



## The Hidden Potential of Gardens: Lidar-based Assessment of Urban Tree Benefits

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Gardens are companions of urbanization worldwide. Over 12% of Flanders' total surface area is garden, more than forests (10%) and nature reserves (2.9%). More than one third of urban areas worldwide exist out of garden. Despite their extensive area, gardens are often overlooked in research and their potential contribution to enhance living quality is un(der)explored. In our study, we delve into the potential of urban trees within gardens, examining their contribution within the broader framework of 'OneHealth'.

Trees offer diverse ecosystem services that play a crucial role in optimizing the health of people, animals, and ecosystems. These services encompass carbon storage and sequestration, mitigation of the urban heat island effect, reduction of stormwater runoff, provision of habitat, and various additional health benefits. The extent to which garden trees contribute to these services in comparison to other urban green spaces across different typologies is a critical question we aim to address.

Light Detection and Ranging (LiDAR) data was used to create a canopy height model on which automated individual tree segmentation was performed. Tree height and crown width were derived directly from LiDAR data, while crown base height and diameter at breast height (DBH) were estimated based on empirical regression models. Tree genus allocation was based on a survey of garden professionals combined with garden inventories, which quantified tree genus abundance in Flemish gardens. Lastly, i-Tree ECO software was applied to calculate various ecosystem services. In the next steps of our research we will focus on quantifying the contribution of urban trees to landscape connectivity as well as to health benefits.

Preliminary results already show a high potential of garden trees in certain urban areas. For the study area of Leuven, Belgium, garden trees are estimated to store 31.64 tonnes carbon (per ha), 0.20 ton carbon sequestration per year (per ha), 5.81 m<sup>3</sup> avoided runoff per year (per ha). They can contribute between 11 and 33% of the total provided ecosystem services of urban trees. In areas characterized by open high-rise buildings and dense forest there is no contribution of garden trees. However, in areas with higher garden area, garden trees can contribute up to 81% of the total carbon storage, 65% of the total carbon sequestration and 86% of the overall reduction in

runoff.