being reflected back into the environment, which leads to higher temperatures relative to outlying areas ("Learn About Heat Islands," n.d.). This is why urban areas are called heat islands, since the high temperatures are trapped in their specific environment alone. The organization Climate Central conducted a research report for summer temperatures in 60 of the largest U.S. cities. In their analysis they found that "Single-day urban temperatures in some metro areas were as much as

27°F higher than the surrounding rural areas, and on average across all 60 cities, the maximum single-day temperature difference was 17.5°F.” (Climate Central, 2014). Also in their report, Climate Central noted that greenhouse gas emissions are projected to rise, causing U.S. summer temperatures to increase, which can worsen the heat island effect and any health risks associated with the high temperatures (Climate Central, 2014). The drastic difference in temperature in urban areas can make living in them extremely uncomfortable. There are of course ways to keep cool during the summer, but if the issue of rising temperatures is not addressed, living in urban areas will become unbearable and the issue will become unsolvable. However, the consequences of high temperatures can be solved now with trees.

One consequence of high temperatures in urban areas is an increase in aggression. Consistently high temperatures in urban areas, especially in the summer, cause the public to complain and become agitated, leading to increasing feelings of aggression. Urban areas have relatively high crime rates for many reasons, and one of them can be this increase in aggression. This connection is surprising, but can also seem unlikely. However, even though there isn't much of a direct relationship, there is evidence demonstrating a connection between vegetation and aggression. Frances E. Kuo and William C. Sullivan, professors at the University of Illinois, Urbana Champaign, explored how our physical environment can influence our aggression, and concluded that trees are able to reduce factors like aggression that can lead to crime, which leads to a lower chance that aggression will cause someone to commit a crime (Kuo & Sullivan, 2001). In their research, they found a study with Alzheimer patients that supported this conclusion. In the study, the violent assaults of Alzheimer patients were observed in five different facilities, two of which had gardens installed while the other three did not. The number of violent assaults for Alzheimer patients is typically expected to increase each year because of the disease's

deteriorating effects on the brain, and this result was shown in the facilities without gardens. However, the facilities with gardens saw a decrease or no change in the incidence of violent assaults after the gardens were installed (Kuo & Sullivan, 2001). This shows the impact of vegetation on aggression, which can translate to the impact of trees on aggression through their ability to reduce temperatures. Trees, especially large ones, provide shade to urban areas. This shade lowers the temperature of urban areas because it stops the sun's heat from reaching buildings and roads, which caused the high temperature in the first place. Trees can also lower temperatures through a process called evapotranspiration. This is where trees return water in the form of vapor into the atmosphere, which in turn cools it down. By providing shade and the process of evapotranspiration, trees can help reduce maximum summer temperatures by 2–9°F (“Using Trees and Vegetation to Reduce Heat Islands,” n.d.). Because of the high temperatures that urban areas face, consequences like high crime rates come along with it, so since trees can lower temperatures, it is important that we plant them and maintain them in urban areas.

Cities are prone to many types of pollution, one of which being air pollution. The high population density linked with high rates of vehicle transportation make air pollution a serious issue in urban areas. Vehicles are a major factor in air pollution because they produce and release significant amounts of pollutants into the atmosphere. This includes things like nitrogen oxides, carbon monoxide, and volatile organic compounds (VOCs). “The US Environmental Protection Agency estimates that about 75% of VOC emissions (by weight) come from transportation.” (Airqoon, n.d.). Vehicles are an issue, but the fact that there are so many in urban areas make the issue even worse. Each person living in an urban area most likely has their own car, and there are so many of those people closely packed into one city, so the emissions from all those vehicles in such a small area creates a humongous amount of pollution. The fact that the pollution is so

densely packed means that it can cause serious health concerns for the residents living in that area. The high rates of transportation in urban areas is not likely to stop, but trees can help combat the continuous emission of harmful pollutants into the atmosphere.

Air pollution can cause many health issues to the public, one of which being asthma. In a study by several professors from Columbia University, they stated that “The prevalence of childhood asthma in the USA increased by 50% from 1980 to 2000, with especially high prevalence in poor urban communities.” (Lovasi et al., 2008). In their study, the professors used data on asthma in children aged 4-5 years and data from New York City’s Department of Parks and Recreation on the amount of trees and pollution sources in different areas. Their study concluded that the amount of children with asthma was higher in areas with low tree density and found that the rate of childhood asthma is 29% lower for every 343 trees per square kilometer (Lovasi et al., 2008). The reason trees can help lower rates of asthma in children is because of their ability to remove air pollutants. David J. Nowak, a member of the USDA Forest Service in Syracuse, New York, describes the two ways in which trees remove air pollutants. Nowak says that the leaves of trees can intercept any airborne pollutants and keep them from returning to the atmosphere. He also describes the way that trees take in gaseous air pollution through openings called stomata in their leaves. The trees spread the gas throughout its leaves and its cells to be either absorbed or reacted with (Nowak, 2002). Air pollution is an issue that is most prominent and significant in urban areas, so trees can provide huge benefits to the area by removing air pollutants, which in turn protects and improves the health of citizens from conditions like asthma.

Because urban areas face higher temperatures and make air pollution worse, consequences like higher crime rates and health concerns like asthma arise, so since trees can

lower temperatures and reduce air pollution, it is important that we plant them and maintain them in urban areas. As I said before, Hartford, Connecticut is an urban area and it is the area that I call home. After discussing all the issues that surround urban areas and how trees can help solve them, I realize that action should be taken, which is why my Capstone project is important. I plan to help plant trees throughout Hartford with the Knox Foundation or in my school's community with Tree-Plenish. I also plan to spread awareness of the importance of trees and let as many people know how beneficial trees are, specifically in Hartford. As discussed before, air pollution due to vehicle transportation is an issue that impacts urban areas, but it is an issue that greatly impacts Hartford. Two major interstate highways (I-84 and I-91) cross through Hartford, greatly increasing the amount of emissions and pollution. Trees have always been beneficial to environments, so if we come together and both plant and maintain them in ours, we could solve so many of our problems and make our home that much better.

## References

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