

# Climate Action for Healthy People, Healthy Places, Healthy Planet: Urban Greening & Green Infrastructure, Climate Change and Health



Climate change is the greatest health challenge of the 21<sup>st</sup> century. It threatens our air, food, water, shelter and security — the basics on which human life depends. Climate change exacerbates health inequities by disproportionately impacting people living in poverty and communities of color.

At the same time, action on climate change provides one of our greatest health opportunities because many climate change solutions improve community environments and the public's health and reduce health inequities. Everybody benefits.

In this brief we explain the health and health equity benefits of urban greening and green infrastructure in the context of climate change. For other “**Climate Action for Healthy People, Healthy Places, Healthy Planet**” briefs see <http://www.usclimateandhealthalliance.org>.

## Key Messages

- The health risks of heat, air pollution and flooding are increasing as climate change brings warmer temperatures, more extreme weather events and sea level rise.
- These risks are greatest in “urban heat islands” and in places with aging infrastructure or where natural protections have been weakened.
- Urban greening reduces the risk of heat illness and flooding, lowers energy costs and improves health.
- Green spaces provide places to be physically active and improve our overall well-being.
- Trees sequester carbon dioxide, improve air quality, capture rainwater and replenish groundwater.



## FAST FACT:

Higher temperatures lead to higher levels of ozone, which increases risks for asthma and heart attacks.

## Climate Change, Urban Heat Islands and Health

- Urban heat islands are areas in cities with many buildings, lots of dark surfaces such as pavement and asphalt, and fewer trees, parks, and green space.<sup>1</sup>
  - In these “urban heat islands,” daytime temperatures are on average 1-6° F higher than in surrounding more suburban and rural areas. Nighttime temperatures can be as much as 22° F higher as the heat is gradually released from buildings and pavement. A recent California study found some inland urban areas experienced average temperature increases of up to 19° F.<sup>2</sup>
  - People living in urban heat islands are at greater risk of heat-related illness.<sup>13</sup>



## DID YOU KNOW?

In urban heat islands, nighttime temperatures can be as much as 22° F higher as the heat is gradually released from buildings and pavement.

- Urban areas experience greater air pollution and more negative health impacts during hot summer months.<sup>3</sup>
- People of color and low-income families are more likely to live in areas with fewer trees and green spaces and are thus more likely to be exposed to the heat risks of urban heat islands.<sup>4</sup>
- People living in poverty are less able to afford the costs of air conditioning, placing them at a higher risk for heat-related illnesses.
- Climate change is projected to increase average summer temperatures and cause more frequent, more severe, and longer heat waves, worsening the effects of urban heat islands and increasing the risks of heat illness and deaths.<sup>5</sup>
  - Heat already causes more deaths than any other type of extreme weather event.<sup>6</sup> Over the last 15 years heat waves have caused over 70,000 deaths in Europe (2003), 650 in California (2006), 55,000 excess deaths in Russia (2010), and 3,300 in India and Pakistan (2015).
  - Higher temperatures lead to higher levels of ozone, which increases risks for asthma and heart attacks.<sup>7</sup>
  - Warmer weather can also lead to increases in energy demands, particularly summertime air conditioning, increasing the chance of electricity brown-outs.<sup>8</sup>

## Urban Greening and Green Infrastructure

- Urban greening refers to strategies that increase trees, parks, gardens, agriculture, forests, and other green and natural space in urban areas.
  - Green infrastructure uses vegetation, soils, and natural processes to manage and create healthier urban environments. Examples include tree planting, rain barrels and rain gardens, green street design with permeable pavements and bioswales, ecosystem restoration and green roofs.<sup>9 10 11</sup>
  - Green infrastructure can increase resilience to natural disasters and help to reduce the impacts of climate change, such as flooding, storm surges and sea level rise.<sup>14</sup>
- Gray infrastructure, sometimes referred to as traditional or hard infrastructure, are man-made structures designed to move water or protect developed areas from flooding. Examples of gray infrastructure include storm sewers, levees, seawalls and detention ponds.
  - Gray infrastructure — often made of concrete — may increase runoff as surface water is unable to be filtered through soil. This contributes to flooding during extreme rain events, and can increase the concentration of pollutants in runoff.
  - Gray infrastructure also retains heat from the air, contributing to the urban heat island effect and increasing nighttime air temperatures.



## Health benefits of urban greening and green infrastructure

Urban greening and green infrastructure have multiple health, climate, environmental and economic benefits, and contribute to climate resilience.

- Urban greening is an important climate adaptation strategy: it reduces urban heat islands by lowering surface and air temperatures, decreasing the risk of heat illness.<sup>16 12 13 14</sup>
  - Shaded surfaces, from trees and other plants, may be 20 - 45° F cooler than unshaded surfaces;<sup>15</sup> the surface of a vegetated rooftop can be cooler than the surrounding air, whereas conventional rooftop surfaces can exceed ambient air temperatures by up to 90° F.<sup>16</sup>
  - A 0.5° C reduction in the maximum and minimum temperatures has been shown to result in a 50% reduction in heat-related mortality. Green infrastructure could reduce temperatures by 0.5 – 0.7° C.<sup>17</sup>
- Trees clean the air by removing harmful pollutants — such as ozone, nitrogen dioxide, and particulate matter.<sup>18 17</sup> These pollutants cause multiple health effects such as eye irritation, airway constriction, asthma and other respiratory diseases.
- Accessible parks have been associated with greater physical activity, relaxation, social interactions, and improved the quality of life in communities, especially in low-income communities and communities of color.<sup>19 20 21</sup>
  - Vegetation has been associated with reduction in traffic noise.<sup>22</sup>
- Access to green space lowers stress, and even speeds up recovery times in hospitalized patients.<sup>23 24 25</sup>
- Trees and greenery have been associated with reduction in crime and increases in property value.<sup>30 26</sup> As with other community design elements, without attention to equity these positive improvements may lead to gentrification and displacement of lower-income residents.<sup>27</sup>

### Environmental Benefits

- Replacing gray infrastructure with green infrastructure can reduce temperatures and heat illness risk in urban heat islands.<sup>15</sup>
- Green infrastructure provides more green and cool space, and reduces the risk of flooding.
- Urban greening reduces energy costs.<sup>28</sup> For example, using deciduous trees and cultivating green spaces around buildings can provide shade on buildings and decrease air conditionings costs by 20%, especially during extreme heat events.<sup>29</sup>
  - <sup>30</sup> Green roofs, a vegetative layer grown on rooftops, have been shown to decrease summer cooling costs.<sup>31</sup>
- Trees sequester carbon dioxide (sequestering an estimated 95.5 million metric tons of carbon dioxide in 2006).<sup>32 33 34</sup>



### FAST FACT:

Vegetation has been associated with reduction in traffic noise.



- Green infrastructure can reduce sewer overflows during storms and recharge groundwater aquifers water by allowing rainwater to soak into the ground. It can also significantly reduce the energy needed to treat and move wastewater.<sup>12 35 36</sup>
  - Rainwater harvesting and reuse also helps to conserve water.<sup>37 38</sup>
- Plants and vegetative growth can protect fragile coastal areas and mitigate sea level rise. Vegetation along shorelines can also improve water quality and aquatic habitat.<sup>12</sup>

## What can we do?

Health professionals and health agencies have a critical role in building healthy, equitable, sustainable, and climate resilient communities. Greening our communities with trees and green infrastructure is one of the most important things we can do to reduce the risks of heat illness and flooding. There are multiple strategies to improve health and climate resilience through greening:

- Identify tree-poor and park-poor neighborhoods in your community and support targeted greening in these areas.
  - Encourage the use of low-allergenicity trees and vegetation.
- Support the development of an urban greening plan in your community.
- Support retrofitting with green infrastructure — such as bioswales and permeable pavements — during street construction and repair.
- Incorporate green space into street design, particularly in tandem with development of “[Complete Streets](#)” that promote walking and biking.
- Support efforts to fund and build community and school gardens, parks, and initiate community gardens and school gardens.
- Promote the use of green infrastructure for flood protection, including the use of permeable pavements.



### ! FAST FACT:

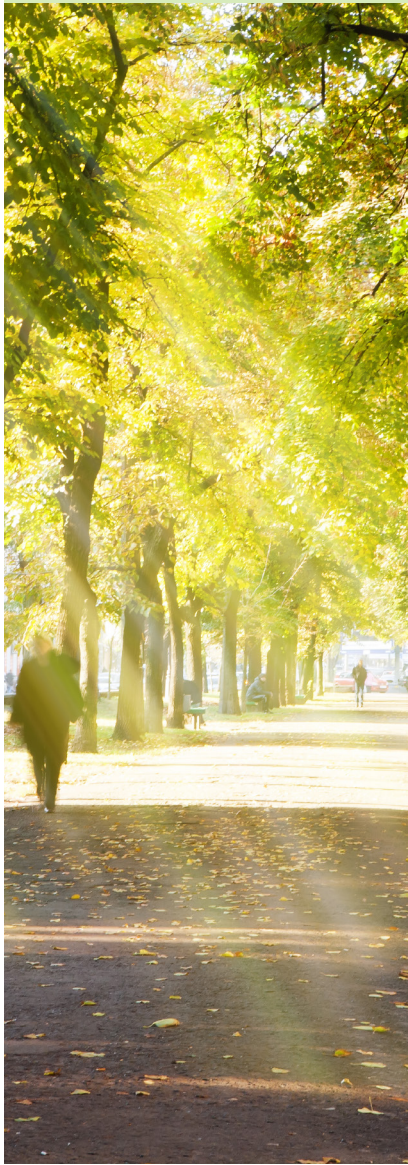
Urban greening and green infrastructure offer health, climate change, and economic benefits for communities.

## Summary

Climate change is the greatest challenge of this century, but climate solutions offer tremendous opportunities to improve the health of our communities. Urban greening and green infrastructure offer health, climate change, and economic benefits for communities.

Collective action is needed to confront climate change. Health professionals and health organizations working locally play a critical role in addressing climate change in collaboration with other sectors, and it is necessary to take decisive, aggressive, and immediate action to combat it. Fortunately, a number of opportunities exist to promote urban greening while also enhancing health.





## DID YOU KNOW?

Trees and greenery have been associated with reduction in crime and increases in property value.



## For More Information

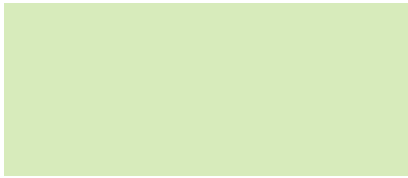
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- Creating and Mapping an Urban Heat Island Index for California (Report):  
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[http://www2.epa.gov/sites/production/files/2014-08/documents/treesandvegcompendium\\_ch2.pdf](http://www2.epa.gov/sites/production/files/2014-08/documents/treesandvegcompendium_ch2.pdf)
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[http://water.epa.gov/infrastructure/greeninfrastructure/upload/climate\\_res\\_fs.pdf](http://water.epa.gov/infrastructure/greeninfrastructure/upload/climate_res_fs.pdf)
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<http://www2.epa.gov/sites/production/files/2014-10/documents/green-infrastructure.pdf>
- Quantifying the Greenhouse Gas Benefits of Urban Parks (Report):  
[https://www.tpl.org/sites/default/files/cloud.tpl.org/pubs/benefits\\_greenhouse\\_gases\\_and\\_parks\\_whitepaper.pdf](https://www.tpl.org/sites/default/files/cloud.tpl.org/pubs/benefits_greenhouse_gases_and_parks_whitepaper.pdf)
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## Citations

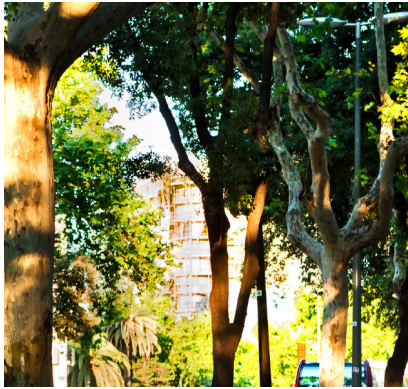
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## FAST FACT:

Accessible parks have been associated with greater physical activity, relaxation, social interactions, and improve the quality of life in communities, especially in low-income communities and communities of color.

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