UTS

Workplace Wellness Festival 2022

The Benefits of Plants at Work

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Plants and Environmental Research Group

We acknowledge the traditional custodians, the Gadigal people, on whose land we work

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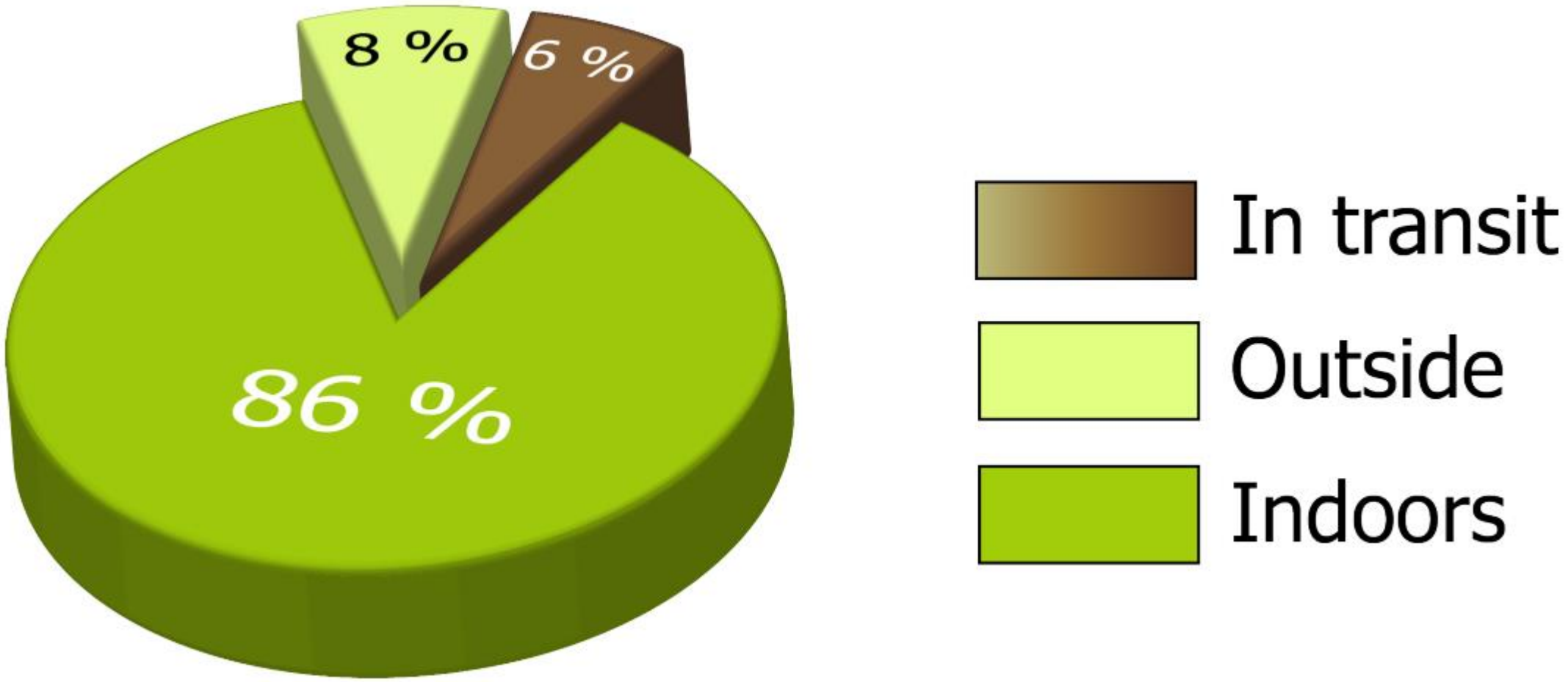
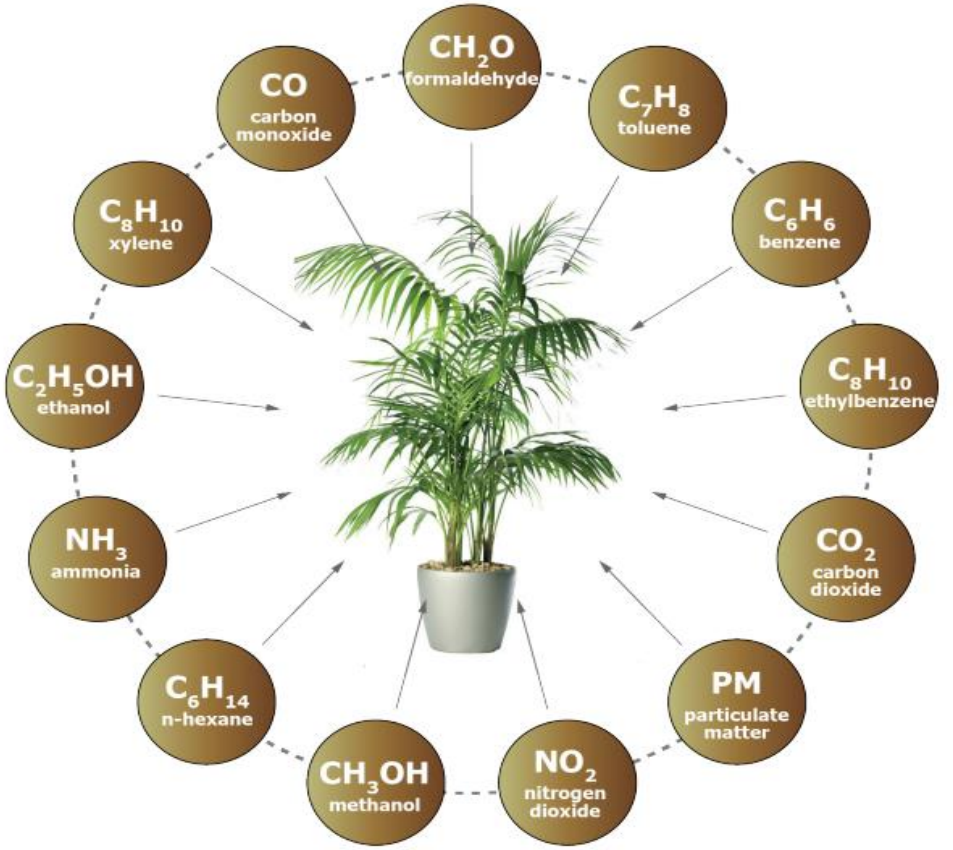
Research interests:
Air quality,
Phytoremediation,
Green Infrastructure,
Green Wall, Green Roof

The percent of the day the average person in Australia spends inside, outside, and in transit.



Sources of indoor air pollution



Indoor sources

adhesives
paint/thinners
aerosols
pressed wood
business machine
combustion by products
people
dust
fungus

Outdoor sources

oil
gas
industry
power plants
cars, trucks, motorcycles
airplanes
cities
fires

Causes 1400 - 2000 deaths per year in Sydney, 3.8 million globally

Indoor air is 3 to 5 times more polluted (sometimes 100x) than outdoors

Indoor air pollution causes Sick Building Syndrome

History of using plants to improve indoor air quality:

NASA pioneer studies using plants to improve indoor air quality

Additional studies showed plants can reduce levels of VOCs, nitrogen oxides and ammonia

Buildings are becoming more sealed to improve A/C efficiency; indoor air becomes an issue

Lab studies documenting removal of VOCs by potted plants

So far over the past 25 years…

In total about 100 different studies

About 20 different research groups

More than 300 species studied

UTS ranked no.1 in this field of research

UTS Laboratory findings – VOCs

- All species ~ equally effective
- Removal rates stimulated by first dose
- Then remove repeated doses in 24 h
- Equally effective in light or dark
- Root-zone bacteria main removal agents

SO -

- Removal by plant/pot-mix symbiotic microcosm

Conclusions

- ***Any species likely to work just as well***
- ***Pot-size does not matter too much! -***
- ***A 200 mm pot is as effective as a 300 mm pot***

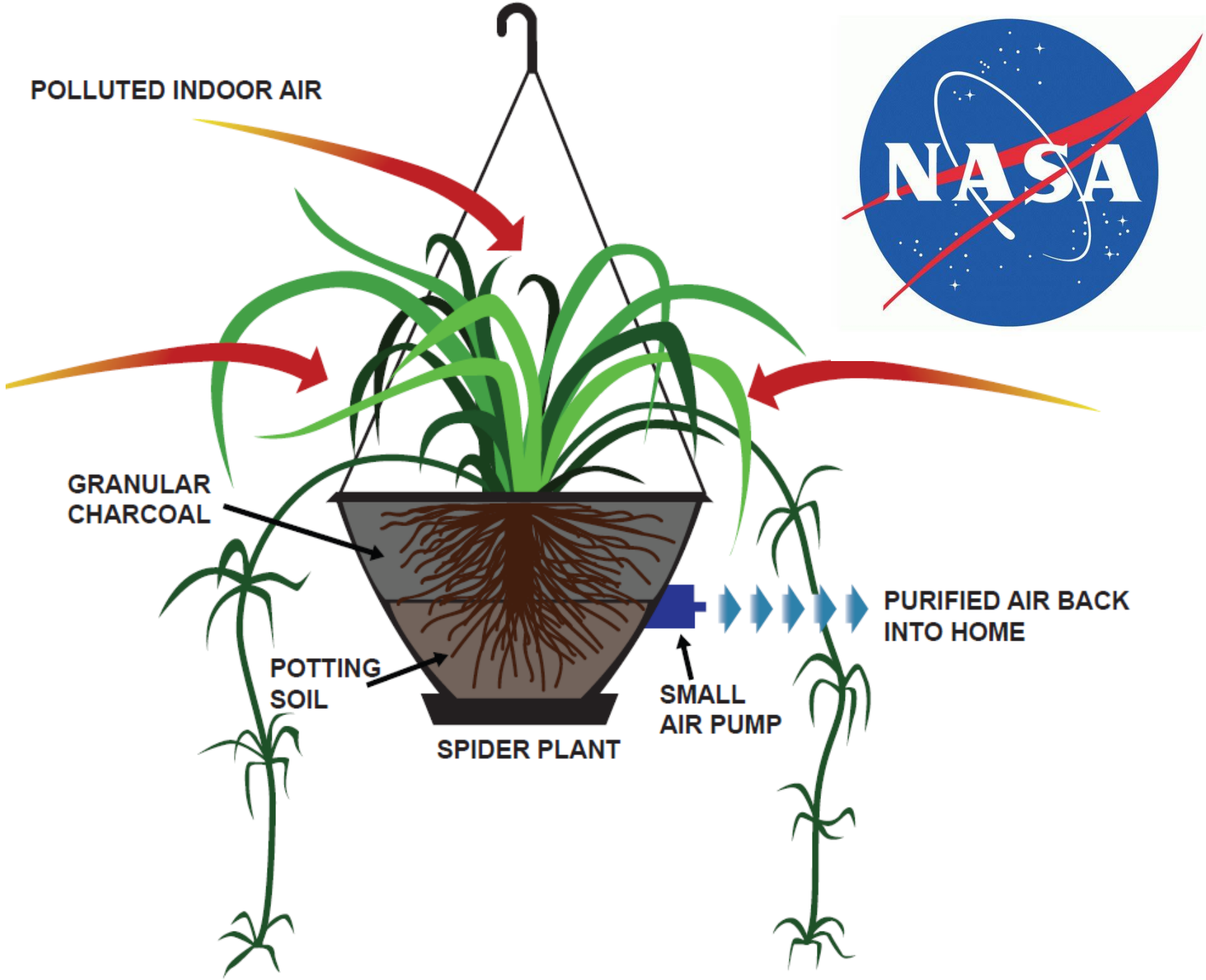
Barriers to Potted Plants Maintaining Indoor Air Quality

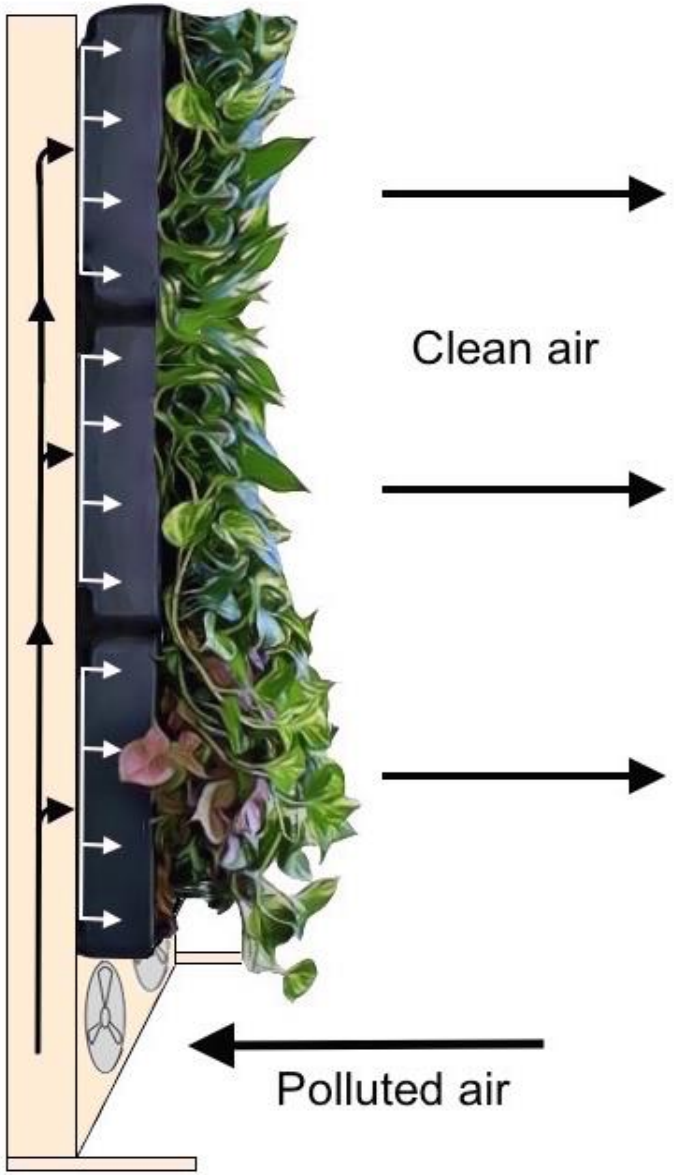
1. Chamber experiment not a good model for ‘Real’ World

2. Pollutant removal rates of potted plants are challenging to quantify when air exchange rates of the indoor space are considered

3. The ‘pot’ inhibits the microbes from being exposed to the dirty air

Best case scenario: 200 plants needed to replace ventilation requirements of 1 person


POLLUTED INDOOR AIR
GRANULAR CHARCOAL
POTTING SOIL
SPIDER PLANT
SMALL AIR PUMP
PURIFIED AIR BACK INTO HOME



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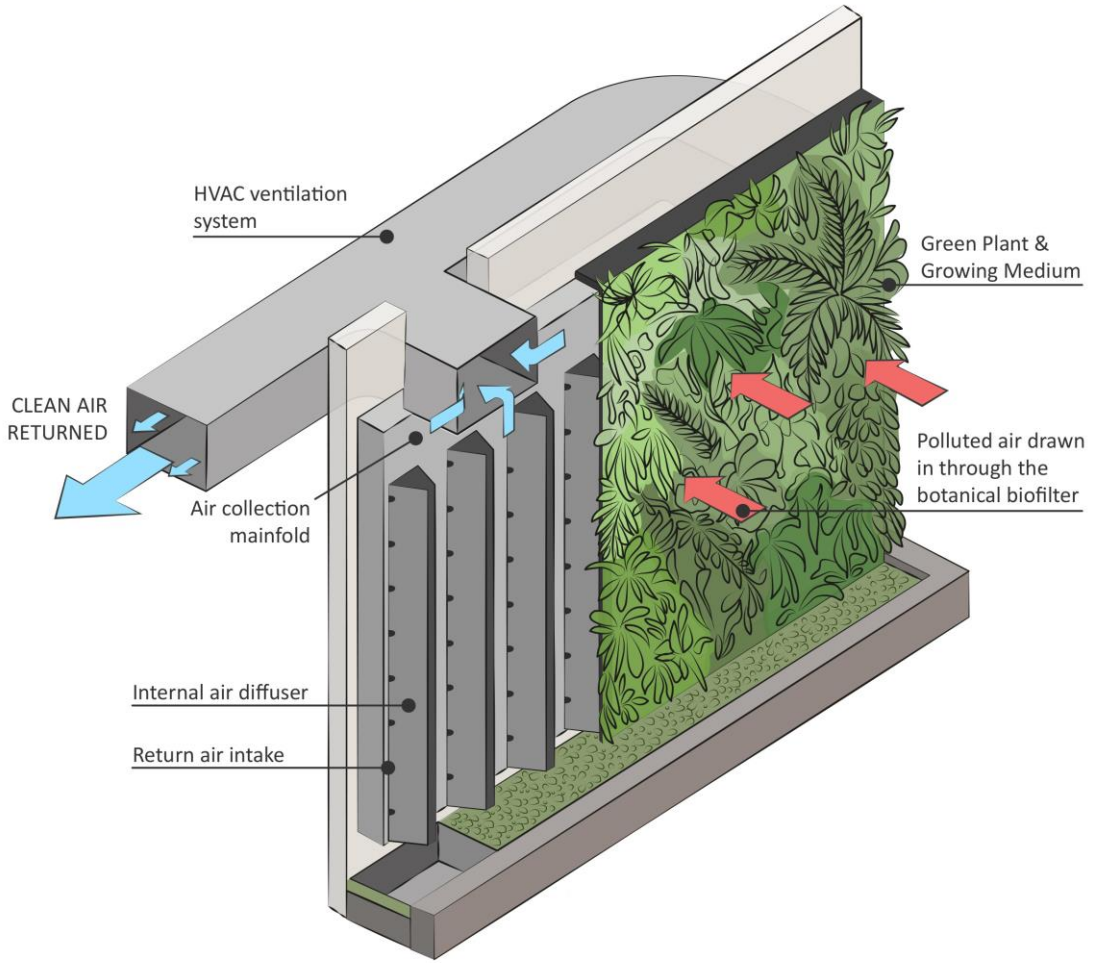
JUNGLEFY



Mechanical ventilation is used to increase pollutant transfer to substrate and plants

First *in situ* installation

Lendlease Head Office in Barangaroo

AIR QUALITY

1 m2 BREATHING WALL = 20 – 36 m2 TREES

One m2 of breathing wall can remove the equivalent pm2.5 as 20 - 36 m2 of tree canopy cover

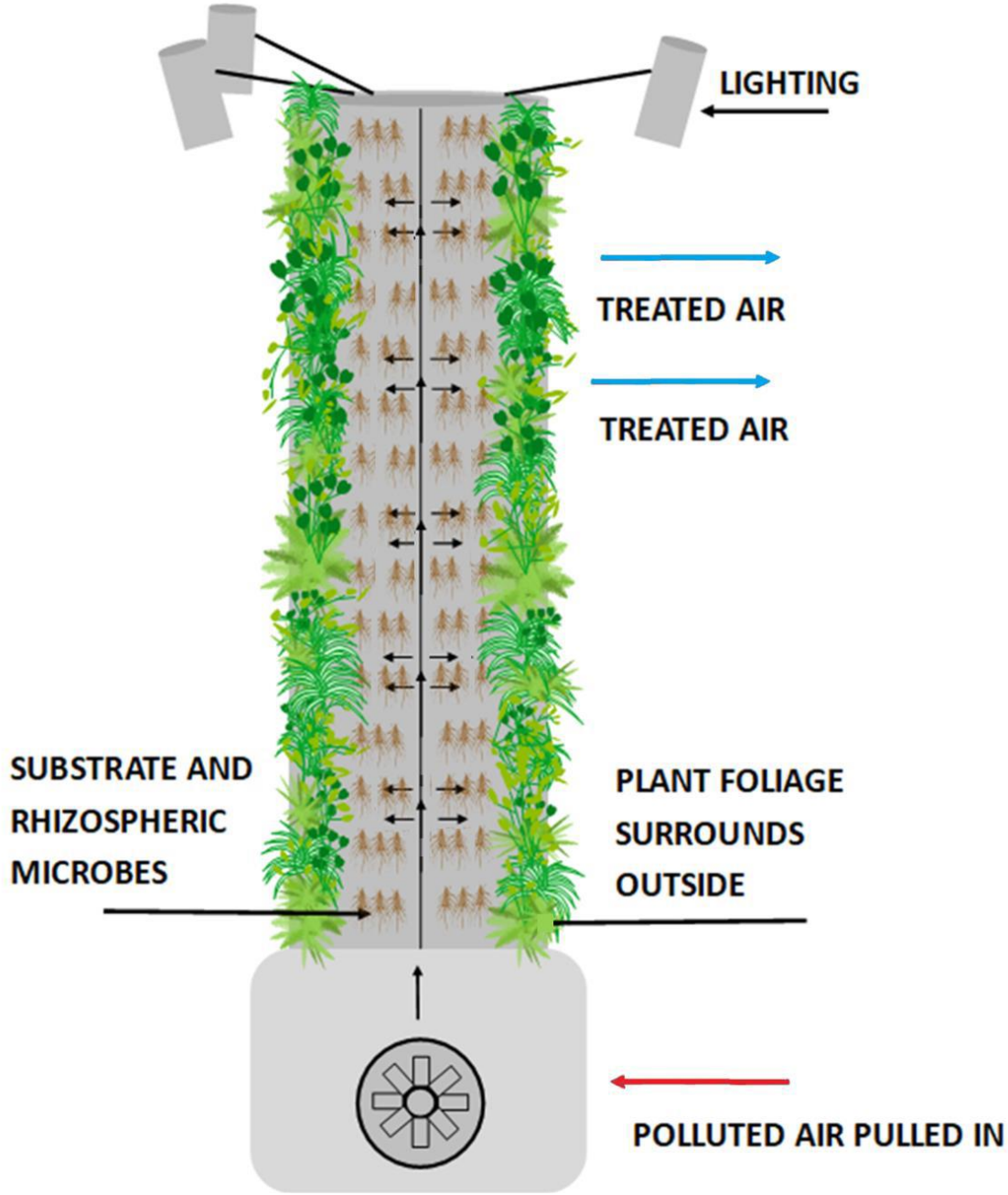
1 m2 BREATHING WALL = 29 – 65 POT PLANTS

29 – 65 potted plants are required to purify the same amount of air as one m2 of breathing wall

Mitchell Street Plaza
Cammeraygal Land, Eora Nation

The Steyne hotel
NSW, Gayemagal Land

* Centre for International Economics Report


LIGHTING
TREATED AIR
TREATED AIR
SUBSTRATE AND
RHIZOSPHERIC
MICROBES
PLANT FOLIAGE
SURROUNDS
OUTSIDE
POLLUTED AIR PULLED IN

BIOPHILIA HYPOTHESIS
The benefits of nature in the workplace

- Humans preconditioned to love nature

- Current workplaces are designed to focus on efficiency rather than psychological wellbeing

- Biophilia promotes health, productivity and performance

- Indoor plants can bring Biophillia into your workplace

- UTS has studied this extensively

UTS Studies: Indoor plants changes in mood states research Plant treatments in over 40 different offices

Reductions in negative-feeling scores:

30% reduction in confusion

37% reduction in tension/anxiety

38% reduction in fatigue

58% reduction in depression/dejection

44% reduction in anger/hostility

4 % increase in vigour

Plants directly reduce stress scores -Promoting productivity and performance

Productivity gains with biophilic workplace design

Effect on productivity	*Biophilic design strategy*	*Source*
+6% to 12%	Indoor plants	Lohr, Pearson-Mims, and Goodwin (1996)
+15%	Daylight	Romm & Browning (1998)
+13.2%	Daylight	Romm & Browning (1998)
+15% to 23%	Daylight	Heschong Mahone Group (1999)
Increase	Leafy indoor plants	Shibata & Suzuki (2002)
+7% to 13%	Daylight and window views	Heschong Mahone Group (2003)
+5%	Natural daylight	Painter & Goodman (2007)
Improved cognitive performance	Pictures of nature	Berman, Jonides, and Kaplan (2009)
+10% to 14%	Presence of plants	Daly, Burchett, and Torpy (2010)
Increase	Wooden surface	Fraser (2011)
Increase	Pleasant sounds from nature	Fitzgerald & Danner (2012)
+20% to 26%	Daylight	Terrapin Bright Green (2012)
+38%	Office plants	Knight (2013)
+15%	Enriched office with plants	Nieuwenhuis, Knight, Postmes, & Haslam (2014)
+6%	View of the outdoor environment	Cooper (2017)

What’s next?


NSW GOVERNMENT
Transport for NSW
CITY OF SYDNEY
Transurban
lendlease
bre
UTS
UNIVERSITY OF TECHNOLOGY SYDNEY
NSW EPA
Society for People, Plants, and Environment
Fulton Hogan
Randwick City Council
a sense of community
NAAVA
Ornatec
INTERIOR PLANTSCAPE ASSOCIATION
JUNGLEFY
ambius
PARRAMATTA CITY COUNCIL
北京市花木有限公司
Beijing Florascape Co.,Ltd.
Horticulture Innovation Australia

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