

# Performance Report Hampstead Hill School

## Climate action and enhancement of school grounds through better air quality, a place to relax and enjoy.

We, at GCS, are excited to link with Hampstead Hill School in tackling the fight against air pollution. We are especially proud to fulfilling our promise of clean air for everybody alongside a school full of young children who are particularly vulnerable and worthy of protection.

The CityTrees at Hampstead Hill School have been in action for almost a year and a half now and are relentlessly cleaning the air for the pupils and school staff alike.

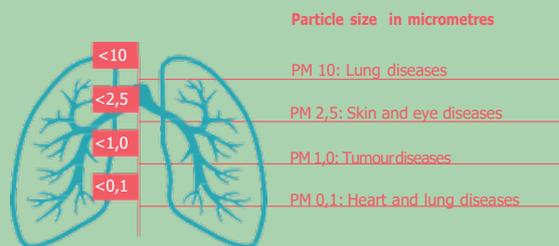
The CityTrees are connected to the CLIMACELL air quality measuring network. A performance enhancement program slowly increases the air volume throughout of the CityTrees which in turn improves the air quality in those surroundings even more.

This performance report shows the data that can be read as a result of the measures above.



## You don't want that in your lungs

Depending on the particle size, fine dust penetrates the body to different depths - the smaller the particles the deeper they go. The particles can trigger a whole range of diseases - among the most common are lung and cardiovascular diseases. We have a better idea for the harmful, ultrafine particles:



## Moss, the fine duster

Due to the fine dense composition, mosses have a huge surface area that provides plenty of space for dirt from the air. Like a small feather duster the moss can thus electrostatically bind large quantities of fine dust, which eventually metabolize.

So, in other words, the moss is a feather duster that eats up the dust and feeds on it.

# CityTree Performance

## AIR VOLUME

In the time from 15.10.2020 to 15.02.2022 (426 days), the CityTree has cleaned **8,366,900 m<sup>3</sup>** of air. This corresponds to...



... The amount of air needed by **1,818** people every day (24h) \*

... The volume of **3,350** Olympic swimming pools\*\*



... The volume of **2,090** hot air balloons\*\*\*

... The fine dust emissions of **20,000 km** driven by car\*\*\*\*



**GESAMT**  
**8,366,900 m<sup>3</sup>**

\*Average volume per breath about 0.5l, we take about 15 breaths per minute. This means 10,800l or 10.8 m<sup>3</sup> of air per person per working day (8h)  
\*\*An Olympic swimming pool has a volume of 2.5 million l and therefore 2,500 m<sup>3</sup> | \*\*\*A hot air balloon has an average of 4,000 m<sup>3</sup> | \*\*\*\* standard Euro6 car

## FINE DUST

**Total amount**  
**90 g**

Average fine dust concentration  
**21.1 µg/m<sup>3</sup>**  
PM10



The filtered fine dust is equal to the weight of

**360**  
rice grains



The filtered fine dust is equal to the weight of

**23**  
sugar cubes



The filtered fine dust is equal to the weight of

**7,500**  
cigarettes



## CO<sub>2</sub>

Average black carbon concentration in the UK\*

**700–1,800**  
**ng/m<sup>3</sup>**



Absorption rate of the CityTree

**25%**



GWP of black carbon

**120–1,800**



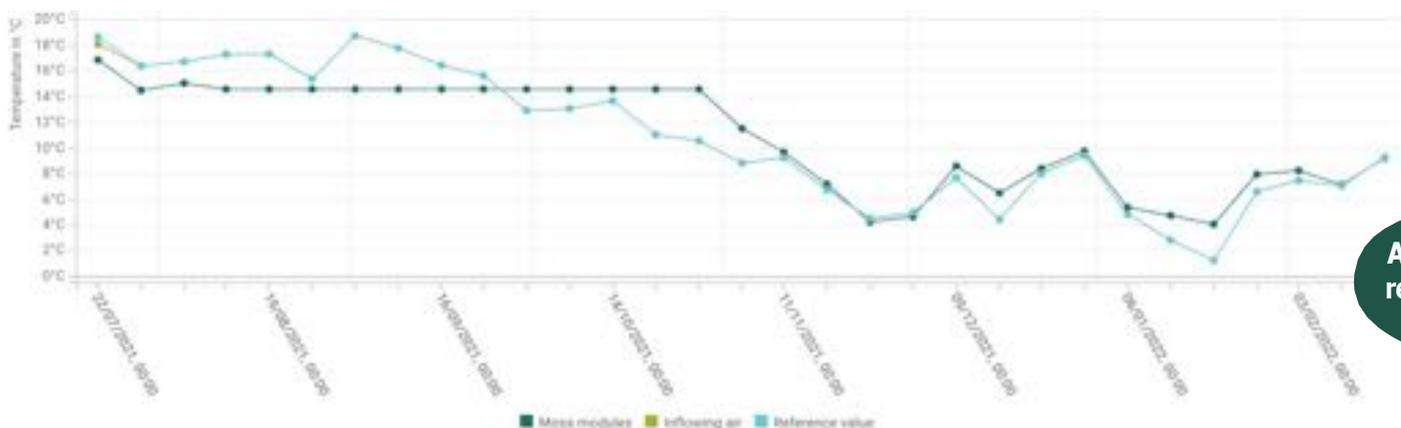
Filtered CO<sub>2</sub>-equivalents by the CityTree

**Up to 108 kg**  
**CO<sub>2</sub>-eq**

**Total amount**  
**108 kg**

\*Source: <https://acp.copernicus.org/articles/11/6207/2011/acp-11-6207-2011.pdf>

## COOLING CAPACITY



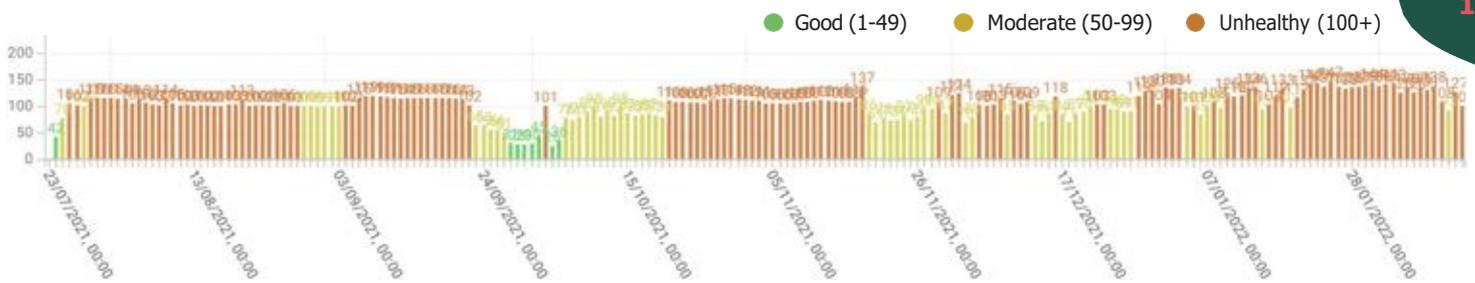
**Average reduction**  
**3.4°C**

# CityTree Performance

## AIR QUALITY INDEX

AQI (Air Quality Index) is a common international parameter for comparing air quality. Each pollutant can be converted to AQI and categorized as "Good" (1-49), "Moderate" (50-99), and "Unhealthy" (100-150). The AQI displayed here shows a combination of the sensor values that the CityTree measures and that we summarize.

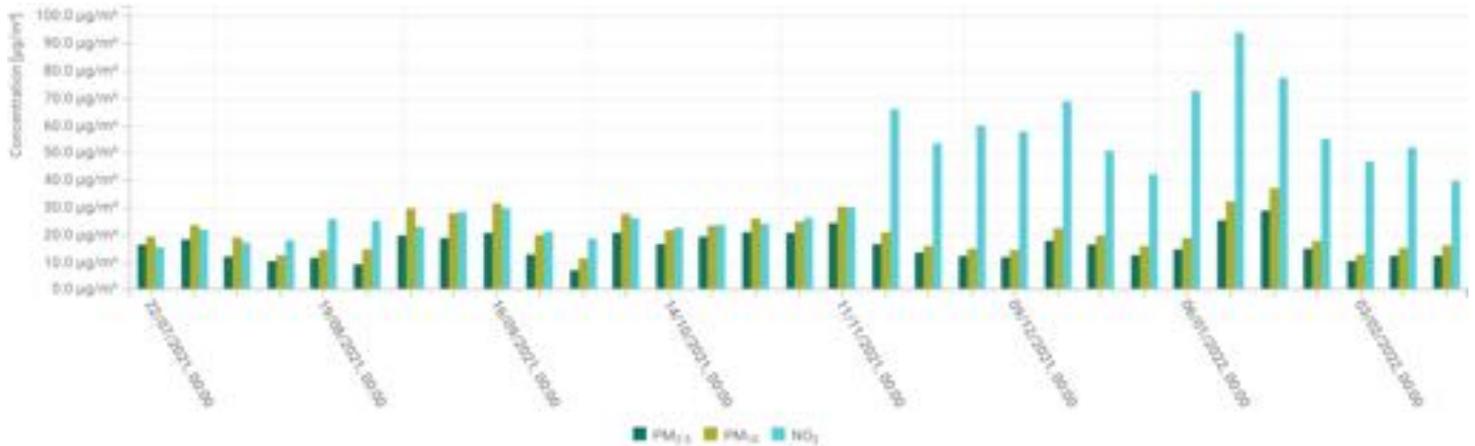
The AQI shown below always displays the **AQI based on the worst particle load** for each day.



## AIR POLLUTANT OVERVIEW

In the past three months, a particularly high concentration of NO<sub>2</sub> could be measured in the area surrounding the Hampstead Hill School.

Due to the clinging characteristics of secondary fine dust (such as NO<sub>2</sub>), elements are gathering in larger groups and can therefore be easily filtered by the mosses.



## PM2.5 AND PM10 OVERVIEW



# CityTree Performance

## PRIMARY PARTICULATE MATTER

Fine dust is defined as fine particles that are so light that they do not sink to the ground but remain suspended in the air for a certain time. In addition to soot, particles from exhaust gases, tyre and brake abrasion, sand grains, pollen, microplastics, salt crystals and glass dust are also considered fine dust. The separation rate of the mosses in the CityTrees was evaluated in extensive scientific measurements. In the following, we visualise the average filter performance in combination with the measured fine dust data of different particle sizes.

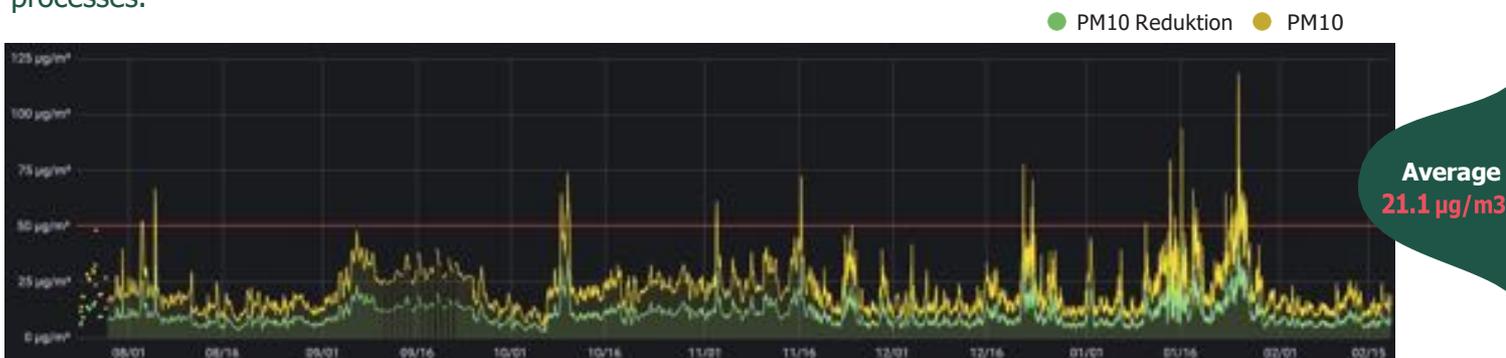
### PM2.5

Due to the small size of fine dust particles, the long time they stay in the atmosphere (days to weeks) and the atmospheric transport distance of up to 1,000 kilometres, PM2.5 is very relevant for air quality.



### PM10

Particles with an aerodynamic diameter of less than 10 micrometres are often referred to as "coarse particles" and originate, for example, from dust in road traffic and industrial operations or from combustion processes.



# CityTree Performance

## SECONDARY PARTICULATE MATTER

Secondary particulate matter is the term used to describe particles that are formed by complex chemical reactions in the atmosphere from gaseous substances such as sulphur and nitrogen oxides, ammonia or hydrocarbons. In the following, we show the concentration of the most harmful secondary particulate matter in the local air over a period of time.

### NITROGEN DIOXIDE – NO<sub>2</sub>



Average  
40.7 µg/m<sup>3</sup>

### CARBON MONOXIDE – CO



Average  
11.0 µg/m<sup>3</sup>

### OZONE – O<sub>3</sub>



Average  
49.6 µg/m<sup>3</sup>