AIRFRESH

Newsletter #2

Editorial

We are pleased to present the second Newsletter of the project **AIRFRESH** "***Air pollution removal by urban forests for a better human well-being***". The main objectives, core actions, and performed activities are presented here.

The Project Team

AIRFRESH: Objectives and Actions

Peri-urban reforestation, near densely populated cities where it is not easy to plant trees, can help **improve air quality** and meet clean air standards in cities. For that, municipalities and city planners need a **quantitative assessment** of the role of urban trees in affecting air quality and a **suitable selection** of tree species.

We have selected two front-runner cities, **Aix-en-Provence** in France and **Florence** in Italy, where human exposure regularly exceeds the World Health Organization protection limits of particles ($PM_{2.5}$, PM_{10}), nitrogen dioxide (NO_2), and surface ozone (O_3).

The project AIRFRESH, which started in September 2020 aims to: 1) estimate the **air pollution removal capacity** by a reforested test area; 2) estimate and quantify the **environmental and health benefits** provided by the urban trees in both cities; and 3) propose recommendations for **reforestation policies** (e.g., number and type of tree species to be planted) for attainment of the air quality standards in both cities.

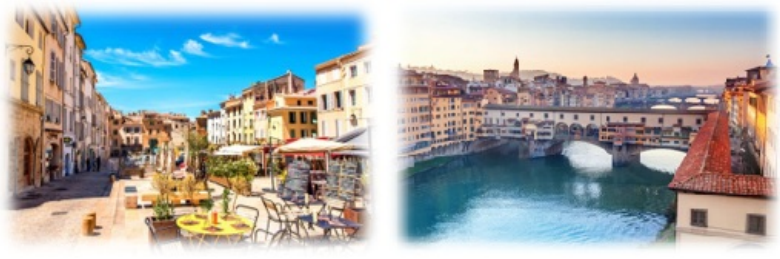

Fig. 1 - Front-runner cities: Aix-en-Provence (left) and Florence (right)

Activities performed

Tree selection is a crucial step for proper urban planning

To overcome the urban challenges (air pollution and climate change effects mitigation) by vegetation use, it is necessary to answer the fundamental question of **which plant species are more suitable to use**, and which one should be avoided.

We ranked about 300 plant species according to their: 1) effectiveness in removing $PM_{2.5}$, PM_{10}, CO_2, NO_2, and O_3; 2) capacity of emitting biogenic Volatile Organic Compounds (bVOC); 3) O_3 and particles formation potential; 4) tolerance to air pollution, drought, pest and disease; and 5) pollen allergenicity. A list of 10 suitable plant species was delivered to municipalities. Several promising tree species (e.g., *Tilia tomentosa, Acer platanoides, Celtis australis*) are selected.

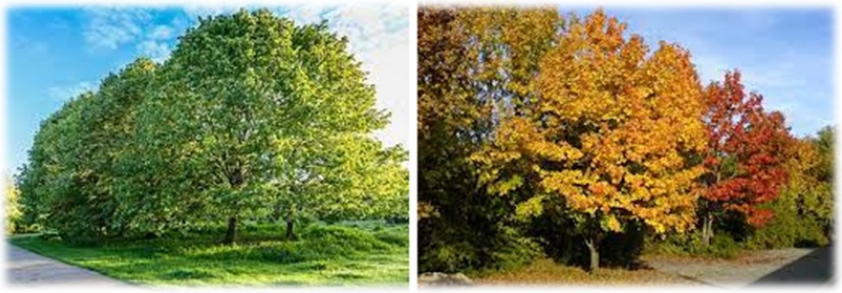

Fig 2 - *Tilia tomentosa* (left) and *Acer platanoides* (right) among the top-ranked tree species.

Trees selection from a Nursery

Based on the list of **suitable tree species** to maximize air quality, i.e., adapted to local conditions with a high absorption and removal capacity of air pollutants and low bVOC emissions, **400 fast-growing trees** (mixed species, > 2 m tall) were selected at a nursery nearby each front-runner city.

Fig. 3 - Selection of 400 trees in the nursery Soupe in France (July 2021) with the municipality of Aix-en-Provence.

Air quality monitoring in Aix and Florence

The hourly air pollutant concentrations (CO_2, $PM_{2.5}$, PM_{10}, NO_2 and O_3) are measured by **AirQino sensors**. The air temperature, relative humidity, wind speed and direction are also continuously measured. The measurements campaign started in July 2021, before tree planting. After tree planting, the measurements will be carried out in and around the area, above and below the canopy.

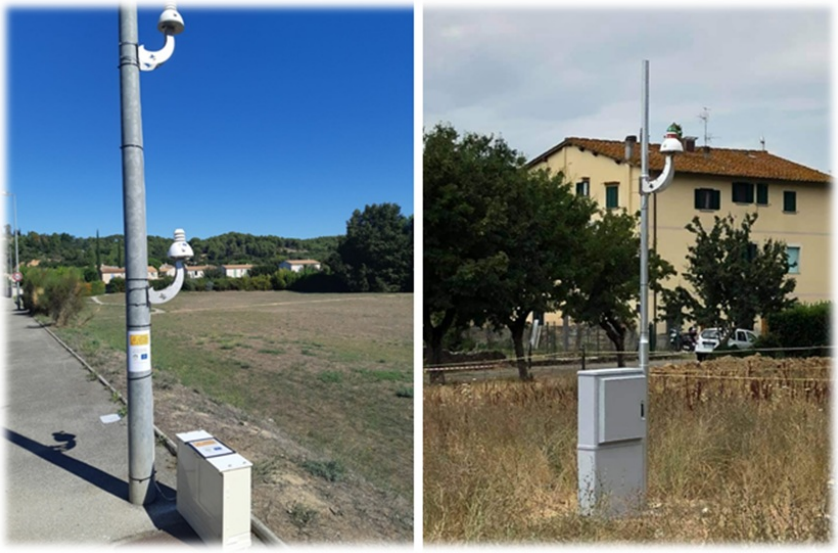

Fig. 4 - Set-up of the air quality and meteorological sensors to measure baseline conditions before tree planting in Aix-en-Provence (left) and Florence (right). The sensors are placed vertically, unsheltered, at 1.8 m and 3.0m above the ground.

Soil biodiversity analyses

From soil core sampling, Environmental DNA (eDNA) allow simultaneously quantification of initial and upgraded status of ecosystems in terms of biodiversity of a range of micro- (bacteria, fungi) and macro-organisms (e.g., invertebrates, plants) before and 2-years after tree planting.

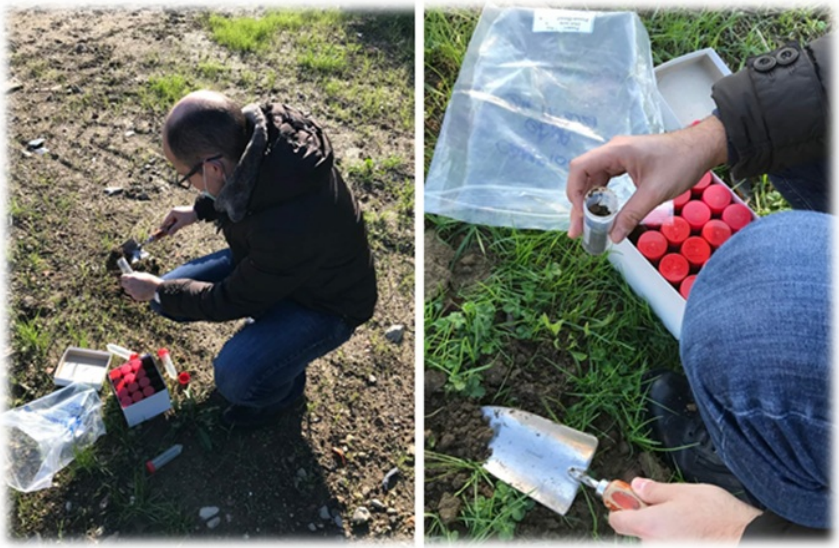

Fig. 5 - Soil core sampling (15 tubes in each test area) in Aix-en-Provence and Florence before the tree planting.

International Conference "Air Pollution Threats to Plant Ecosystems"

The conference entitled "*Air Pollution Threats to Plant Ecosystems*", organized by Dr Pierre Sicard was held in Paphos (Cyprus) on 11-15 October 2021.

Fig. 6 - Dr Pierre Sicard (left) during the opening speech, and Dr Alessandra De Marco (right) Chair of the session "*Plant ecosystems in a changing world: monitoring, modeling, and risk assessment*".

The hybrid conference gathered **93 participants from 27 countries**, with 61 oral and 26 poster presentations, to share the current state of knowledge and discuss scientific gaps in the understanding of the interaction of climate change, air pollution and atmospheric deposition and their integrated effects on forest ecosystems.

Fig. 7 - Conference room in Annabel hotel (left) and Group photo (right).

The session "*Urban green: sinks or sources of air pollution and climate change*" has been organized in the framework of the AIRFRESH project, including presentations focusing on the effects of the main urban pollutants on plants as well as estimations of the mitigation potential by urban plants in urban and peri-urban environment.

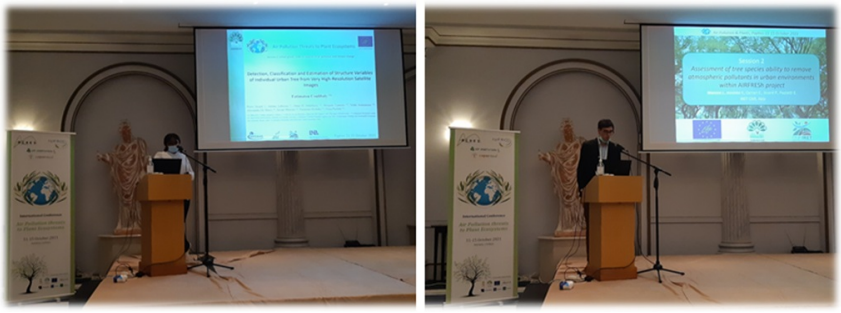

Fig. 8 - Coulibaly et al., "*Detection, Classification and Estimation of Structure Variables of Individual Urban Tree from Very High-Resolution Satellite Images*" (left) and Manzini et al., "*Assessment of tree species ability to remove atmospheric pollutants in urban environment within the AIRFRESH project*" (right).

Presentation of the project to the population

In November 2021, the AIRFRESH project was presented to the inhabitants of Aix-en-Provence by the Mayor, Mrs Sophie Joissains, and by the project coordinator, Dr Pierre Sicard.

Fig. 9 - The Mayor, Mrs Sophie Joissains, and local elected officials (left) and Dr Pierre Sicard (right).

Planting and maintenance: ongoing

The planting activities started mid of January 2022 in both areas and will finish by 31st January. In Aix-en-Provence, the inauguration of the peri-urban forest will be held on March 8, with all AIRFRESH partners, LIFE representatives, local elected officials, and the Mayor.

Fig. 10 - Both peri-urban areas, where 400 trees will be planted, in Southwest Florence (left) and Southwest Aix-en-Provence (right).

Upcoming events

International Urban Forestry Conference

Partners

2-4 March 2022
Hong Kong, China
https://www.hk2022iufc.hk

Tree planting ceremony - Inauguration
8 March 2022
Aix-en-Provence, France

European Forum on Urban Forestry
17-21 May 2022
Belgrade, Serbia
https://efuf2022.com

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