



**greencity
solutions**



we grow fresh air

PRESS KIT

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FACTSHEET GREEN CITY SOLUTIONS

About Green City Solutions

The Berlin & Brandenburg based company Green City Solutions wants to help people in highly polluted places enjoy clean air, and the improved quality of life it brings. As its first product, the company developed the CityTree biotech air filter for exactly this purpose.

About the CityTree

The CityTree is an air filter based on the idea of combining nature with digital technology. It uses the natural ability of living moss to bind fine dust and remove it from the air, thus improving air quality. The interaction of sensors, intelligent ventilation, irrigation and software makes the natural cleaning power both functional and measurable.

The CityTree is a combination of street furniture and bio filter: a bench below, a moss-covered surface above, and complex technology with IoT interface inside. This opens up further application possibilities, such as in the areas of smart city (e-mobility) infrastructure and communication.

Quick Facts

Each CityTree can clean, cool and humidify about 3,500 m³ of air per hour, which is equivalent to the breathing volume of 7,000 people

The CityTree can remove up to 82% of fine dust from the air and thus improve the air in the surrounding area by up to 53%

These measurements have been confirmed by the Leibniz Institute for Tropospheric Research

Environmental performance can be detected, evaluated and controlled through the use of sensors

The CityTree is a highly effective air conditioner, but needs only the power of 5 light bulbs (about 125W)

The CityTree is never „full“, as the fine dust is converted to natural biomass by the moss

Mosses thrive under controlled conditions in the moss farm up to 16x faster than in nature

FOUNDING DATE

MARCH 2014

MANAGING PARTNER

Peter Sanger

FOUNDER

Peter Sanger
Zhengliang Wu

EMPLOYEES

35 (November 2020)

MOSS FARM

1.200 sqm moss cultivation
in vertical farming

CITYTREE LOCATIONS (F.EX.)

London
Berlin
Erding
Lissabon
Cork

FUNDING

> 2 Mio. Euro through public funding
via EU projects (f.ex. Horizon 2020)

AWARDS

> 25 national and
international awards

PARTNERSHIPS

> 15 strong partnerships,
i.e. with Telekom

WEB

greencitysolutions.de

SOCIAL WEB

Instagram
YouTube
Facebook
Twitter
LinkedIn

PRESS CONTACT

OTL – Erika Reimann
erika@otl.rocks

ADDRESS

Green City Solutions GmbH
Fernstrasse 27
15741 Bestensee
Germany



THE PROBLEM OF AIR POLLUTION

Air pollution is one of the world's biggest environmental issues, responsible for 1 in 7 deaths. Controlling this complex problem requires the cooperation of many different actors. Successful measures also often require long planning and implementation phases, making them difficult for cities and companies to implement. Short-term measures against air pollution are therefore of great importance. Green City Solutions' products contribute to this by helping people in particularly polluted urban areas to enjoy cleaner air and thus better health and quality of life.



CLEAN AIR FOR ALL

Green City Solutions was founded by a young team of experts from different fields in Dresden. The intelligent combination of their individual expertise led to the basic idea of combining nature with state-of-the-art technology to improve air quality. Their vision is a world where people can breathe fresh, clean air in urban environments. The core product is a moss filter, called the CityTree, which combines the natural filtering properties of moss with intelligent technology to make it measurable and controllable.

THE CITYTREE

Green City Solutions has developed the CityTree, the world's first biotech particulate filter for demonstrable improvements in air quality. The CityTree is based on the idea of combining plants with Internet of Things technology to create a natural yet intelligent air filter. Special moss cultures filter fine dust and other harmful substances from the air in the process. An innovative IoT technology concept generates both environmental performance and condition data in real time, which is displayed using specially developed software. The CityTree is an innovative solution that can provide clean air immediately and lead to a healthier life for people in highly polluted urban environments.



A PIECE OF NATURE

Various moss species grow in the CityTree that can absorb and metabolise fine dust. At the same time, they produce valuable oxygen and lower the air temperature.



HEALTHIER BREATHING AIR

Using its intelligent ventilation technology, the CityTree filters breathing air for up to 7,000 people in one hour and has been proven to improve the air quality around it by up to 53%.



PLEASANT COOLING

Due to their enormous surface area, mosses store and evaporate large amounts of moisture. This cools the ambient air by up to 4°C and produces noticeably fresher air.



TECHNOLOGY FOR A SMART CITY

The integrated IoT technology provides extensive performance and condition information in real time, as well as environmental data in the surrounding area of the CityTree.



UTILITY UNIT

A fully automated irrigation system controlled by sensors provides an adaptive water supply to the mosses.



ECOLOGICAL DESIGN

Carefully selected materials and optimised supply chains ensure a particularly good CO₂ balance.



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QUESTIONS FOR GREEN CITY SOLUTIONS

Co-founder and Managing Director
Peter Sanger

Why was Green City Solutions founded?

Cities are the living space of the future and have many benefits. However, healthy air is not one of them in many places. My co-founder Liang had this experience in his native hometown Shanghai. I felt the same way while traveling through various European cities. When Liang and I met at university with these individual but similar experiences, we shared the desire to develop an ecological and economic solution to this problem. Thus, with a young team of experts from the fields of horticulture/biology, computer science, architecture and mechanical engineering, we launched Green City Solutions in 2014.

It's important to realise, air pollution is one of the world's biggest environmental problems and is responsible for 1 in 7 deaths. With our products, we want to help people in particularly polluted urban locations to enjoy clean air and thus better health and quality of life.

The current coronavirus pandemic has made us even more aware of the importance of our mission. Poor air quality promotes not only cardiac arrhythmias and dementia, but also lung and respiratory diseases. According to recent surveys, 15% of COVID-19 deaths are believed to be due to air pollution.

How does GCS address the problem of polluted and contaminated air?

Our core product is a moss filter. It is based on the idea of combining nature with digital technology to improve air quality. There is more to our natural superhero moss than meets the eye! Mosses bind fine dust, some are antiseptic, antiviral and fungicidal—true all-rounders for air pollution control and health. With the interplay of sensors, intelligent ventilation, irrigation and software, we can make this natural cleaning power measurable and usable.

The result is the CityTree. It's a combination of street furniture and biofilter: a bench below, a moss-covered surface above, protected by slats. And inside, it's packed with complex technology that both controls the moss's water supply and measures the surrounding air quality. The CityTree is thus the world's first biotech filter to quantifiably improve air quality.



How exactly does the CityTree work and what can it do?

Mosses have a huge surface, comparable to the human lung. On this surface, fine dust particles from the air sucked in are electrostatically attracted and stick, so to speak, similar to a microfiber cloth. The difference to the microfiber cloth is that the moss metabolizes the fine dust particles. That is, it „eats“ the fine dust.

In extensive measurements we could determine that a CityTree can remove up to 82% of fine dust from the air. However, the distance up to which this effect is measurable depends on numerous factors such as wind direction and strength. Under constant conditions, the effect is still scientifically detectable at 5 to 10 meters.

Each CityTree can clean, cool and humidify about 3,500 m³ of air per hour, which is equivalent to the breathing volume of 7,000 people. Although it is a highly effective air conditioner, filtering thousands of cubic meters of air every hour, one CityTree uses only the power of 5 light bulbs (about 125W).

The advantage of this bio-filter over conventional air filters is also that it is never „full“, as the fine dust is converted to biomass by the moss. So it is a self-cleaning air filter.



Contaminated, warm air is sucked in by the integrated fans.



The air flows through the vertical moss mats and is cleaned and cooled during the process.



The integrated sensor system is used for automatic moss irrigation and measures the moss performance in real time.



Filtered and cooled air gets into the environment through the ecological slat design of the City Tree.

Where does the moss used in CityTrees come from and how long does it last?

There are about 20,000 species of moss all over the world, from the polar regions to the desert. Since we don't want to take the mosses out of nature, of course, and we are constantly striving to find better moss species and mixtures for our purposes, we have built the world's first vertical moss farm in Bestensee near Berlin. Here, mosses grow on a good 1,200 m² in the form of vertical moss mats.

In nature, mosses need about four years to grow together into a dense moss surface. Through special cultivation and ideal supply conditions, we were able to shorten the time in our moss farm to less than 12 weeks. Once inserted into

the CityTree, our special bio-algorithm ensures that the mosses are well supplied. This means that they can theoretically remain in the CityTree for an indefinite period of time, and we are working on perfecting the algorithm to do just that. Currently, however, we replace the moss mats every 3 months on average to ensure ideal performance at all times. These can then regenerate on the moss farm under ideal conditions—we call this our „moss spa”—and are then used again in cities.

How long did it take to develop CityTree and what was the process like?

Since the launch of Green City Solutions, we have already worked with numerous cities and companies across Europe and we are incredibly grateful for the support of these early customers! The first version of “CityTree” was used in over 50 projects for several years.

As expected, the novelty of the technology, the complexity of linking hardware and software, and also the demands of the living creature moss far away from its usual terrain brought numerous challenges in the early years. Technical problems, special site requirements, complications with maintenance services, changing water qualities—to name just a few factors—all put a strain on the organisms. As a result, at the end of 2018, it was decided to develop a completely new product generation that would take into account all the findings of the past. To this end, we opened our production site in Bestensee near Berlin. Our interdisciplinary team there includes experts from biology, engineering and software development.

The latest product generation was presented in Berlin in March 2020 as part of the European Commission’s Horizon 2020 program for outstandingly innovative and sustainable projects. The CityTree focuses on keeping mosses healthy and is a low-maintenance, long-lasting system that rivals conventional, engineered filters in terms of performance.

In cooperation with the Leibniz Institute for Tropospheric Research Leipzig and the Institute for Air and Refrigeration Technology Dresden, the filter performance and filter effect were determined according to scientific guidelines and continuously developed.



So which is better or more effective: a normal tree or a CityTree?

This question is actually somewhat unfortunate, since both organisms provide different environmental services. We see our product as a complement to trees, not a replacement for them. Trees convert CO₂ into oxygen, provide shade and are important for the climate and biodiversity. However, they can do little to combat air pollution caused by fine dust; in fact, they suffer massively from it.

This is where our CityTree comes into play, because mosses can filter and digest fine dust in a natural way. In addition to this natural air purification, the CityTree also produces a noticeable cooling effect, right at the height of the people. Unlike trees, these environmental benefits can be monitored, measured and controlled through the use of sensors. A CityTree can also be used where trees have a hard time thriving.

The normal city tree and our CityTree are therefore not in competition with each other, but rather complement each other as solutions to different problems. As a measure, a tree tends to have a long-term effect, while the CityTree has a short- to medium-term effect. So together they form a perfect team!



What are possible locations for the CityTree and what might not be?

We are often asked „How many CityTrees would it take to clean the air in Berlin or Hamburg?“ This question is a bit absurd because, after all, you don't need it that way. There are so many places in the city where the air is fine or where there are not really a lot of people reside. The CityTree is useful in places where particulate pollution is high and where people are present or even have to be present. Think of a bus stop on a busy street, a street café, a train platform, an inner-city schoolyard, even a company campus. In these places, the CityTree can efficiently make the air better with a good use of resources and create a fresh air zone with a high quality for the people that stay there. There they can recharge with fresh air so to speak.

What are the plans for the future? Are there already ideas for further products?

Green City Solutions' vision is to bring fresh and clean air to everyone. After the test phase from 2015–19, it's now about rolling out the first production-ready model of the CityTree in cities worldwide—that's what's currently happening. The next phase will be to build up so-called Clean Air Networks, with further moss-based air filters that are also suitable for end consumers, for example, or that function as greenery for vertical facades.

In the long term, our moss filters shall be offered almost free of charge and will be financed by the analysis and visualization of high-quality data. In this way, we aim to provide clean and fresh air for 500+ million people and bind 56,000 tons of CO₂ by 2030.

Who buys or rents the CityTree?

On the one hand, the CityTree is bought or rented by cities and municipalities. However, it is also of interest to larger companies, private schools or universities in order to create targeted fresh air zones to spend time in during breaks. In addition, real estate developers have shown interest in the CityTree because it helps in reaching sustainability standards, such as those of the German Sustainable Building Council. We provide all customers with our great know-how for choosing the right installation site and give detailed advice.



CUSTOMERS AND PARTNERS ABOUT THE CITYTREE

„Berlin is the right place for innovative solutions [...]. The Berlin-based company Green City Solutions [...] has the potential to solve urban-climatic problems that are increasingly affecting our urban areas.“

Michael Müller, **Governing Mayor of Berlin**

„That’s why startups like Green City Solutions are worth their weight in gold. Because only environmental protection paired with the latest technologies can enable sustainable locations for modern living - and with the CityTree, let city dwellers finally breathe some fresh air again.“

Deutsche Telekom AG

„We were surprised how quickly the residents at Walter-Benjamin-Platz accepted the new CityTrees.“

Ludger Hammerschidt, **OfficeFirst**

“We intend to help one of the areas with the greatest circulation in the city of Lisbon, Avenida Ribeira das Naus, to improve air quality.“

Olivier Establet, **President of DPD Portugal**

“I’m delighted that this cutting-edge CityTree technology has come to Putney. We will monitor its effectiveness in absorbing air pollution on the High Street as part of our ongoing commitment to tackling climate change.”

Cllr Rory O’Broin, **Cabinet Member for Finance, Corporate Resources and Climate Sustainability**

USER TESTIMONIALS

“The CityTree is really cool because it cleans the air so we can breathe and play in the clean air.“

Student representative of Hamstead Hill School, London (age 6)

„Since the CityTree has been at my workplace, I enjoy the fresh air and no longer need asthma spray.“

Nicole Schäfer, **ISS Facility Services**

IMAGE MATERIAL

Under this link you will find a selection of image material.

Founder

Team

Moss farm

CityTree > Product photos

Renderings / Illustrations

The use of the pictures is permitted free of charge in the context of reporting on Green City Solutions. Please note the respective copyright notice in the file name (123_(c)Firstname_Lastname).

VIDEO MATERIAL

In the Green City Solutions YouTube channel, you will find numerous videos on different topics:

General

Moss

CityTree

Company & Founder

Events



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