THE BENEFITS OF TREES IN A CITY FAR OUTWEIGH THEIR COSTS

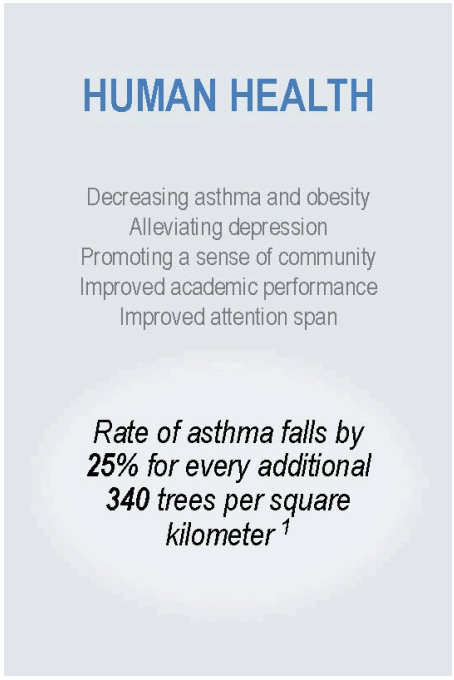
Prepared for Trees for Honolulu's Future by:
Sara Bolduc PhD: June 2018

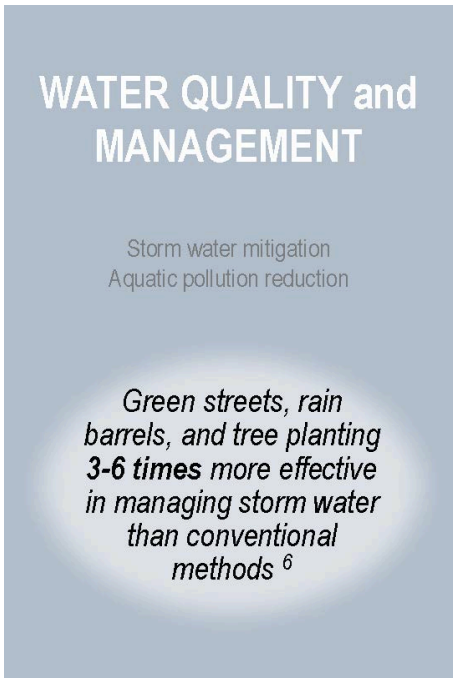
Studies are increasingly showing that the benefits of trees in urban areas far outweigh the costs. Benefits include those associated with improved 1) Human Health; 2) Water Quality and Management; 3) Public Well-Being and Safety; 4) City Planning; 5) Economic Development; 6) Air Temperatures; 7) Air Quality and Energy Use; and 8) Transportation.

1) **Improved Human Health:** Urban forests have been shown to help reduce a variety of health issues, such as respiratory diseases (including asthma), skin cancer and even depression. One study of children with asthma in New-York City found that childhood asthma rates were highest in parts the city where tree density was lowest, and that the rate of asthma might fall by as much as **25% for every extra 340 trees per square kilometer.** [1]

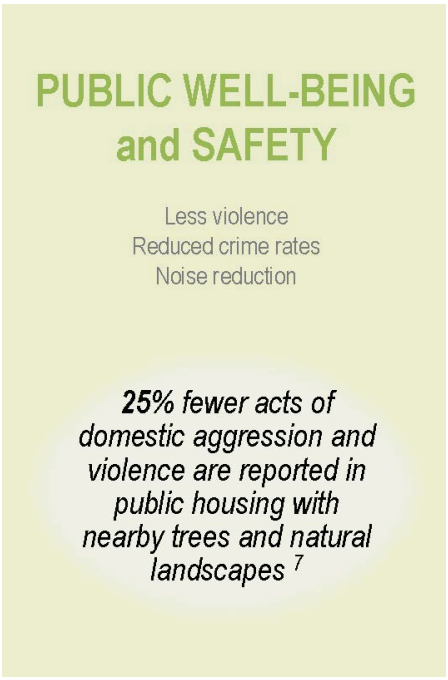
   Park settings and trees have also been linked to creating a sense of community for residents, to improving attention spans and academic performance for students, and promoting active lifestyles, which can reduce obesity. Some studies suggest that exercising in natural environments (such as city parks) is associated with greater feelings of revitalization and positive engagement, decreases in tension, confusion, anger, depression, and increased energy. [2] Furthermore children with attention deficit disorders have also been found to function better after activities in green settings. [3] Finally, residents of areas with higher levels of greenery are three times as likely to be physically active and **40% less likely to be overweight or obese** than residents living in less green settings. [4]

2) **Water Quality and Management:** Trees have been reported to have a significantly positive impact on water quality and quantity. They can help filter aquatic pollution and mitigate storm water runoff, an important component of managing urban infrastructure, in addition to their other benefits. For example, street trees in New York City have been reported to intercept 890 million gallons of storm water annually (that would be an average of 1,525 gallons per tree), and with a total value of over **$35 million each year**. [5] According to another study, green streets, rain barrels, and tree plantings are estimated to be **3-6 times more effective in managing storm water per $1,000 invested** than conventional methods. [6]



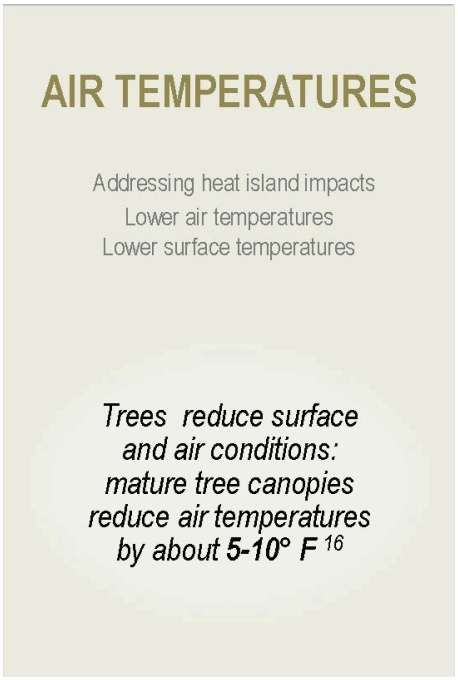


3) **Public Well-Being and Safety:** A well-maintained tree canopy can also reduce crime. One study in Chicago reported that residents of public housing with nearby trees and natural landscapes experienced **25% fewer acts of domestic aggression and violence** than those living in barren environments. [7] Another study in the same city reported that apartment buildings with high levels of greenery had 52% fewer crimes than those without any trees.[8] Other benefits have been reported, including less graffiti, vandalism, and littering in outdoor spaces with natural landscapes than in comparable plant-less spaces.[9]



4) **City Planning:** While city investment in tree planting and maintenance has been thought to be costly, studies show that the investment is well worthwhile because of the benefits they present. Trees in New York City have been reported to provide **$5.60 in benefits for every dollar spent** on tree planting and care (maintenance). [10] The City of Providence, RI, has been reported to reap **$3.33 in benefits** for every dollar spent.[11] Some of these benefits include improving air quality, sequestering carbon dioxide, reducing storm water runoff, and beautifying the city. A city's investment in green landscapes can promote a city's resilience, including anticipating and mitigating current and future impacts of climate change and sea-level rise by investing for the long-range and planting trees that will benefit generations to come.

5) **Economic Development:** Trees can also increase property values, promote the creation of jobs, and improve business performance. Several studies have shown that the presence of trees on residential parcels can **increase property values from 2% to as much as 15%.**[12] In fact, urban trees in residential areas have been reported to increase property values at **the plot, parcel, and neighborhood scales**.[13] Planting more trees also means more green jobs. Finally, visitors to well-treed central business districts have been found to **spend 9 to 12% more for products**, which might be a joyful economic incentive for local businesses.[14]



6) Air Temperatures: Increasing urban tree cover can help lower surface and air temperatures, and help address heat island impacts. Heat islands are felt when surface temperatures are hotter than air temperatures. This frequently occurs in highly paved, un-shaded urban areas with limited landscaping or trees. Trees and vegetation lower surface and air temperatures by providing shade and through evapotranspiration. According to some research, evapotranspiration, can help **reduce peak summer temperatures by 2–9°F**.[15] It has been reported that a mature tree canopy can help **reduce air temperatures by about 5-10° F**.[16] This not only is more comfortable for Hawai'i residents, but also cost-effective and energy efficient.

7) Air Quality and Energy Use: Trees clean the air by absorbing carbon and sulphur dioxides, nitrous oxides and other pollutants. Trees also shade cars and parking lots, leading to a reduction in ozone emissions from vehicles. Tree shade can significantly reduce energy consumption. A 25-foot tree can reduce annual heating and cooling costs of a typical residence **by 8 to 12 %**. The net cooling effect of a healthy tree is equivalent to **10 room-size air conditioners operating 20 hours a day**.[17]

8) Transportation: Trees can reduce the environmental impacts of high levels of carbon dioxide emitted in surplus by the number of cars and buses in a city. Trees can help to slow traffic, decrease aggressive driving, reduce road accidents, encourage walking or biking, and extend the life of pavement in city streets. Mid-block islands with trees have been shown to provide up to **7% reduction in motor vehicle speeds**.[18] A study has shown that street landscape improvements actually **reduced accidents in Toronto by 5% to 20%**, generating significant public costs savings, and boosting pedestrian use of urban arterials.[19] Finally, streets deteriorate at a faster rate in the sun than if they are shaded. A California case study demonstrates that shade on city street segments with large-stature trees can **reduce costs for repaving by 58%** over a 30-year period compared to unshaded streets, and that shade from smaller-stature trees reduce cost by about **17%**.[20]

Disclaimer: Each city is unique so it is understandable that costs and benefits vary widely and that researchers employ similar but not necessarily identical methodologies in assessing these factors. What is impressive, however, is that so many studies, conducted independently, lead to a similar conclusion, namely, that the socio-economic-environmental benefits of trees in a city significantly outweigh the cost of planting and maintaining them.

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