

# How street trees can unlock the potential and vibrancy of cities: International examples and recommendations for Vietnamese cities towards a Green & Livable City

Vietnamese version: Cây xanh đường phố khơi dậy tiềm năng và sức sống đô thị: Các ví dụ quốc tế và khuyến nghị với các thành phố tại Việt Nam hướng tới một Thành phố Xanh và Đáng sống.

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Street trees have long been recognized as an essential factor in the value of urban areas. They provide numerous environmental, economic, and social benefits to both residential and commercial zones. However, urbanization, along with unsustainable street design standards and urban open space planning, has rapidly increased the concrete surface areas, reducing the land's ability to absorb rainwater. This has directly put pressure on the living environment of trees, especially street trees. This article presents our perspective on the importance of street trees for sustainable urban development and building livable cities. Additionally, it offers several successful case studies from cities around the world and recommendations for cities in Vietnam to enhance the role of trees in transforming urban areas into green and livable cities.

## Introduction

Cities around the world are striving to improve living environments and build more livable cities. Street trees are a common and important solution used by urban planners and street designers. It is easy to see that street trees bring a natural landscape to urban areas. However, beyond decorative and aesthetic purposes, street trees also serve urban communities by playing a positive role in improving public health.

Street trees are a sustainable and low-cost solution to address common urban issues, such as air pollution, urban heat islands, overloaded drainage systems, unsafe and unfriendly traffic, and the lack of green spaces for physical activities and social interactions. Investing in street trees is always a worthwhile investment, as the benefits they provide far outweigh the costs required to plant and maintain them. From a broader perspective, urban forestry involves planting and maintaining urban trees and vegetation.

This work is usually carried out by municipal authorities, but individuals, organizations, and private enterprises can also be encouraged to participate. The entire green ecosystem within a city forms an urban ecosystem, and it is the responsibility of both the government and residents to maintain and develop it. As such, street trees—an essential and indispensable part of urban forestry—should be given due attention.

This article will analyze how street trees can contribute to environmental, economic, and social prosperity, as well as to the health of both residents and the city. Street trees can help address current or emerging issues arising from urbanization.

## Benefits of Street Trees

Street trees improve the urban living environment in several ways, including reducing surface water runoff, enhancing air quality, absorbing carbon emissions, providing shade, and mitigating the urban heat island effect. Street trees can also boost biodiversity by creating habitats and supplying food for urban wildlife.

Many studies have shown that most urban residents have a positive perception of street trees and believe that the benefits they provide far outweigh any potential drawbacks. The inherent qualities of street trees—such as aesthetics, landscaping, shade provision, increased property value, and noise reduction—are highly valued by urban dwellers.

### Social benefits

#### *Creating a positive psychological effect for urban residents:*

Street trees have a positive impact on people's psychological and emotional health. People's moods are often influenced by what they see, so observing beautiful natural landscapes can improve the health of urban residents. Environmental and social science researcher Kathlene Wolf mentioned that "trees have a calming and healing effect" [3]. Street trees can help reduce stress for those on the streets.

#### *Creating an attractive urban landscape:*

Under the shade of street trees, seating areas can be arranged. These resting areas make sidewalks more pleasant and welcoming for pedestrians. This can be a great way for elderly people or those with mobility challenges to walk independently and rest when needed, instead of relying on others to transport them or staying at home.

The beauty that trees bring to our streets is immense. Street trees can transform the appearance of urban concrete infrastructure and improve the overall landscape of the city. In other words, trees can act as a filter or screen to hide unwanted objects that contribute to visual pollution in urban areas. For example, lawns and street trees can be designed together to make streets less dominated by asphalt and concrete. Beyond this, they can be designed as part of green infrastructure to enhance the city's capacity to absorb surface water, reducing the amount of water flowing into drainage systems, providing shade, and mitigating urban heat.

#### *Connection with nature:*

Street trees can provide a connection to nature. Everyone needs to connect with nature for better health, and street trees can offer a great way to achieve this connection. From another perspective, "street trees provide canopies and root systems that create a necessary environment for a variety of organisms and insects."

*Enhancing the quality of public spaces, walking, and cycling environments:*

Creating more attractive and welcoming sidewalks contributes to safer streets. Trees can act as natural barriers separating sidewalks from motor traffic, increasing the sense of safety. Psychologically, people feel more comfortable walking and cycling in environments with many trees. This directly promotes walking, cycling, social interactions, conversations, and a sense of connection with neighbourhoods and streets. This sense of security may come from the perception that there is a safe space, free from traffic intrusion, on the streets.

Street trees also have a positive impact on protecting health from adverse weather conditions, such as rain, wind, and extreme heat. The tree canopy can act as a shelter from most sun, rain, and wind.



*Shaded trees and grass strips along sidewalks improve the quality of walking and cycling infrastructure in Kigali, Rwanda. Photo: Đinh Đăng Hải.*

*Safe traffic speed management:*

One remarkable feature of street trees is their ability to help “safely manage urban traffic speeds.” Trees on both sides of the street create visual boundaries that make it easier for drivers to

observe and recognize other road users, especially pedestrians and cyclists. In other words, by establishing sidewalk boundaries with rows of street trees, motor vehicle drivers are better able to control their speed safely in urban environments. Particularly when comparing street designs, tree-lined roads offer better “traffic calming effects” and are more likely to achieve traffic safety goals.



*Street trees limit lane widths to ensure safe traffic speeds in London, UK. Photo: Tree for Streets.*

#### *Reducing surface water runoff into the city's drainage system:*

Street trees and grass strips can create a more effective green infrastructure system. In cities with moderate to heavy rainfall, the pressure of rainwater on the drainage system is significant. Urban flooding is often caused when drainage systems cannot handle large amounts of rain at one time. Intentionally planting street trees and grass can help reduce the load on urban rainwater drainage systems effectively. Typically, 30% of the initial rainfall will evaporate back into the atmosphere. Another 30% of the rain can be absorbed by street trees, grass, and public spaces [1]. This water will naturally seep into the groundwater and urban aquifers, reducing surface water runoff and preventing the city's drainage infrastructure from becoming overwhelmed and causing flooding.

## Environmental benefits

### *Improving Urban Air Quality:*

Urban environments increasingly suffer from declining air quality and pollution from smoke and dust. Planting trees remains one of the most cost-effective and efficient methods for absorbing carbon dioxide from the atmosphere. In fact, street trees can absorb pollutants up to 9 times more effectively than trees further away, converting harmful gases back into oxygen [1]. Street trees enhance air quality by blocking and absorbing airborne pollutants caused by traffic, such as nitrogen dioxide, sulfur dioxide, and carbon monoxide. The ability of trees to remove pollutants in cities varies depending on weather conditions, tree species, canopy cover, and pollution levels.

### *Regulating Urban Climate:*

Urban environments have a climate that differs significantly from the climate of surrounding suburban and rural areas. Urban areas experience variations in solar radiation, air quality, rainfall, wind speed, humidity, and temperature. These microclimate factors are influenced by the urban built environment, terrain, and surrounding natural environment. Urban areas often have higher temperatures due to the urban heat island effect and increased flooding and runoff from reduced natural water absorption. Street trees can improve the urban environment for city residents. For example, street trees reduce the urban heat island effect by providing shade. Additionally, the evapotranspiration from street trees lowers air temperatures through heat exchange and by adding moisture to the air. Many studies have shown that temperatures under tree canopies can be up to 10°C cooler than the surrounding outdoor temperature. This is crucial as global temperatures continue to rise with climate change.

### *Improving Urban Hydrology:*

Street trees act as natural water filters and significantly slow down the movement of rainwater, reducing overall runoff, soil erosion, and flooding. Compared to natural forest environments, urban environments have reduced capacity to intercept rainfall due to large impervious surfaces, leading to higher risks of flooding and runoff. During heavy rain, water flows over the surface rather than infiltrating into the ground, creating high surface runoff that enters stormwater drainage systems. Street trees and permeable land areas in urban settings can help manage surface runoff by retaining some of the rainwater, facilitating evaporation, and enhancing the infiltration capacity and rate of the soil. This also reduces soil erosion in rivers within and near urban areas. A study estimated that for every 5% increase in tree canopy cover, surface runoff decreases by 2%.

### *Maintaining and Preserving Urban Wildlife:*

Street trees create habitats for wildlife. Trees serve as nesting sites for birds and provide environments conducive to the development of insects, which are important food sources for birds and other wildlife. Street trees also offer nesting places, pollen, and nectar for pollinators. In urban environments, street trees form linear corridors for wildlife habitats, connecting isolated natural areas and linking to surrounding rural areas. [18] This is crucial for wildlife migration and connecting natural areas. Street trees and other vegetation also play a significant role in reducing

noise by reflecting and absorbing sound energy. Field tests have shown that noise levels can be reduced by 50% thanks to wide tree belts. This is important as many wildlife species prefer quieter habitats. Overall, trees provide habitats, food, and protection for plants and animals, directly contributing to increased urban biodiversity.



*Integrated Design of Drainage and Street Tree Planting. Photo: Citygreen*

## Economic benefits

Everything in the world has its value. Trees can provide remarkable economic benefits, whether to cities, residents, or the environment. There are various approaches to determine the economic value of trees and urban vegetation. Below are some basic economic values of urban trees. The economic value of urban trees should be considered as an asset. In other words, it involves evaluating both the associated costs and the benefits provided. Planting trees can be viewed as an investment, even though the benefits are not always realized in monetary terms. The value of a tree is determined through the following categories: maintenance costs, timber value and related materials, management and protection costs, replacement costs, and its contribution to property value.

When calculating the value of trees, it is important to balance the benefits and costs over the tree's entire lifecycle. Benefits can include energy savings, improved air quality, reduced CO<sub>2</sub>, storm protection, soil conservation, and water management. The costs associated with a tree involve maintaining it to ensure it grows well, remains safe, and is attractive to the public.

#### *Considering Trees as City Assets:*

Urban trees, including street trees, are similar to any other city assets. They need to have an assessed value and be managed by city authorities. However, there is a fundamental difference between trees and other city assets such as urban infrastructure, including roads, sidewalks, water supply, drainage systems, and other street equipment. Typically, urban infrastructure depreciates over time with use and operation, whereas trees appreciate in value. In other words, urban trees increase in economic value over time.

#### *Maintenance Costs:*

Depending on environmental conditions, climate, and tree species, the maintenance costs of urban trees should be considered as a lifetime investment in a tree. The lifespan of urban trees involves three stages: planting, regular care/protection management, and harvesting/removal. Proper planting procedures are crucial because improper planting can lead to higher and more frequent care requirements, special maintenance, and even early removal. Inadequate initial planning for planting can prevent the tree from reaching its full potential value.



*Street trees create a favourable environment for employment and stimulate urban economic development. Photo: thenatureofcities - Bangalore, India*

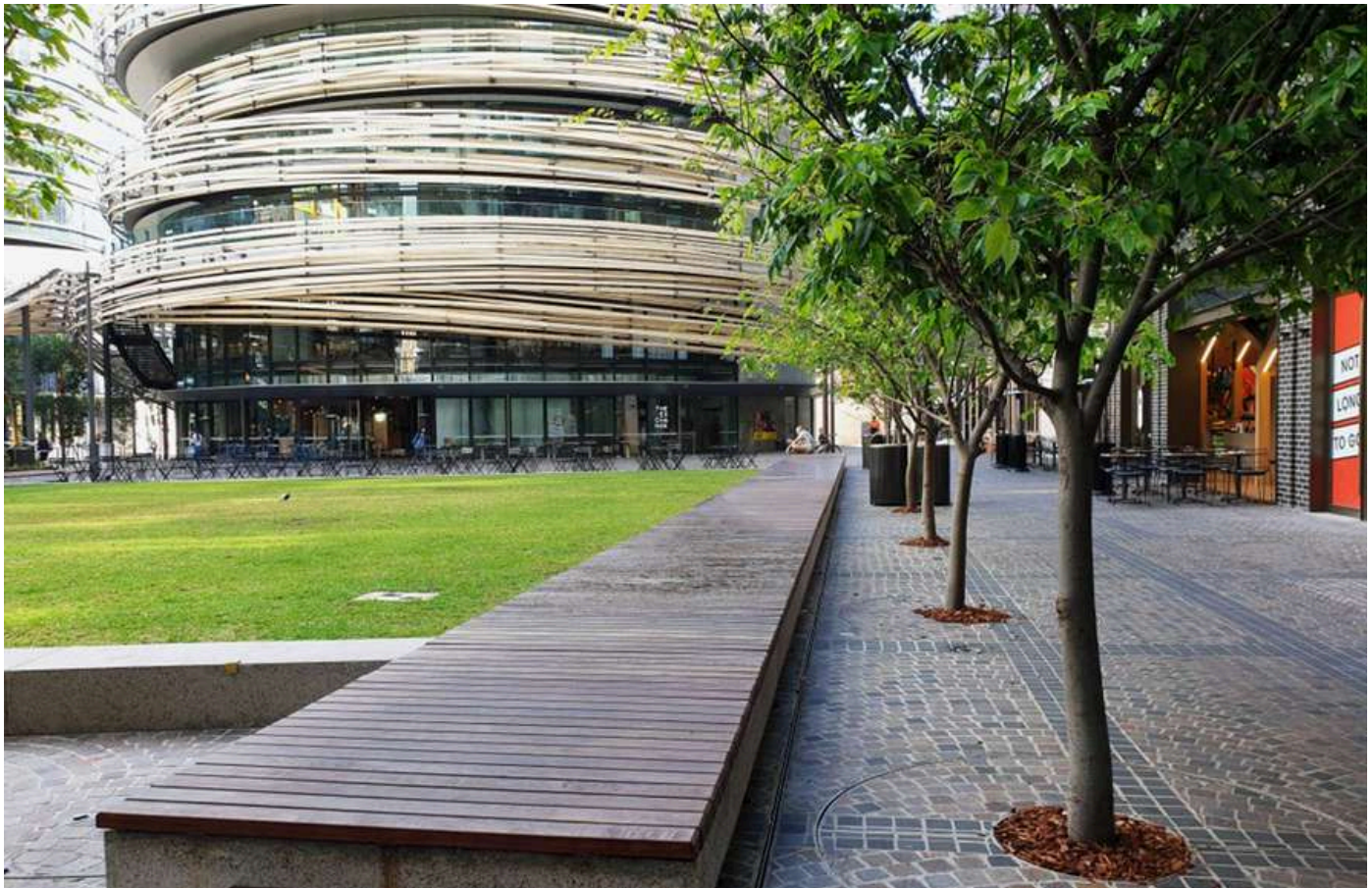
### *Timber and Other Material Values:*

While street trees, like other types of trees, do have timber and material value, this value is often considered relatively small compared to the other benefits trees provide to cities. Therefore, in modern cities, the removal of street trees for timber when they are in good health is rare and even illegal. City authorities and residents usually oppose the removal of a healthy, growing tree.

## **Successful Practices**

### **Economic benefits Beautiful tree-lined streets contribute to the success of Darling Harbour in Sydney, Australia**

Darling Square is a newly developed public space that has transformed from the former Sydney Entertainment Centre. As part of the NSW government's \$3.4 billion Darling Harbour redevelopment project, this public area offers recreational, commercial, and service opportunities in central Sydney. At the heart of Darling Square is The Exchange—a honeycomb-shaped building designed to house a library, market, childcare facility, and rooftop bar. Stakeholders collaborated to bring vibrancy to Darling Square with large tree-lined streets and grassy areas out front.



*Trees and Grass at Darling Square in Sydney. Photo: Citygreen*



Since its completion in May 2019, Darling Square has been a tremendous success. It is frequented weekly by thousands of residents, workers, and tourists. The site has become a hub, connecting to other notable areas such as Ultimo, Haymarket, and Chinatown. The trees are thriving, with lush canopies providing color and shade to the buildings and streets. As a result, Darling Square has become one of the most visited public spaces in Australia.

## Toronto's Plan to Green the Streets

The city of Toronto is making significant efforts to increase its street tree coverage. Toronto's Mayor, John Tory, has planted 40,000 trees since taking office in 2014 and has committed to planting an additional 3.8 million trees over the next ten years.

Toronto owns the land within the roadways and the private property lots, known as the boulevard areas. Urban forestry is responsible for planting and maintaining trees in these areas to develop Toronto's urban forest. The city's goal is to increase tree canopy cover to 40%. Currently, Toronto has approximately 26.6% to 28% of the city area covered by tree canopy, equivalent to 10.2 million trees. Of these, it is estimated that 600,000 are street trees. Overall, there is growing support in North American cities and around the world for maintaining healthy and sustainable urban forests and green spaces.



*Street Trees in Toronto, Canada. Image: Toronto.ca*

## Economic benefits Building Local Identity Through Diverse Street Trees in Lyon, France

In the mid-1990s, the Willow or Black Poplar was the species representing over 52% of the trees managed by Greater Lyon Authority (GLA). By 2018, this species had decreased to 21.7%, while the total number of species found in the hardscape of the Lyon area increased by 80%, with over 280 different species and 94 genera represented. This significant increase is the result of GLA's strategic commitment to diversifying urban green spaces.

The GLA's Tree Scheme aims to ensure that no single species accounts for more than 10% of the total street trees and other public green areas and landscapes. To achieve this, GLA monitors the planting and development of tree populations at a strategic level. Each area is studied to create a list of local species suitable for planting. The mix of species helps build and reinforce local identity. The 10% diversity goal does not compromise the unity and identity of the area. At the project level, GLA encourages designers to work with local experts to enrich the use of native tree species wherever possible.

According to Frédéric Ségur, GLA's green space expert, the success of diversifying tree populations in GLA's streets and public residential spaces is attributed to three main factors: “

First, the city needs to control not only policies and strategies but also the design, planting, and management of green spaces. This allows the City to set goals at three levels that are suitable and mutually reinforcing. Second, we must build strong relationships with local tree suppliers and encourage them to grow high-quality and diverse native species. In 2007, less than 50% of planted trees were of local origin, whereas now this figure has nearly reached 80%. Third, we do not dictate to designers which species to plant. The 10% per species goal in the tree scheme serves as a starting point for dialogue: it sets a framework for collaboration rather than prescribing a solution. For each project, when the design unit submits a list of trees to be planted, it also provides an opportunity for us to discuss and select species suited to the local climate, soil, conditions, or space.”



*Diverse Street Trees in Lyon, France.*

*Image: Tree&Design*

## Conclusion and Recommendations

City management agencies, especially those involved in urban planning, need to recognize the benefits that street trees can bring to local environments. By increasing the number of street trees, cities can enhance and build livable urban environments, boosting biodiversity and improving public health through better respiratory conditions in green urban settings. In the future, street trees should be considered an integral part of all urban planning and design efforts to maximize their benefits. Street trees play a crucial role in enhancing urban quality of life. This means cities should view street trees as a solution for sustainable urban development and analyze their impact when making decisions on all urban development projects, including street projects.

Street trees not only provide shade, aesthetic beauty, and improved living environments in the short and medium term but also serve as a legacy for future generations in Vietnamese cities in the long term. Therefore, cities should develop a Strategy for Urban Green Space Development, focusing specifically on street trees. Annual activities should be considered within a Mid-term Street Tree Management & Development Plan to ensure that management agencies and stakeholders share a common vision and development direction.

### Street Tree Management & Development Plan

The plan offers a strategic approach and emphasizes interdisciplinary coordination with community involvement for the future development of street trees, ensuring that street trees in Vietnamese cities become key elements in creating green and sustainable urban areas. The planning process could include, but is not limited to, various city agencies such as the Department of Construction (urban tree management), Department of Planning and Architecture (urban planning and design management), Department of Transportation (street management), Department of Health (public health management), Department of Tourism, Department of Industry and Trade, as well as social and professional organizations like youth unions, women's associations, park and tree associations, drainage associations, and architectural and planning associations. Local community representatives and street user groups should also be involved. An overall plan for managing and developing street trees is a crucial tool for city agencies to have a basis and direction for proactive implementation.

The main objectives of the comprehensive plan for managing and developing street trees include, but are not limited to, the following:

- Increase Tree Canopy Coverage: Enhance the formation of attractive, shaded, and environmentally sustainable streets.
- Develop a List of Suitable Tree Species: Identify tree species that thrive in local street environments and have the potential for strong future growth.
- Promote Native Species: Boost the use of native tree species to improve street biodiversity and expand habitats for local wildlife.

- Improve Community Health and Living Environment: Create streets that promote and support active transportation—such as walking and cycling—as well as social interactions.
- Ensure Consistent and Effective Tree Management: Implement a consistent and efficient approach to planting and managing street trees across the city, ensuring trees are planted 'right tree, right place.'
- Enhance Local Character: Strengthen and enhance the unique character of different areas of the city through the planting of appropriate and locally distinctive street trees.



*Street Trees. Image: Word Forest*

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