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Green City Solutions



On 25 March 2014 Green City Solutions was launched by a team of experts from the fields of architecture, mechanical engineering, computer science and horticulture/biology: Dénes Honus, Victor Splittgerber, Zhengliang Wu and Peter Sängler. The biotech and Internet of Things (IoT) start-up offers smart solutions in the areas of environmental services, CleanTech and sustainable urban development, to help provide a more healthy life for the residents in smart, networked and green cities that are fit for the future.

The founding members have been bound by a firm friendship for more than 15 years.

Because of the different expertise and technical backgrounds the linking of biotechnology, IoT, mechanical engineering and future-oriented urban planning is virtually rooted in the founding team and thus in the product directly. All this guarantees our uniqueness on the market down to the present day.

Green City Solutions employs a staff of 13 in the areas of software and hardware development through to business development.

Awards



The CityTree



CityTree

The CityTree is built upon a patented combination of specifically selected plants, in particular moss cultures and the most advanced internet of things (IoT) technology. Each individual unit has an environmental performance of 275 conventionally planted trees and is capable of reducing the annual CO₂ footprint by up to 240 tons. It needs not more than a space of 3m² for installation and because of the IoT technology, the use of solar energy and an integrated water tank just a few hours is needed for maintenance per year. In addition the CityTree can come with visual and digital information that can be incorporated in marketing campaigns. It is thus possible to communicate analog content, such as logos and pictures, and

get access to digital services, such as iBeacon or screens. Integrated settees and the offerings of additional services, e.g. Wi-Fi hotspots or e-bike charging points enlarge the functionality of the biofilter.

Biotechnology



Moss cultures

The IoT technology is linked with the natural abilities of special moss cultures and flowering plants to remove fine particles, nitrogen oxides and thus large amounts of CO₂ equivalents from urban air. Attached vertically on a free-standing wall and optimally supplied by the IoT technology the moss filters the air 275 times more efficiently than all other biogenic solutions available on the market. The CityTree helps cultivate the mosses in the city where by themselves they would be inviable. The technologies have been patented or are in the process of patenting.

+

IoT technology

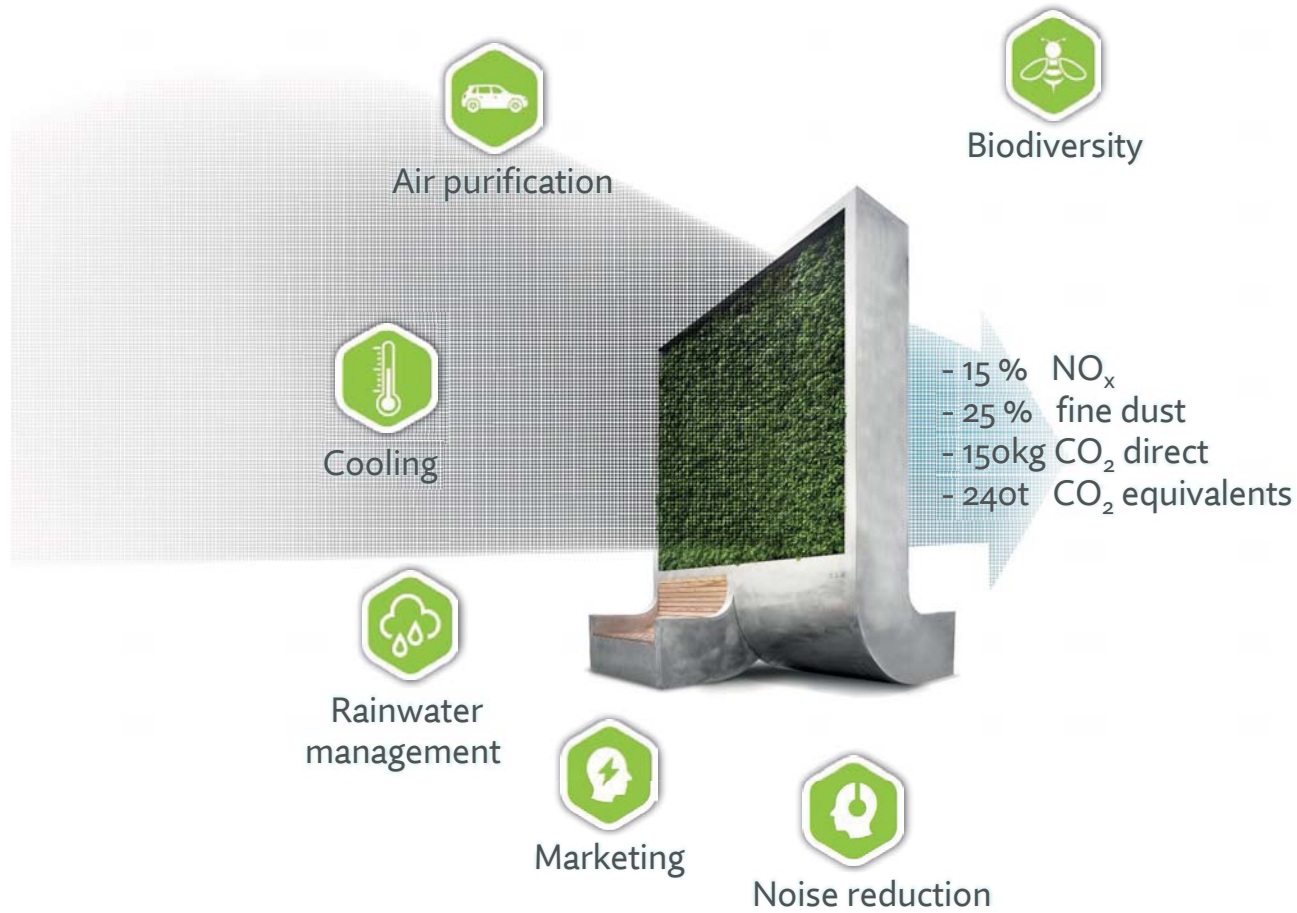


IoT-/ Internet of Things technology

The specially developed IoT technology gathers climate and environmental data that can be combined and extended with the air quality data of cities. It is thus possible to monitor the effectiveness of the CityTree in different environments and identify and analyse any correlation with existing data records of other external factors. A photovoltaic system generates a sufficient amount of energy to operate the entire control, measuring and transmission equipment. The use of solar energy, IoT technology and an integrated water tank reduces the maintenance of the vertical plant display to just a few hours per year.



The CityTree



Environmental performance

The vertical plant filter constitutes the first building block when it comes to the vision of a climate infrastructure: a sustainable urban infrastructure combining climate and environmental protection with the objectives of climate change adaptation. A CityTree absorbs the fine particles of up to 417 cars and has thus an environmental performance of 275 conventionally planted urban trees but needs just 5% of the costs and 99% less space. Each of the vertical plant filters is capable of reducing the local air pollution within a radius of 50m by up to 30%.

In one day the CityTree can contribute to a fine particle reduction of up to 25% and NO₂ reduction of up to 15%. One unit captures up to 150kg CO₂ directly.

By way of evaporative cooling the ambient temperature can be lowered by up to 17° Kelvin and local hotspots reduced. When it comes to rain water usage the ecologically active vertical greening mitigates the impact of heavy rain.

On the scale of things the free-standing biofilter improves the quality of stay because of the reduction of air pollution, noise and heat. In addition to that the CityTree can increase the biodiversity. In total the environmental and climate effects amount to a direct and indirect capture of 240 tons CO₂ equivalents per year and unit.

CityTree
Moss
(+ Cover Planting)

Calculation of Environmental Performance

Ø Urban Tree
abt. 40 years
(here Robinia pseudoacacia)

	Green Area 16,7 qm	Area comparison	Tree Crown Area 250 qm	
	30 ⁽³⁾ (+7) ⁽²⁾	Leaf Area Index (LAI)	1,5 ⁽¹⁾	
	22 ⁽³⁾ (+10) ⁽²⁾	Capturing capacity fine dust (g/qm)	0,8 ⁽¹⁾	
	365 days	Leafed phase (per year)	186 days (average)	
		Particle concentration 100% = 0-4 m height 29% = 4-10 m height		

Calculation total absorption of fine dust (per Year)

Area in m ²	16,7	250
x LAI	30 (+7)	1,5
x Capturing capacity in g/m ²	22 (+10)	0,8
x Leafed Phase	365/365	186/365
x Particle concentration	1	0,29
Total absorption	12.191 g	44.33 g

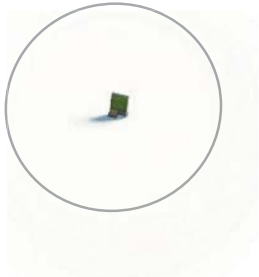
12.191 / 44,33 = **275 Trees**

Sources:
(1) Tabelle „Depositionskapazität verschiedener Pflanzenarten“, insbesondere nach S. FLOHR: Untersuchungen zum Fangvermögen von Mittel- und Feinstaub, 2010
(2) O. GORBASCHEVSKAYA: Feinstaubbindungsvermögen der für Bauwerksbegrünung typischen Pflanzen, 2012
(3) J. FRAHM: Feinstaubreduzierung mit Moosen, 2003

12.191 = (16,7 x 30 x 22 x 1) + (16,7 x 7 x 10 x 1)



275 trees = 1 CityTree



References



References - Dresden and Paris



CityTrees Dresden

- Eight CityTrees for the historic district of Dresden
- CityTrees as eye catcher and oasis of recreation at a scientific exhibition
- Great media interest and social media involvement
- Broad acceptance by visitors and residents
- Popular seating



CityTrees Paris

- Three CityTrees for Paris and Cisco
- CityTrees as green infrastructural elements and flagships of the Smart City project
- International coverage
- Broad public acceptance
- Paris and Cisco provide a higher standard of living and add to environmental protection and nature conservation .



References - Oslo and Berlin



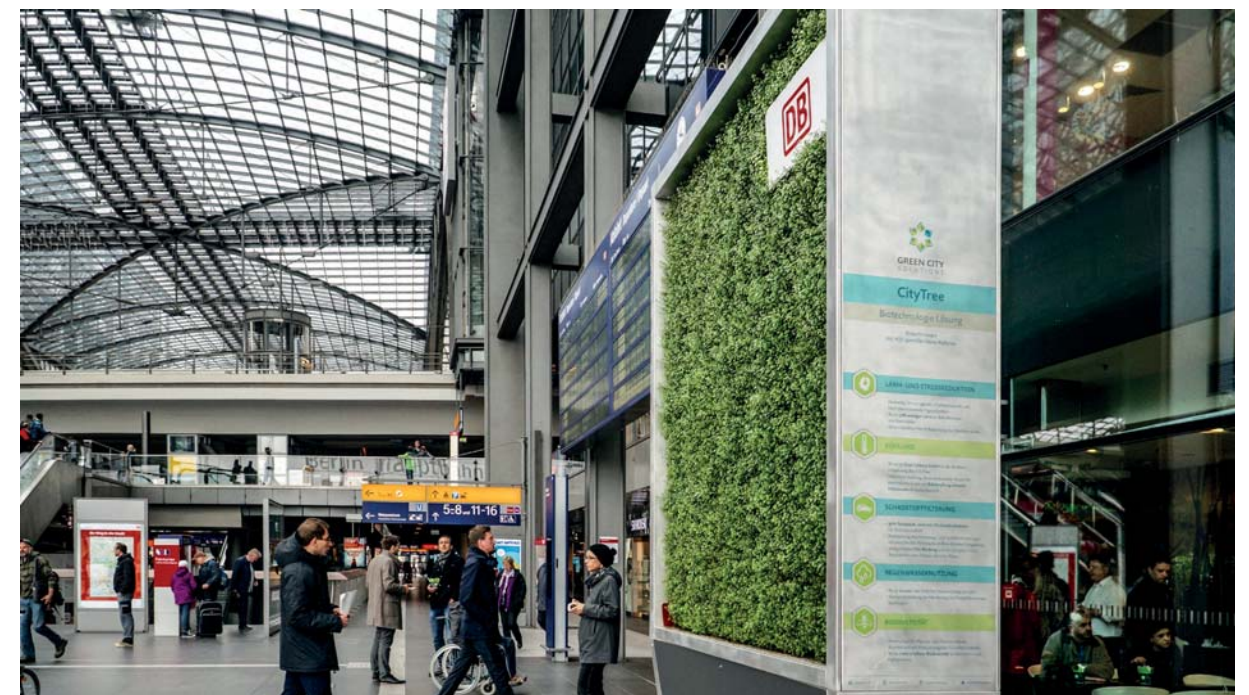
CityTrees Oslo

- Two CityTrees for the capital city of Norway to improve the residents' standard of living
- The city adds to environmental protection and nature conservation
- Increase of biodiversity of urban area
- Contribution to environmental education on air pollution and impact on health.



CityTrees Berlin

- CityTrees with logo, info slides and multimedia screens in service for Deutsche Bahn
- CityTree as communicator for information and sustainability strategy
- Use at rail stations and their forecourts and at exhibitions
- Great media interest and social media involvement
- Broad acceptance by visitors, ascertained by survey



Dashboard



Dashboard: Overview

Dashboard

The CityTree is your digital interface to the CityTree and depicts all relevant information at a glance – divided into five easy-to-survey subareas.

Overview gives you an initial overview on the overall condition of the CityTrees.

Air Quality Impact visualizes the current performance of the unit whereas the **Purification Data** tab allows to actively control the ventilation performance. The air purification performance can thus be controlled exactly and quantified at the same time. Through **Media** you may track articles and postings on one or all of your CityTrees and share the same on your channels. At **Maintenance** you can retrieve the current status of maintenance and servicing of your CityTrees.

In future it will be possible to directly communicate with the team of Green City Solutions and retrieve environment-related data via the Dashboard.

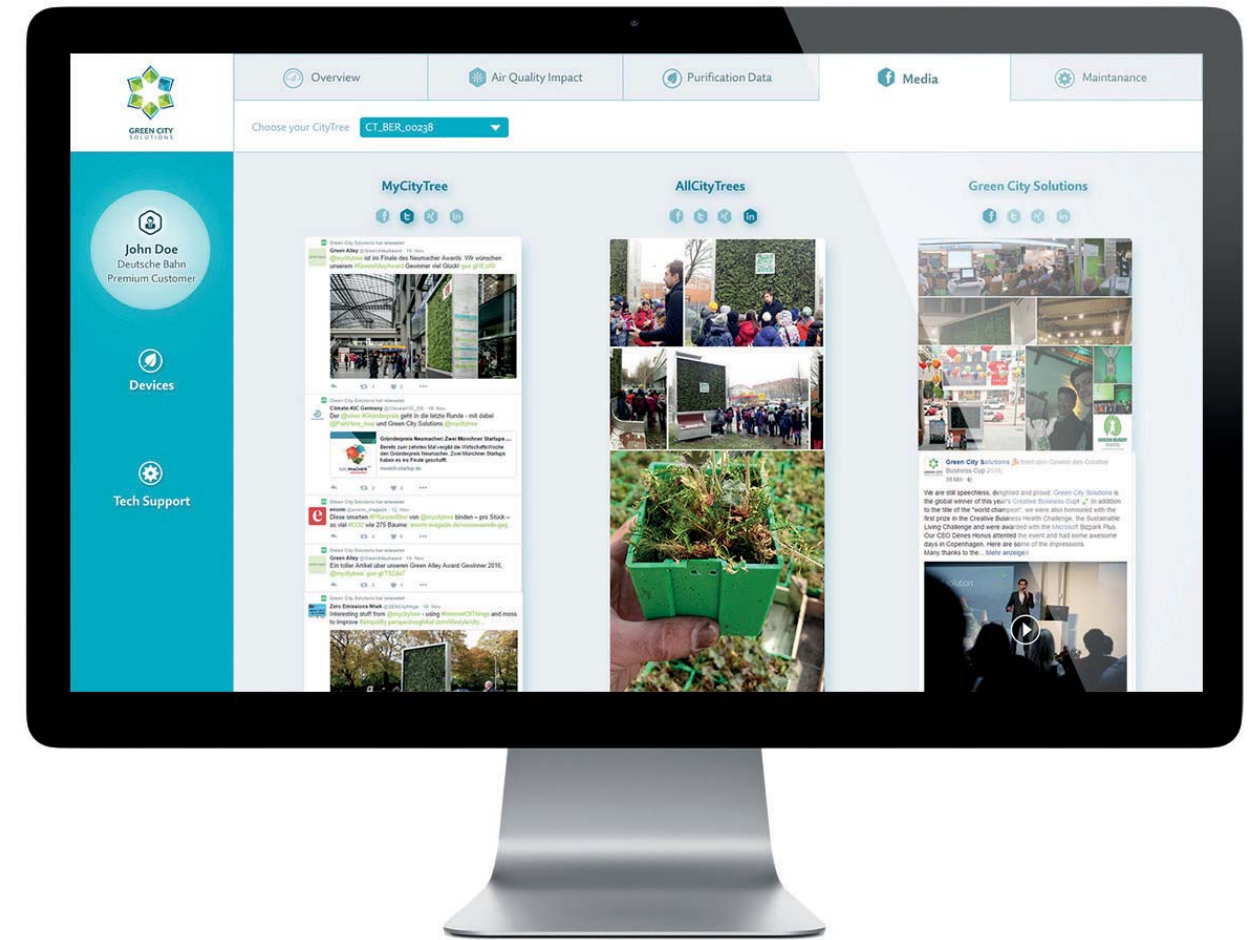


Dashboard - Air Quality Impact und Media



Dashboard: Air Quality Impact

Air Quality Impact visualizes the current performance of the unit to positively influence the air quality of the environment and reduce the air pollution. The components, such as fine particles, nitrogen oxides and sulphur dioxide can be displayed and analyzed separately.



Dashboard: Media

Through Media you call up press coverage and the social media involvement concerning one or all of your units. In addition you may share this or general information on Green City Solutions and the CityTree on your own digital channels.





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