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WP 4 & Modelling tools

Deliverable 4.2: Graphical user interface for modelling and APIs for Sofia and Copenhagen

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Disclaimer

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9	NDConsult Ltd (associated partner)	NDC	UK	

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1 Executive Summary

Deliverable 4.2 focuses on the development of a web-based user interface that will enable end users, clients and administrators of the 100KTrees Toolbox to utilize the functionalities designed for analyzing green systems, simulating landscaping, and exploring various tree planting scenarios.

This deliverable primarily consists of software that includes a back-end, front-end, database, user management system, and a geospatial data visualization system. The software communicates with services provided by partners, which facilitate the various functionalities offered by the 100KTrees Toolbox.

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2 Introduction

The goal of the Graphical User Interface of the 100KTrees Toolbox is to serve as an entry point through which users and clients of the product can view spatial data, submit requests for simulations of various landscaping and tree planting scenarios, as well as review the results. Based on graphically presented data, maps, and statistics, users will be able to make the most suitable decisions for their needs.

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3 Graphical User Interface

3.1 Architecture diagram

The user interface consists of front-end, back-end, a database, and services that support the visualization of geospatial data. Through it, via an API, requests are sent to partners who perform specialized calculations and modeling of various scenarios for landscaping, simulation of changes in temperature, noise, air pollution and other environmental characteristics.

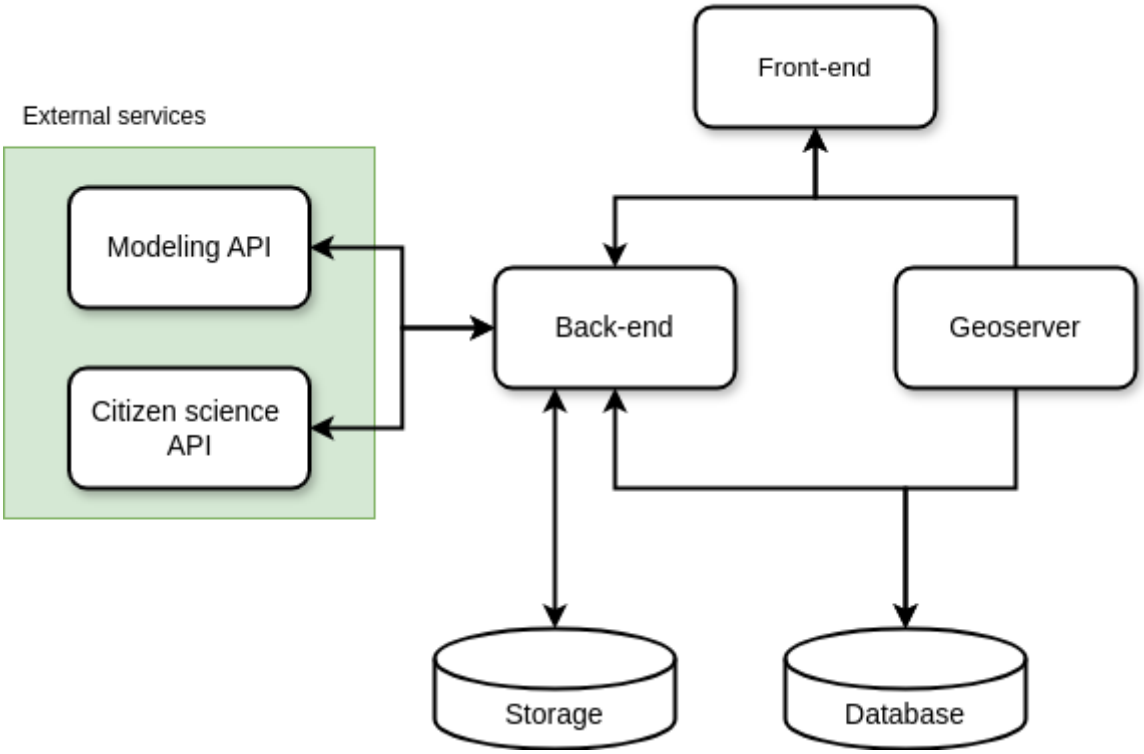

Figure 1. Architecture diagram

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3.3 Functionalities

3.3.1 City overview

In the user interface, the user or client can see a map of the entire city with several different layers: trees, temperature, noise, air pollution and buildings.

Trees layer

The trees that are visualized can be identified through automatic indexing using satellite data from the project's partners, provided as a dataset from the respective city or added by citizen science applications. The visualization of each tree includes various options that provide easy initial information about the quality of the data.

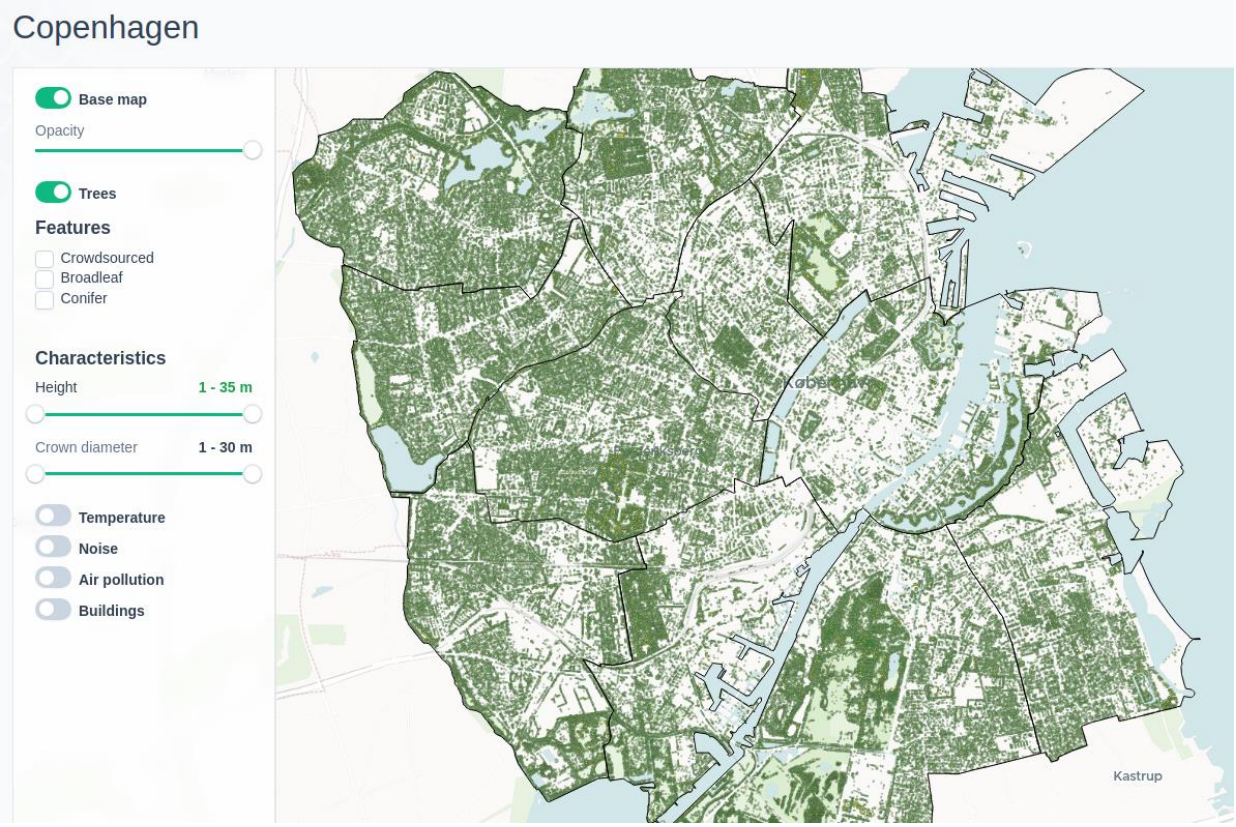

Figure 2. Tree layer of Copenhagen

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In the visualization of trees, two circles are used to represent the diameter of the crown and the diameter of the trunk. The size of the circle for the diameter of the crown and trunk is directly proportional to their size in meters.

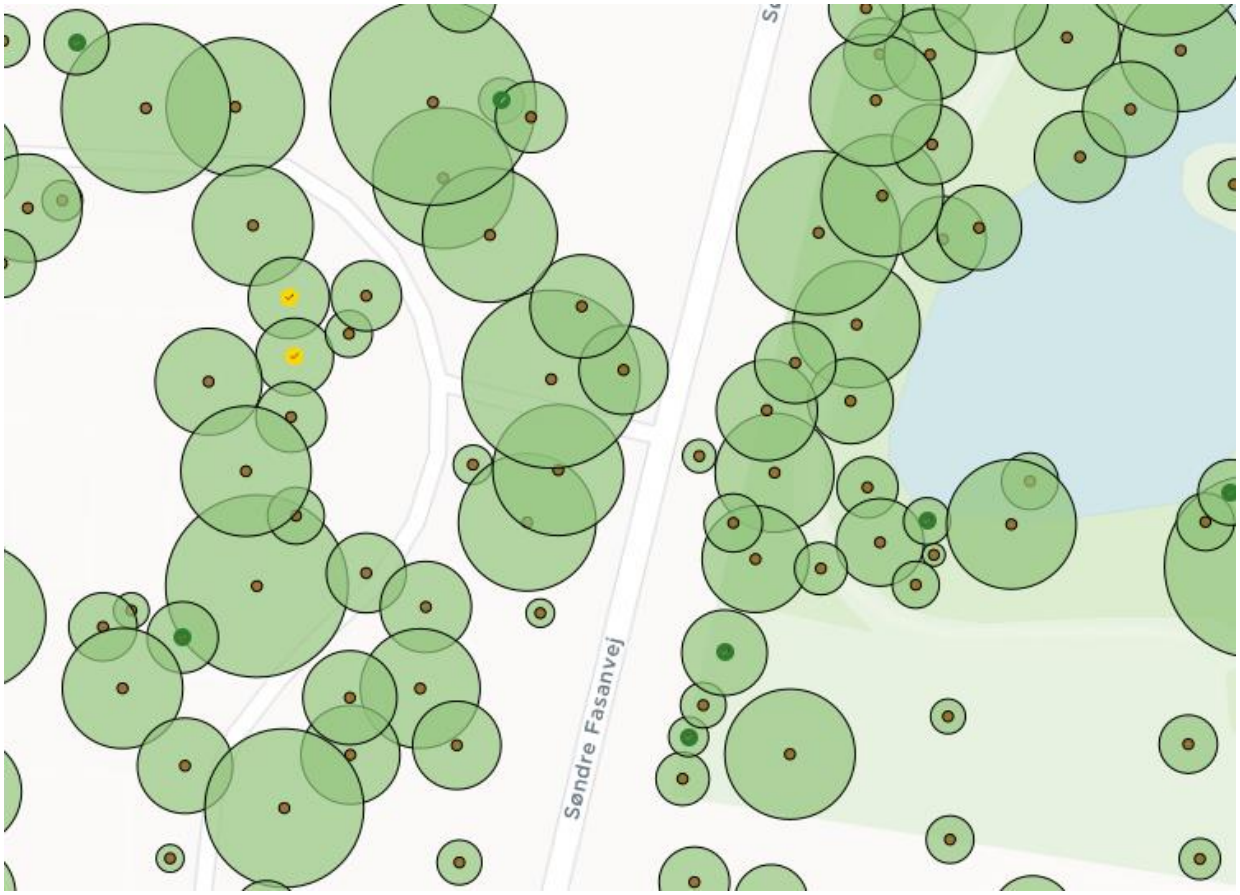

Figure 3. Visualization based on crown size.

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The data for some trees can be validated through citizen science, while for other trees, the data can be validated by official sources or other channels. To illustrate the reliability of the data, it is planned that each tree can display an icon with a different color and symbol.

Example of trees validated by citizen science contributions and trees validated by official sources.

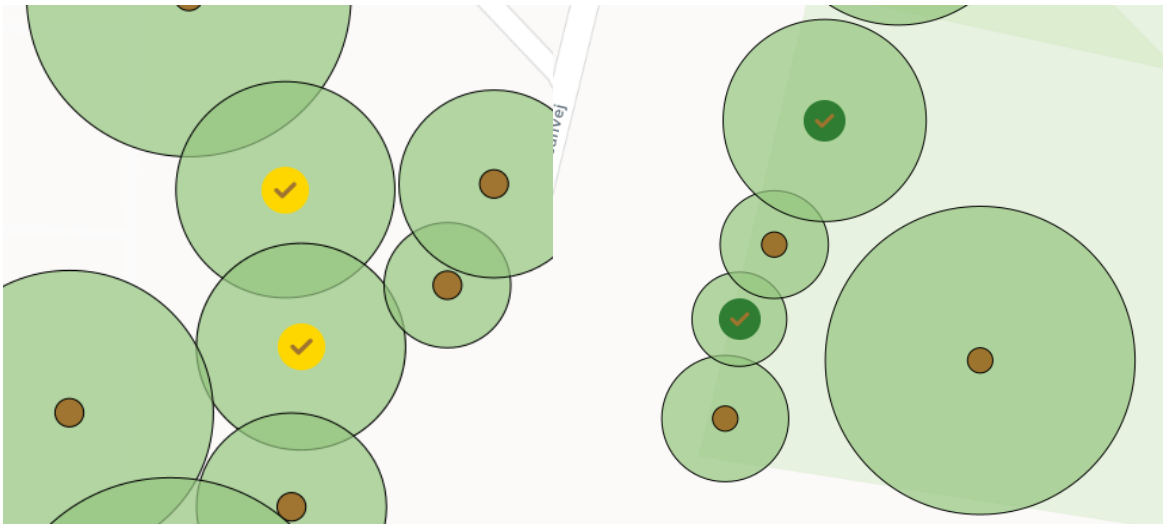

Figure 4. Example of trees with citizen science data (left) and trees with validated data (right).

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When clicking on a tree, a side panel opens with a view of Google Street View and additional information about the tree, such as specie, genus, height, crown diameter, and more.

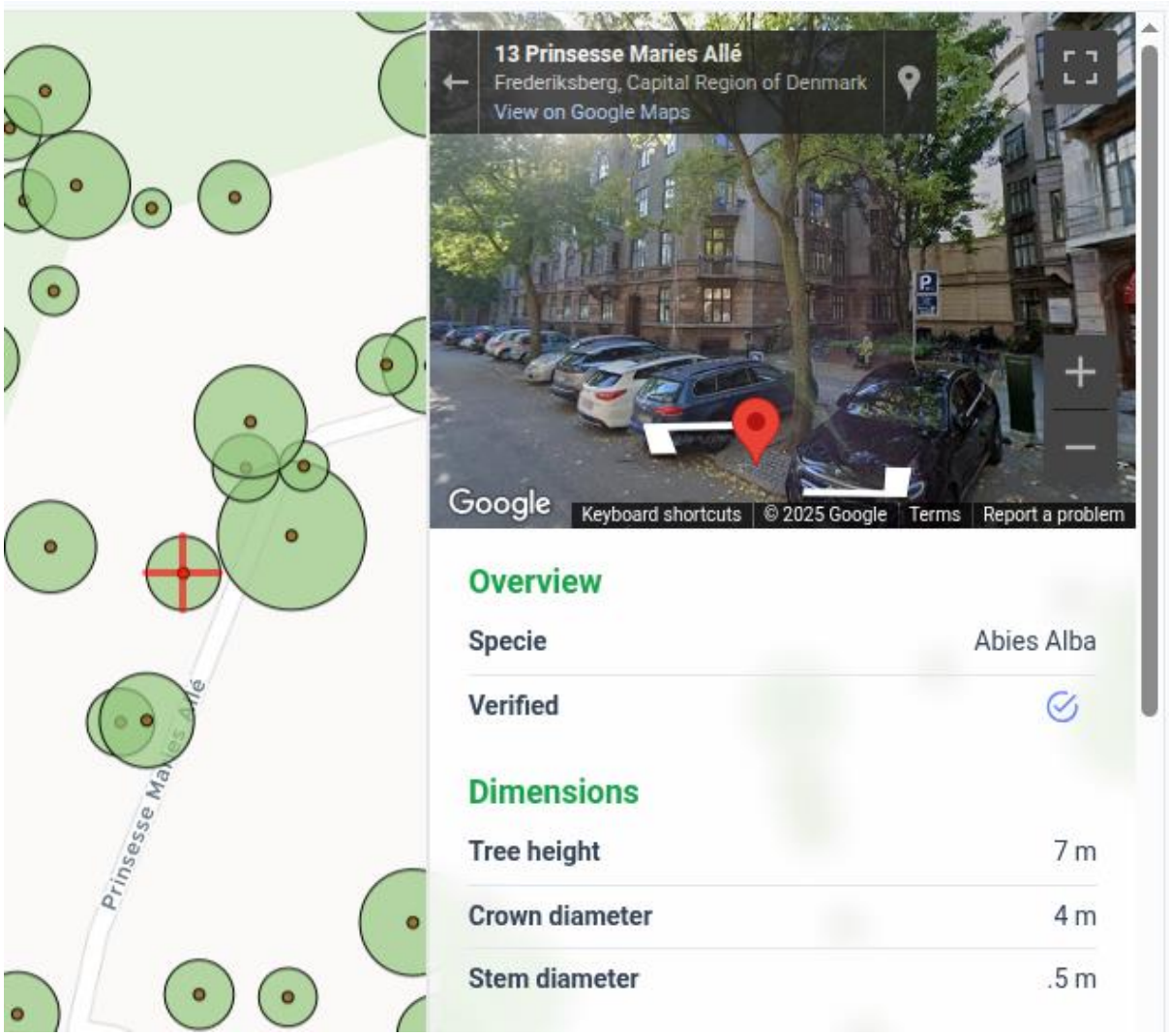

Figure 5. View of Google Street View with extended information about the tree.

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The option is provided for filtering the trees on the map by various criteria, such as height, crown diameter, species, genus, type (coniferous, broadleaf), trees from citizen science, and options that can be continuously expanded.

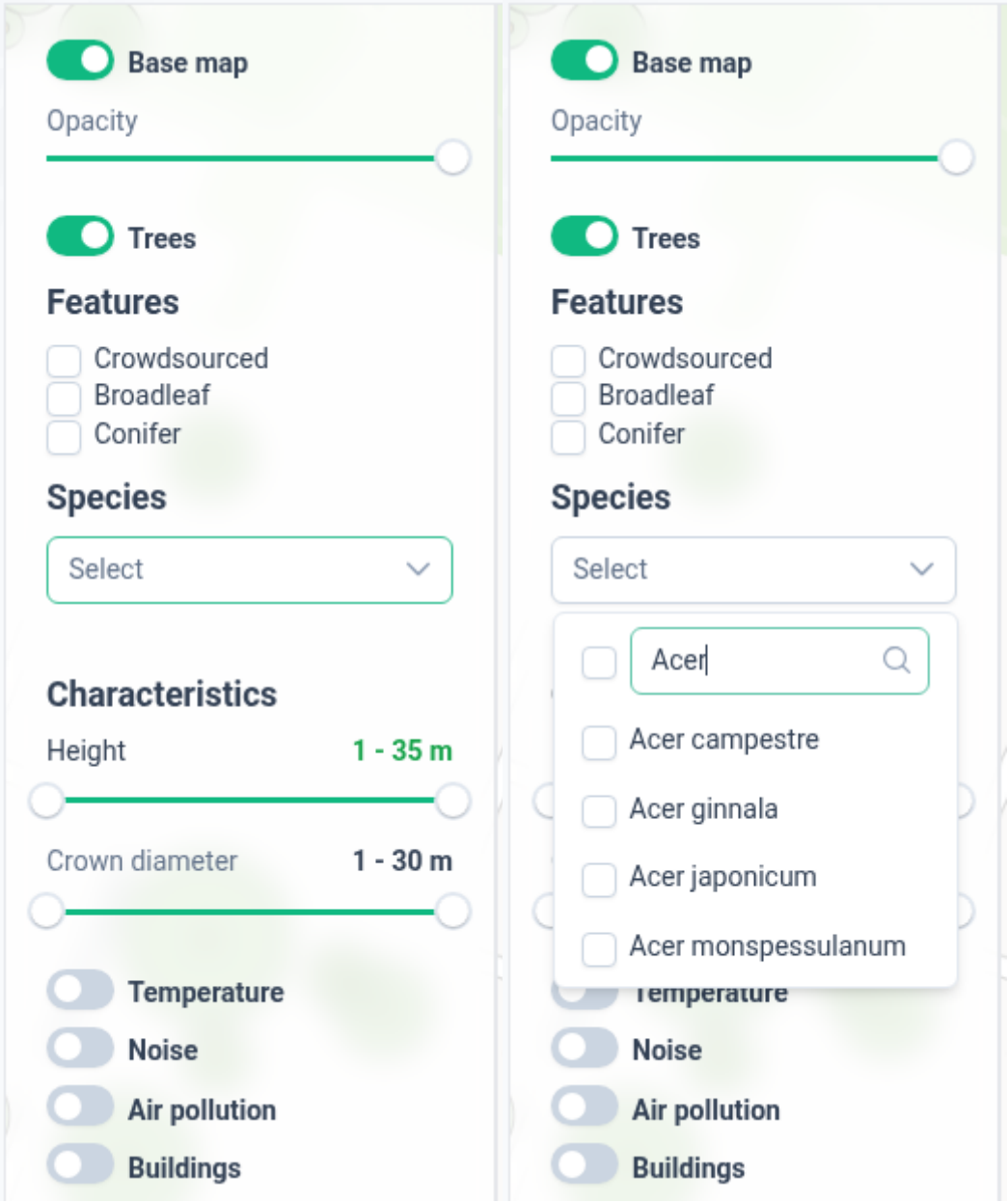

Figure 6. Tree filters.

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3.3.2 Additional Layers

The option is provided to support multiple layers on the map. Such layers can include temperature, noise, air pollution, buildings, and more. Each layer can be toggled on and off individually.

Figure 7. Additional layers with the ability to adjust the transparency of each one.

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Temperature Layer

The temperature layer is computer-modeled. The data for it is provided by the project partners.

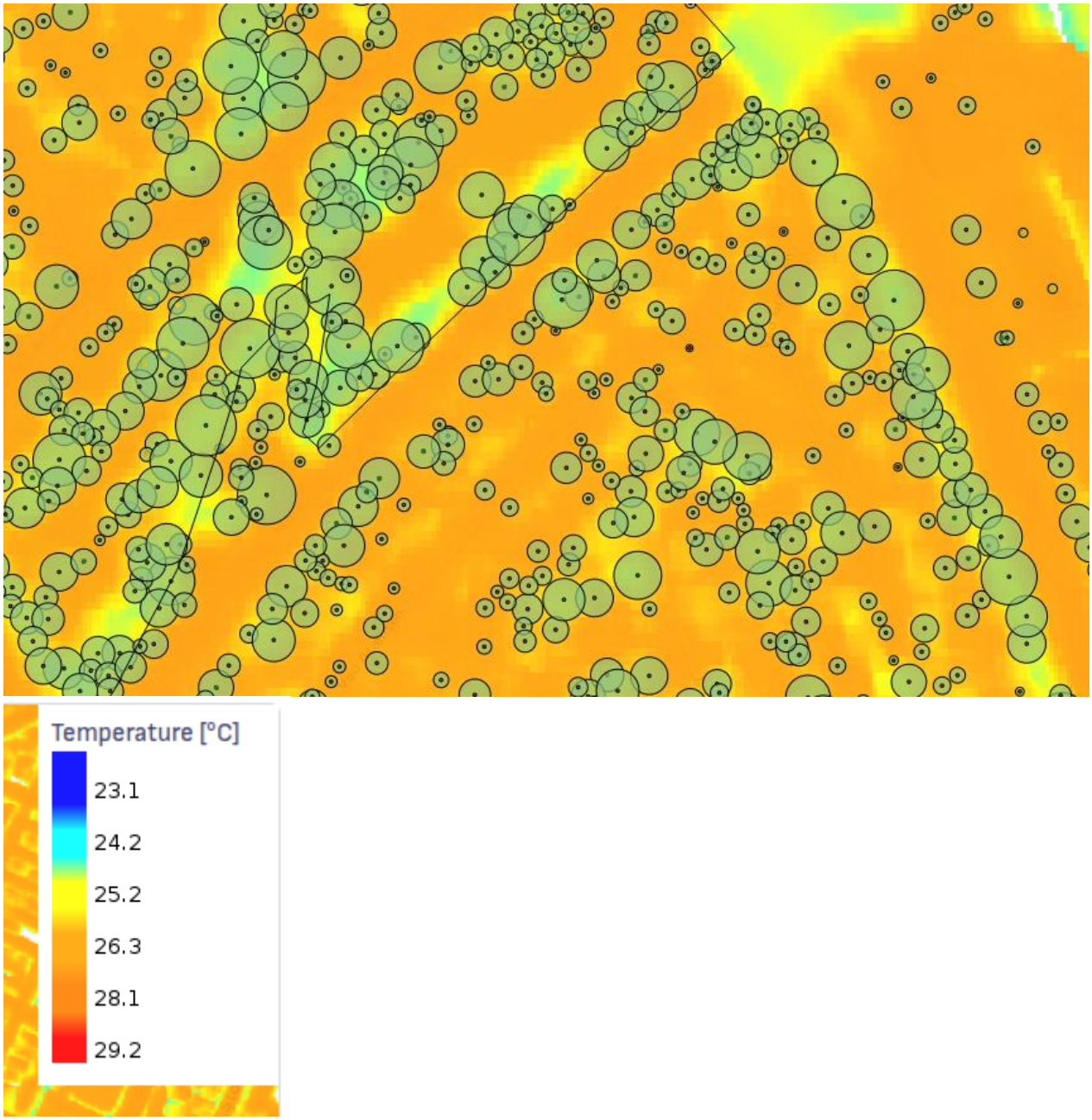

Figure 8. Temperature layer.

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Noise Layer

The noise layer is computer-modeled. The data for it is provided by the project partners.

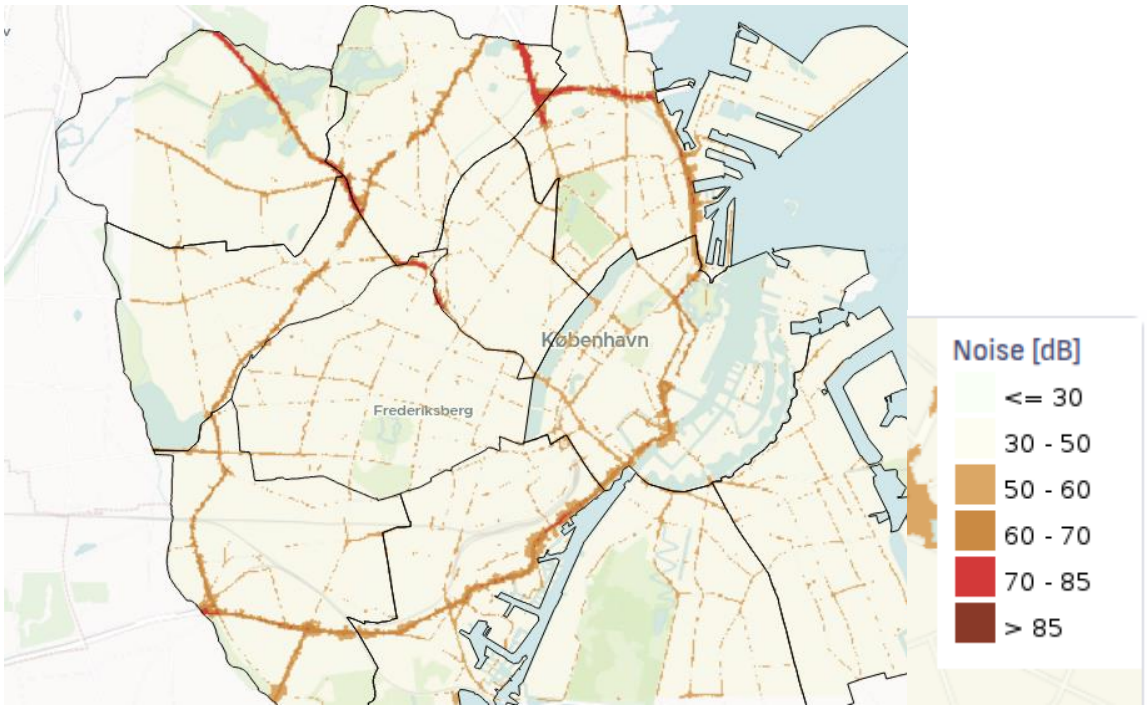

Figure 9. Noise layer overview.

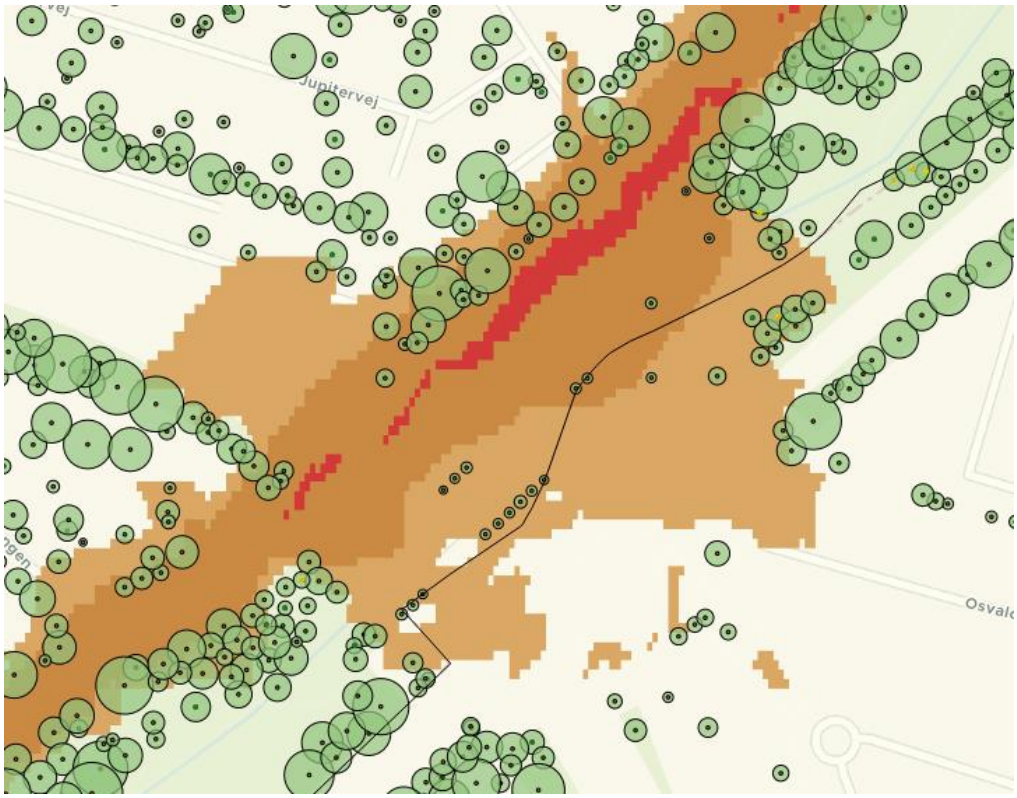

Figure 10. Noise layer zoomed.

Air pollution layer

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The air pollution layer is computer-modeled. The data for it is provided by the project partners.

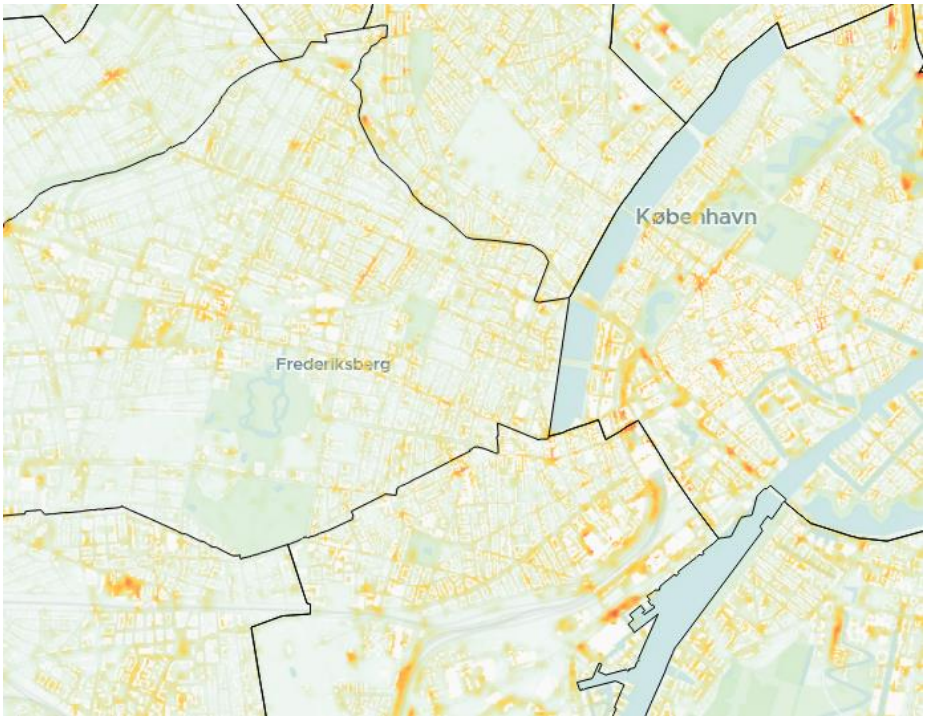

Figure 11. Air pollution layer overview.

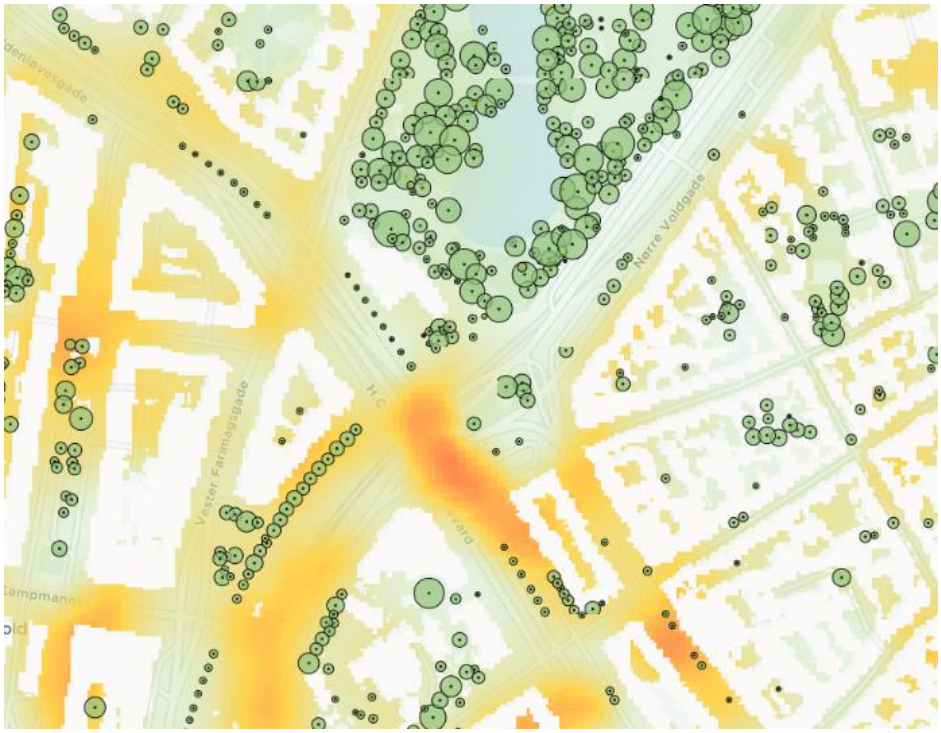

Figure 12. Air pollution layer zoomed.

Building Layer

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Figure 13. Building Layer.

Figure 14. Building Layer zoomed.

3.3.3 Scenario planning

Through the user interface, simulations for various scenarios in smaller areas can be requested. The requests for generating the scenarios are sent to the project partners via

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API, and the results are received, stored, and visualized.

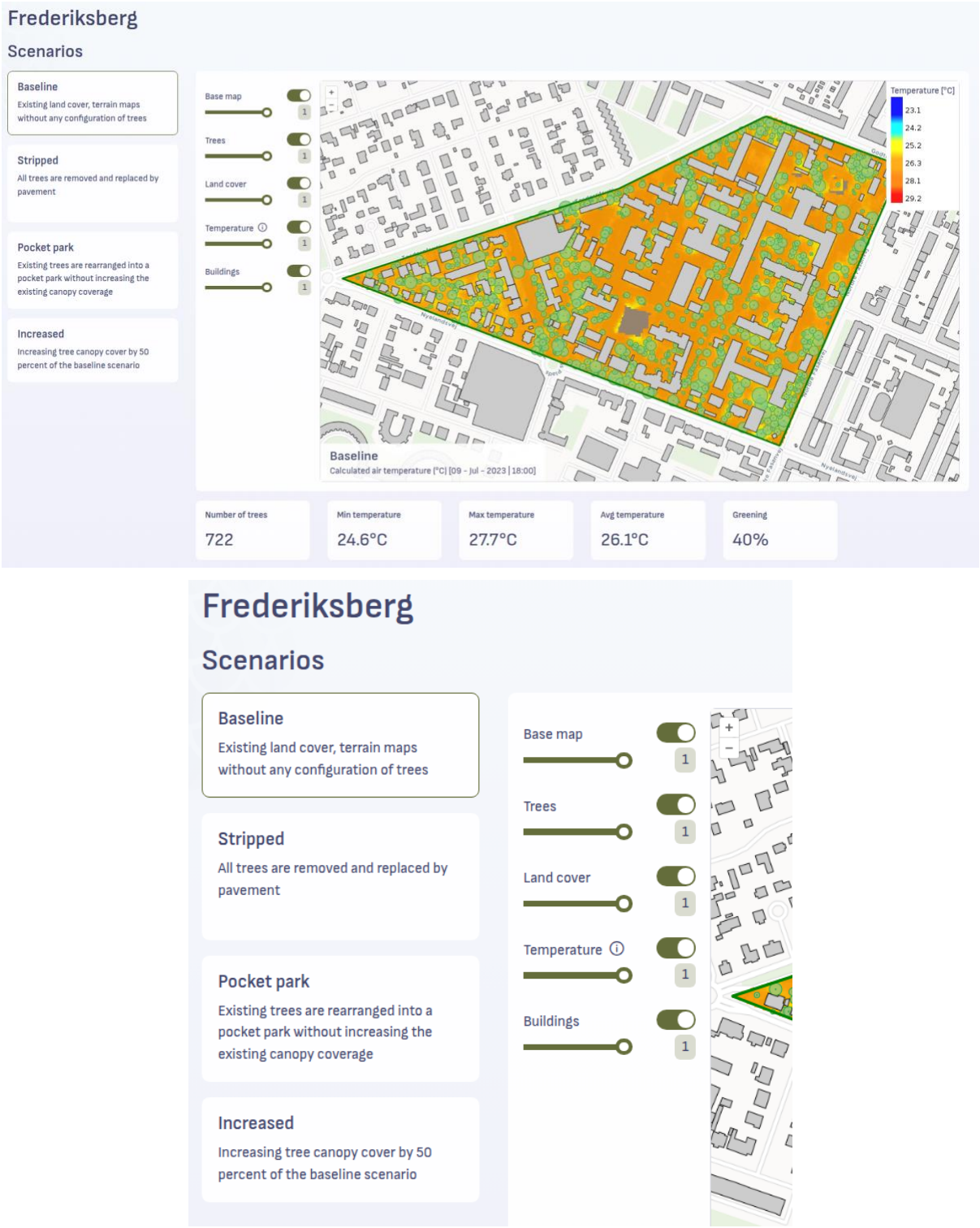

Figure 15. Scenario planning.

Scenarios

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Baseline

Existing land cover, terrain maps without any configuration of trees.

Figure 16. 'Baseline' scenario visualization for Frederiksberg, Copenhagen.

Stripped

All trees are removed and replaced by pavement.

Figure 17. 'Stripped' scenario visualization for Frederiksberg, Copenhagen.

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Pocket park

Existing trees are rearranged into a pocket park without increasing the existing canopy coverage.

Figure 18. 'Pocket park' scenario visualization for Frederiksberg, Copenhagen.

Increased

Increasing tree canopy cover by 50 percent of the baseline scenario.

Figure 19. 'Increased' scenario visualization for Frederiksberg, Copenhagen.

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4 Used software

The user interface was created entirely using open-source technologies.

Front-end

Angular is a framework developed by Google for building dynamic single-page web applications. It allows developers to create modular and maintainable applications with features like automatic data synchronization and easy navigation between different views.

OpenLayers is a tool that simplifies the integration of dynamic maps into web pages. It can display map tiles, vector data, and markers from various sources. Developed to enhance the use of geographic information, OpenLayers is completely free and open-source

Back-end

Symfony is a free and open-source PHP web application framework that includes a collection of reusable PHP component libraries. It was released as free software on October 18, 2005, under the MIT License.

GeoServer is a web server designed to serve maps and data from various formats to standard clients, including web browsers and desktop GIS programs. It publishes data through standards-based interfaces such as WMS, WFS, WCS, WPS, and Tile Caching. Additionally, GeoServer features a browser-based management interface and can connect to multiple data sources at the back end.

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PostgreSQL, often referred to as Postgres, is a free and open-source relational database management system that focuses on extensibility and compliance with SQL standards.

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5 Conclusions

Through the user interface, users and clients of the 100KTrees toolbox can explore a variety of geospatial data, visualize and filter the trees in the city by different parameters, and submit requests for simulations with various scenarios for landscaping targeted areas.

Demo:

A demo of the user interface can be viewed at the following address:
https://d12tmbp819lsrj.cloudfront.net/

This is a development version of the user interface, and the link may become inactive in the future.

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