

## 9. Quantifying the Hidden Services: An Environmental Economic Perspective on Avenue Trees in Urban Areas

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### Abstract

*Urban environments increasingly rely on natural infrastructure to counterbalance the pressures of population growth, pollution and climate change. Avenue trees, lining streets and public spaces, deliver a wide range of ecosystem services that are often overlooked in formal planning and budgeting processes. This article explores the hidden services provided by avenue trees—such as carbon sequestration, air purification, microclimate regulation and aesthetic enhancement—through the lens of environmental economics. By assigning tangible economic value to these services, we underscore the essential role of avenue trees in ensuring sustainable and liveable urban futures.*

### Valuing the Ecosystem Services of Avenue Trees

Avenue trees represent more than just ornamental features of city design—they function as natural infrastructure, vital to urban well-being. Their ecosystem services span provisioning, regulating, cultural and supporting categories. In cityscapes,

regulating services—such as improving air quality, moderating microclimates and capturing carbon—are particularly crucial. Avenue trees actively filter pollutants such as particulate matter (PM<sub>10</sub>), nitrogen dioxide (NO<sub>2</sub>) and ground-level ozone, directly benefitting public health and reducing expenditure on healthcare systems.

Economists estimate these services using tools such as contingent valuation, hedonic pricing and avoided cost methods. For instance, a mature urban tree can absorb around 21 kilograms of carbon dioxide per year (Nowak et al., 2013). If priced via global carbon markets (at, say, USD 50 per tonne), this translates to roughly one dollar per tree annually—solely for carbon sequestration. When combined with benefits like shade provision, noise buffering and increased property values, the cumulative value of thousands of such trees becomes significant.

### Urban Climate Resilience and Microclimate Regulation

The urban heat island (UHI) effect—where cities retain more heat due to build surfaces—has become a growing concern amid global warming. Avenue trees counteract this by offering shade and releasing water vapour through evapotranspiration. Shaded streets have been found to be up to 10°C cooler than unshaded ones (Gill et al., 2007), contributing not only to thermal comfort but also to reduced energy consumption for air conditioning.

Additionally, avenue trees assist in managing urban flooding by enhancing water infiltration and reducing surface runoff. From an economic perspective, these effects can be valued using the replacement cost or damage cost avoided methods, helping municipalities justify long-term investments in green infrastructure.

Beyond immediate environmental gains, these trees contribute to social cohesion, mental health, and the aesthetic appeal of neighbourhoods—factors not always captured in market transactions but highly valued by residents.

### Policy Integration and Environmental Accounting

Despite their benefits, avenue trees are frequently underrepresented in urban development agendas. A key reason is the absence of direct pricing in standard

economic assessments. Here, environmental economics plays a vital role by quantifying non-market services. Natural capital accounting, which involves incorporating environmental assets into national or municipal economic accounts, has gained global attention as a remedy.

Tools like i-Tree, developed by the USDA Forest Service, allow city planners to measure the ecological and economic benefits of trees, including carbon storage, pollution filtration and stormwater control. Policymakers should be encouraged to embed these assessments into urban planning frameworks, develop incentives for community greening and enforce the protection of mature trees.

Moreover, raising public awareness about the hidden services of avenue trees is essential. Citizens are more likely to support and protect urban greenery when its value is visibly demonstrated—through economic data and participatory greening programmes.



*Figure 1: Illustrating the environmental, health and wellbeing benefits of trees.*

**Source:** Royal Horticultural Society (RHS) poster

## References

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