

METABUILDING 2nd GROW / HARVEST CALL : MEET THE WINNERS !

BioAirPurifier

A modular indoor Bio-air-purifier as an energy efficient solution to reduce CO2 uptake

SECTORS INVOLVED : Construction – Digital industry – Nature based solution

Symbia&gro

ITALY

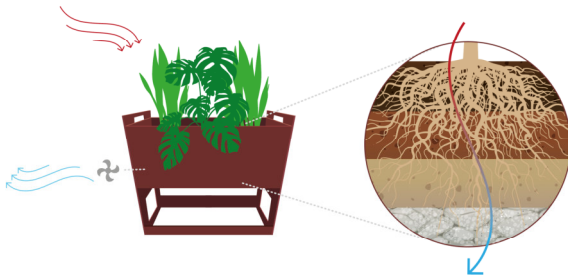
Strategic BIM ||

ITALY

VESELA
MOTIKA

CROATIA

Air Flowing trough
substrate and root system

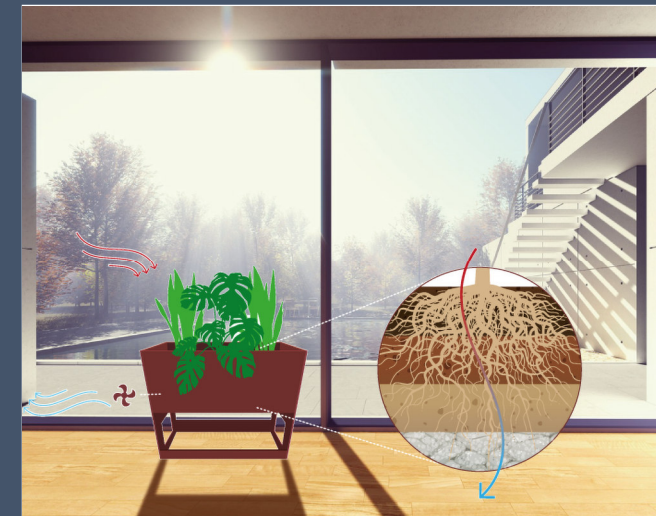


Reducing CO2 uptake with
a nature based solution

"Indoor Air Quality is directly related to well-being, comfort, and health of indoor building occupants, we have found a way to improve it using natural and low energy solutions"

Alessandro Pipolo

Executive Manager - Symbiagro srl



Consortium partners



AgBiotech, Digital and Nature based solution companies



Symbiagro is an Italian company in green biotechnologies applied to agriculture, our innovative formulations that, when applied to plants and soils, increase agricultural productivity and resistance to external stress, finally restoring fertility in an environmentally friendly and sustainable way.



Strategic BIM is an Italian innovative company, entirely composed by under 35, for assets and buildings' management. We create and update digital twins of existing buildings, supporting buildings' owners reducing building management costs through our Platform usage "Strategic Twin". We allow buildings' owners to manage buildings from anywhere.



Vesela Motika is a Croatian company that provides design, production and implementation of green roofs and walls, turnkey green tech solutions including nature-based solutions, professional and home use indoor vertical gardening systems and fresh vegetable produce (herbs and microgreens) from their indoor vertical farm.



Project Summary



BioAirPurifier Project

The project will provide a new combined technology for **a modular indoor Bio-air-purifier** with a greenery package that can be implemented during **building refurbishment as a low cost and energy efficiency solution to reduce CO2 uptake** and other dangerous substance in indoor air, control humidity and have a positive effect as natural cooling indoor system.

The project partners will use their **cross sectorial experience (Digital , Biotech, NBS sector)** to achieve this goal combining technology near to market or already on the market and reach a TRL6 solution as project co-creation final goal with a pilot demonstration in relevant environment.

The solution will be developed following some principles of the new ESPR regulation about ECODESIGN and to **be compliant with a selection of criteria from LEED® and WELL™ certification protocols.**



GROW/HARVEST CALL II

BioAirPurifier



Challenge and proposal

CHALLENGE AND PROPOSAL



BioAirPurifier Project

Challenges: The **removal of gaseous compounds** through the usage of current technologies represents an **expensive and inefficient option**, IAQ is affected by pollution with various airborne contaminants: gaseous compounds such as CO, CO₂, NO_x, SO_x, aldehydes and VOCs (Volatile Organic Compounds), fine particles (nonbiological), and bioaerosols.

Our Solution: a combined strategy to **increase efficiency in CO₂ uptake with a lower energy** cost than actual solution on the market, available also as low cost air purifier modular solution in refurbishment process of a building

Sustainable and modular design

a **sustainable and scalable BioAirPurifier module design** integrated with a ventilation system

CO₂ uptake with green and natural solution

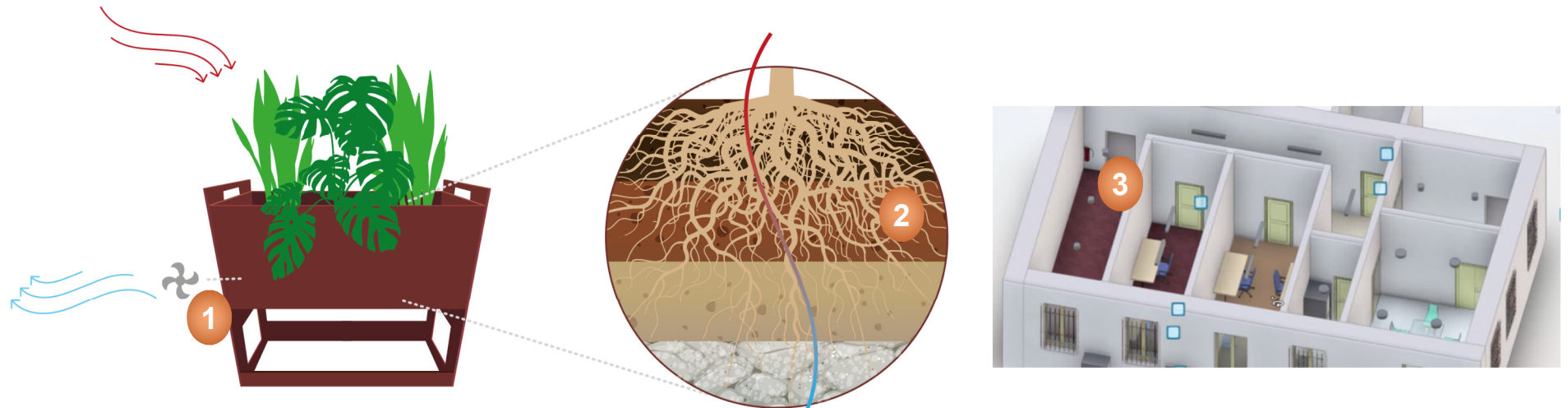
a selected **substrate mix and microorganisms** strategy to increase CO₂ uptake and plants life

Increase information flow and reduce time for better decision

a real time monitoring system integrated in a BIM **Digital Twin platform to manage the BioAirPurifier modules**

IMPLEMENTATION

BioAirPurifier Project



1 Wood modular structure designed as **indoor greenery** and **ventilation system integrated**

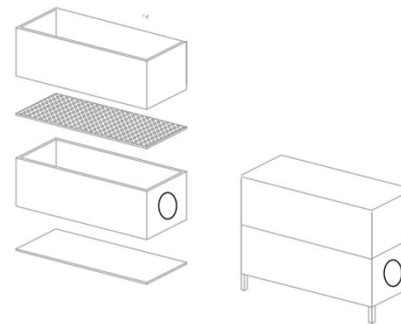
2 Mix of **selected natural substrates** and **microorganism** that can **uptake CO2** and other hazardous substances

3 **IOT sensors** for Temperature , humidity and CO2 **integrated** with a control unit and **BIM platform**

RESULT

BioAirPurifier Project

1. Multilayer design to provide modularity and scalability of the solution depending of the indoor enviroment to be integrated
2. Selection of materials due their efficiency as natural biofilters layers and plant substrates , 100% recyclable
3. Compact Vent design, low energy consumption and low noise
4. Sensor integration to BIM Platform for real time monitoring for higher efficiency and mantainance cost reduction



RESULT



BioAirPurifier Project

CERTIFICATION STANDARDS LEED AND WELL™

Targeted LEED® criteria		Targeted WELL™ criteria	
IEQ - Enhanced Indoor Air Quality Strategies	Option 2. Additional Enhanced IAQ Strategies. Path c. Carbon Dioxide Monitoring: Monitoring of CO2 concentrations within all densely occupied spaces. CO2 monitors must be between 3 and 6 feet (900 and 1 800 millimeters) above the floor. CO2 monitors must have an audible or visual indicator or alert the building automation system if the sensed CO2 concentration exceeds the setpoint by more than 10%.	A01-Air Quality	This WELL feature requires projects to provide acceptable air quality levels, as required by public health authorities. Indoor air quality can be properly managed through different features listed in the WELL Air concept, including source control strategies, passive and active building design and operation strategies and human behavior interventions.
IEQ – Indoor Air Quality Assessment	Option 2. Air Testing. Under ventilation conditions typical for occupancy, baseline IAQ testing is conducted using protocols consistent with the methods listed in Table 1 for all occupied spaces. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.	A05-Enhanced air quality	The solution will be in line with enhanced levels of indoor air quality by buildings that promote health solutions. Indoor air quality can be properly managed primarily through source control strategies, passive and active building design and operation strategies and human behavior intervention and well-being of people.
		A06-Enhanced ventilation design	The solution will meet A06 WELL criteria thresholds by lowering the indoor concentration of carbon dioxide (CO2)
		A12-Air filtration	The solution will help to reduce indoor airborne contaminants through air filtration.
		S03-Sound Barriers	The solution will help to increase the level of sound isolation and speech privacy between enclosed spaces.
		M02-Nature and Place	The solution will help to support occupant well-being by incorporating the natural environment throughout the project and integrating design that celebrates the project's unique identity.
		M07-Restorative spaces	The solution will help to support access to spaces that promote restoration and relief from mental fatigue or stress by nature incorporation.
		M09-Enhanced access to nature	The solution will support access to Nature and Beauty, by further incorporating nature through interior design, exterior design, and access to nearby nature.

ANSI/ASHRAE Standard 62.1-2010
 Minimum filter standard required F8
 Air filter must be done for every environment occupied
 Concentration levels mandatory for certification:

- PM2.5 ≤ 15 µg/m³
- PM10 ≤ 50 µg/m³
- VOC (CAS 71-43-2) ≤ 10 µg/m³
- VOC (CAS 50-00-0) ≤ 50 µg/m³
- VOC (CAS 108-88-3) ≤ 300 µg/m³
- Total VOC ≤ 500 µg/m³
- Co2 ≤ 10 mg/m³ [9 ppm]
- O3 ≤ 100 µg/m³ [51 ppb]

Wood certification FSC or PEFC
 Wood with VOC low emission

IMPACT AND KPI



BioAirPurifier Project

Result at the end of the project

- Relevant data about **result in CO2 uptake, energy consumption and indoor microclimate** (humidity and temperature):
 - 1) CO2 uptake reduction up to avg 5% on top of indoor air ventilation systems , better indoor microclimate with a lower variation up to 10% in humidity and temperature during the day.
 - 2) Daily Energy consumption reduction up to 70% vs avg Air purifier on the market
 - 3) Circular economy : 100% material used is compostable or can be recycled
- Compliance with a selection of criteria from **LEED® and WELL™ certification protocols.**

FUTURE DEVELOPMENTS



BioAirPurifier Project

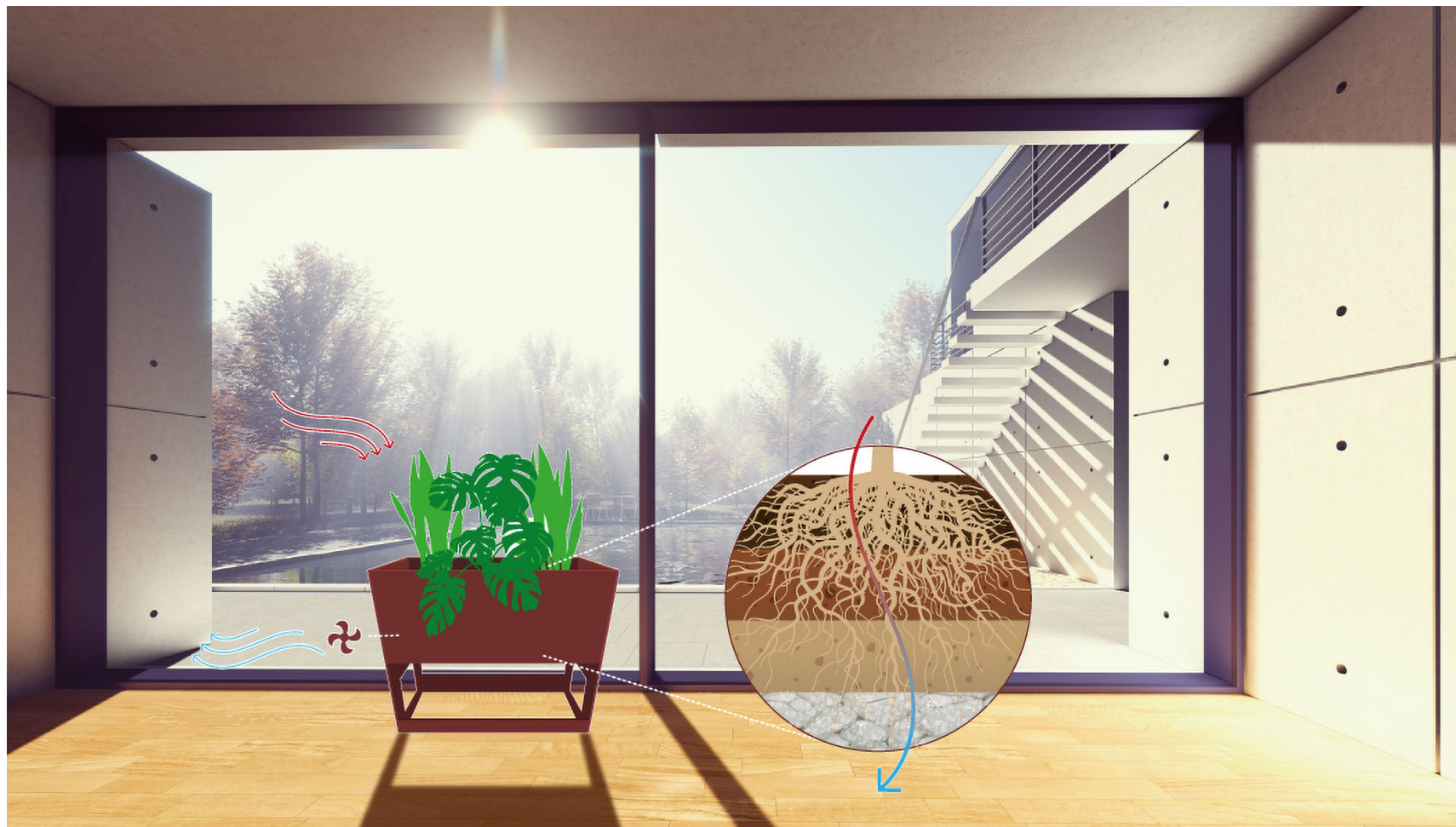
Future developments

Development of the next generation air purifier systems able to be eligible to improve LEED and WEEL TM certification protocols in construction sector

Improvements in the supply chain of materials for Circular Economy.

Impact for an SME: Collaboration within international framework and project scaling-up opportunities to develop a feasible **distribution model with other technology partners**

BioAirPurifier Project



METABUILDING · H2020 G.A. 873964



Thank you for your kind attention

www.metabuilding.com



METABUILDING Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 873964. The European Commission and the European Innovation Council and SME Executive Agency (EISMEA) are not responsible for any use that may be made of the information it contains. The sole responsibility for the content of this document lies entirely with the author's view.