AIRFRESH

Air pollution removal by urban forests for a better human well-being

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Partners: ACRI-ST (FR), AIR-Climat (FR), ENEA (IT), IRET-CNR (IT)

Mass urbanization is one of the most urgent challenges of the 21st century, as ab. 80% of EU population will live in cities in 2030 and outdoor air pollution will cause 6.6 million premature deaths. **Urban reforestation can help** improve air quality and people's wellbeing. To efficiently reduce air pollution and target carbon-neutral and climate-resilient cities, a quantitative and concrete assessment of the role of urban trees in affecting air quality and thermal environment as well as a **suitable selection of tree species** are urgently needed. **AIRFRESH** worked in Aix-en-Provence in France and Florence in Italy, with **transfer of good practices** to Bucharest and Zagreb city planners and stakeholders.

AIRFRESH key messages:
- A new methodology was developed to detect, classify, and map individual trees and green spaces at city scale, and quantify the amount of pollutants they remove from the urban air.
- The results allow identifying priority areas for greening in densely populated cities.
- Peri-urban forests influence climate conditions and air quality within the cities. Thus peri-urban areas can be a target for greening strategies.
- Private trees in Aix and Florence were more than 80% of the total, stressing the need of policies for private owners.
- Trees remove air pollutants from the air, e.g. particles (PM_{10}), nitrogen dioxide (NO_2), tropospheric ozone (O_3) and carbon dioxide (CO_2), but their efficiency depends on the species and local climate conditions.
- Scientifically-sound recommendations of the best/worst woody species for urban polluted environments were made available by AIRFRESH. Recommendations differ in different cities.
- The amount of removed pollutants can compensate the emissions from thousands of cars, e.g. in Aix-en-Provence, trees remove every year 41 tons NO_2 (corresponding to the emissions from 6,600 cars), 97 tons PM_{10} (147,400 cars) and 16,560 tons CO_2 (10,400 cars)
- A methodology was developed for checking compliance of each building with the 3-30-300 rule, i.e. at least 3 trees must be visible, green coverage in the surroundings must be 30%, the nearest entrance to a green space must be 300 m afar.
- The mean tree coverage in Bucharest was 6.5% in 2019, with 2,471 premature deaths attributed to air pollutants.
- Increasing Bucharest tree cover to 30% could prevent 387 premature deaths each year, that is about 16% of the premature deaths attributed to air pollution.

- The economic value of air pollution removal and Urban Heat Island reduction by current vegetation, as estimated in terms of avoided premature deaths, was 550 M€ for the city of Florence, 150 M€ for Aix-en-Provence and 700 M€ for Zagreb. The economic value is city dependent.
- This is the first time that air pollution and warming reductions by urban forests are quantified in tandem.
- These results help the implementation of the EU strategies, e.g. on biodiversity protection and Green Deal, that target planting of 3 billion trees by 2030 in the EU.
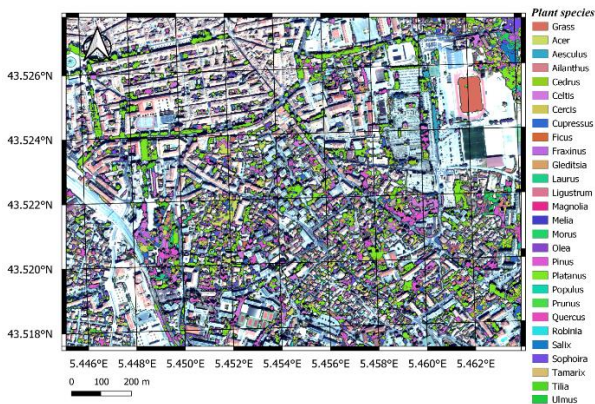
Map of ozone removal by individual trees
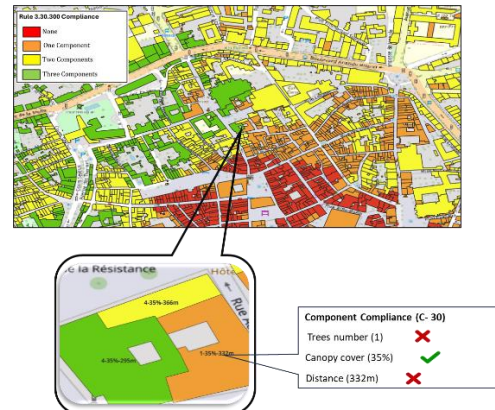
Test of the 3-30-300 rule compliance
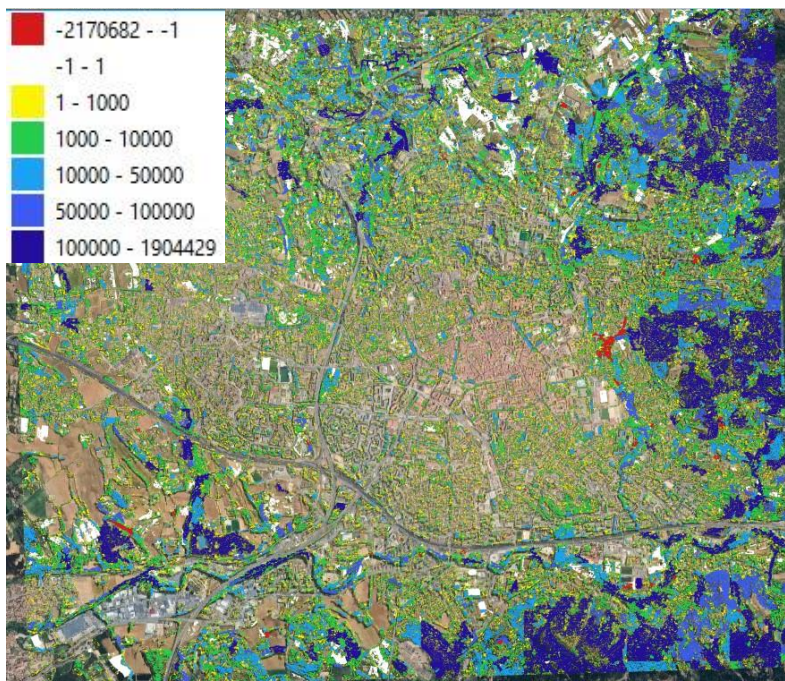
Mapping of the removed ozone amount by each individual tree (g year^{-1})