

Living the Green: A Symposium on Green Roofs and Walls; 3/8/17, Prince Henry Centre, Little Bay, Australia

***Functional green  
infrastructure for  
sustainable urban  
environmental quality***

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# *We function better with green plants*

- Plants produce positive **physical and psychological** outcomes

## ***Reductions in:***

- Sick leave
- Coughing, fatigue ,  
headaches, sore eyes,  
nose or throat
- Poor Concentration
- Stress, depression

## ***Improved:***

- Work productivity
- Job satisfaction  
compared to  
window views

- Due to '*attention restoration theory*' through '*exposure to nature*'



# *Plants improve air quality*



NASA studies showed that plants improved air quality in spacecraft simulators

# *Urban air pollution harms our health*

- AQ is critical to our health
- Australia is the most urbanized western country
- ***Urban air is polluted:*** CO<sub>2</sub>, CO, NO<sub>x</sub>, SO<sub>x</sub>, Volatile Organic Compounds, particulate matter, ozone

## ***Outcomes***

- 1,400–2,000 deaths per year in Sydney (NSW Dept Health 2013)
- \$12 billion per year in health costs in Australia (CSIRO 2005)
- Poor health, lost productivity, low performance workplaces





30 y of indoor plant research shows:

All potted plants (and their substrates) can remove all VOCs

With enough light, can lower CO<sub>2</sub>

Potential to reduce ventilation costs

*But this won't work very well...*



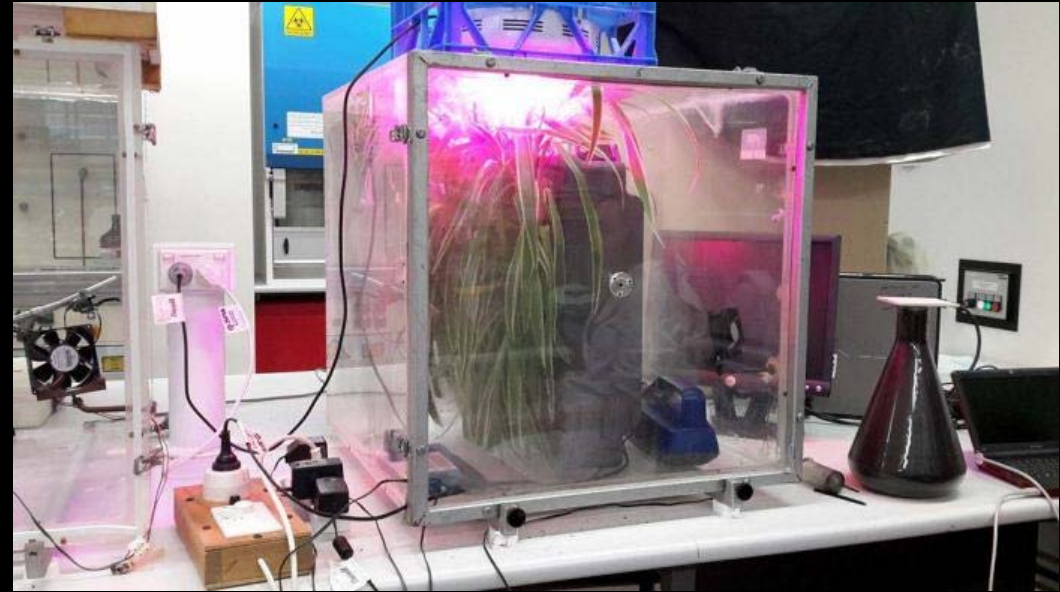






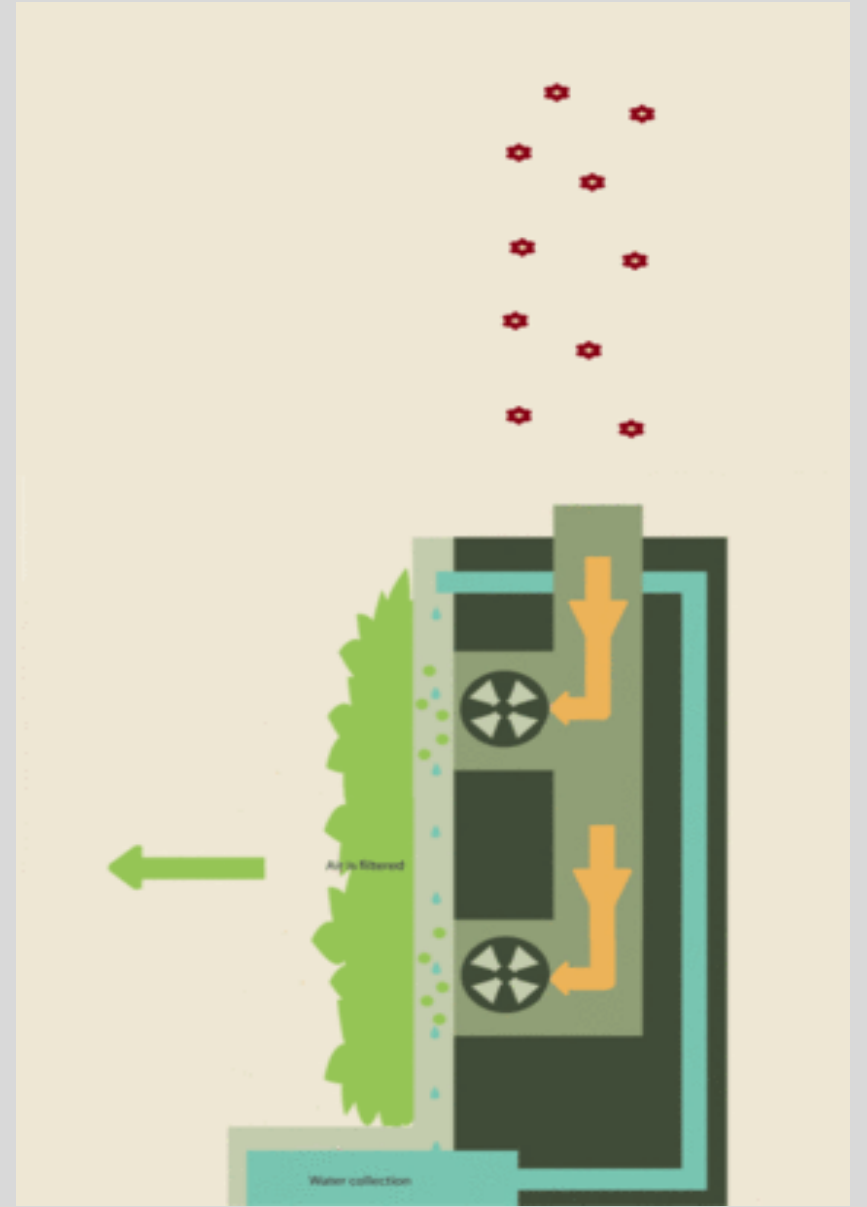
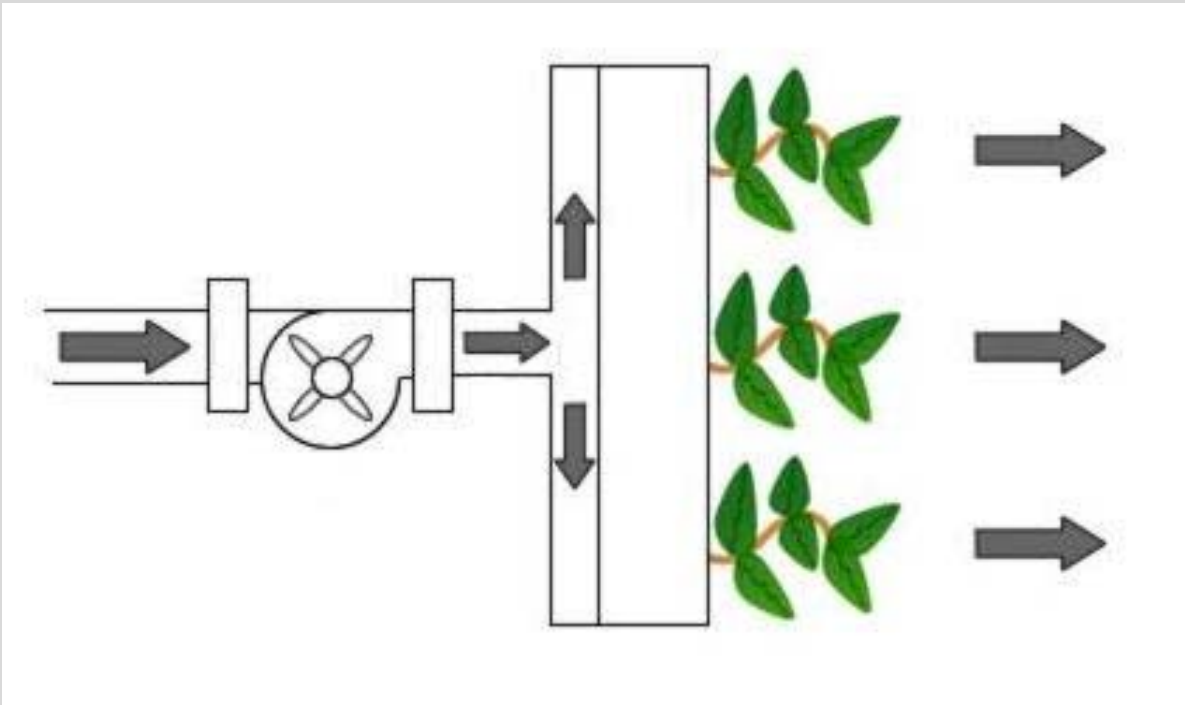
# *Active Breathing Walls*

- Increased rate of removal of CO<sub>2</sub>, VOCs
- Reflected noise attenuation
- Temperature and RH effects: reduced A/C costs

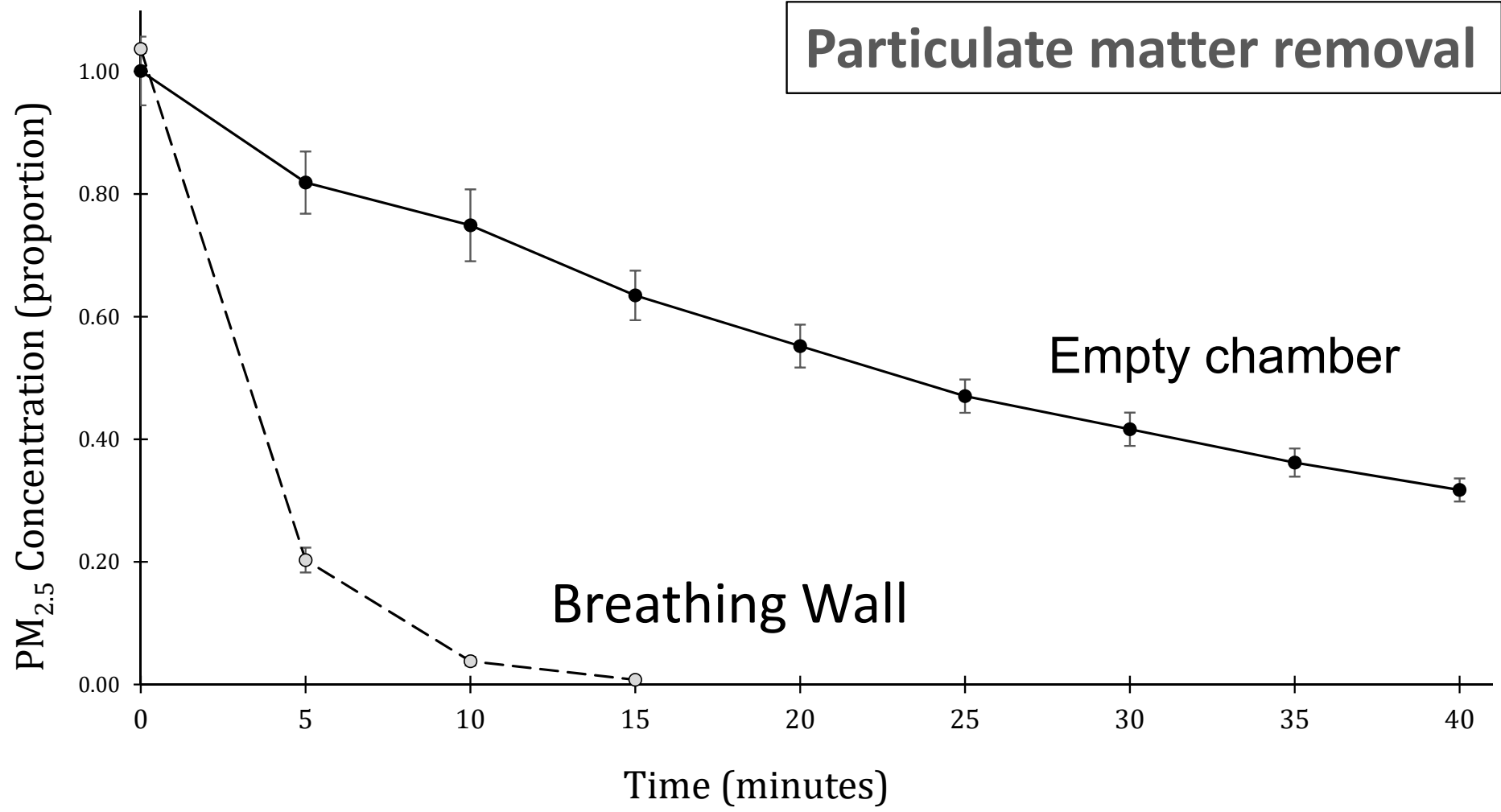


*Pollutant mitigation is at a functional level*

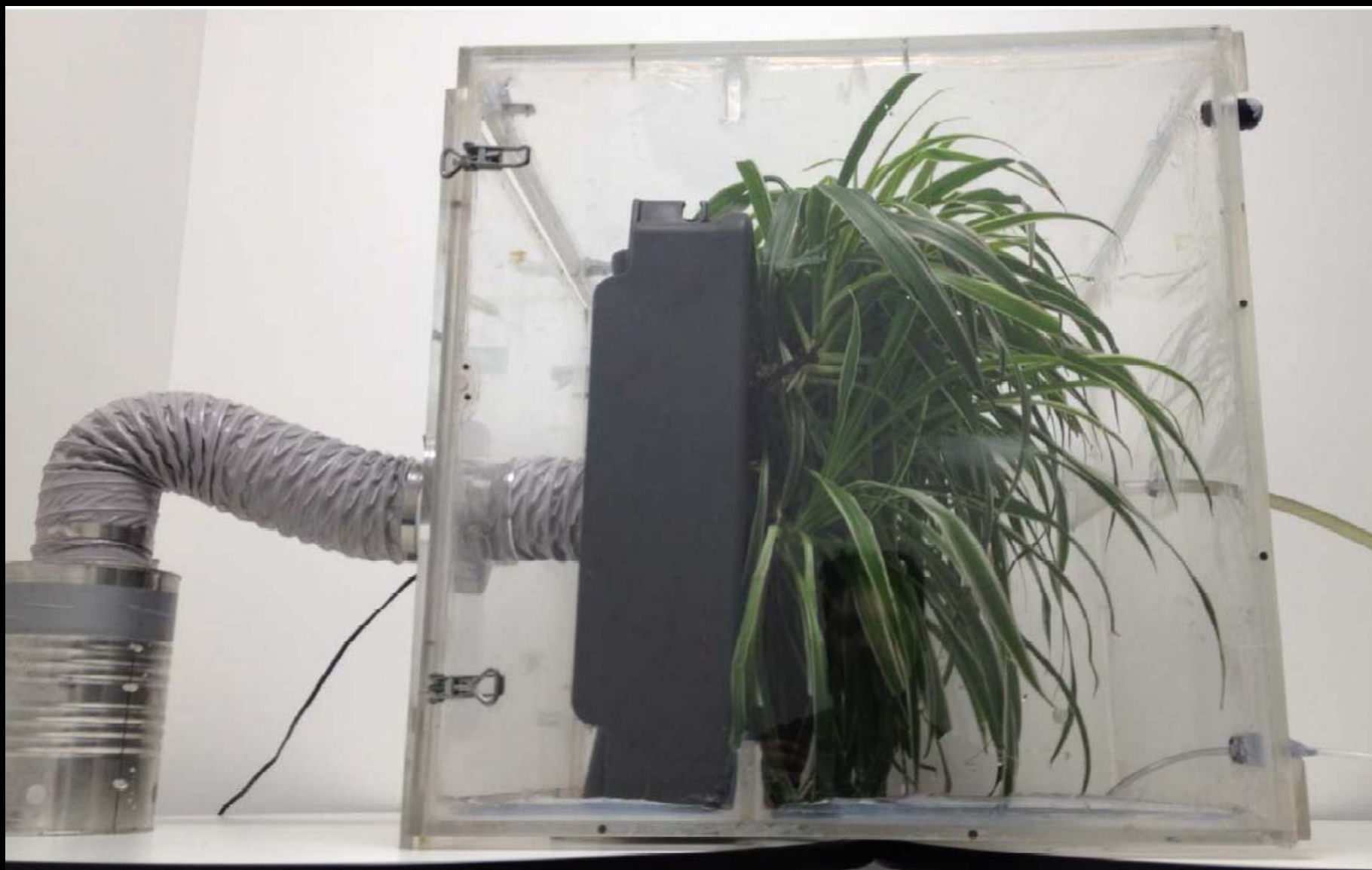




# Particulate matter removal







# An assessment of the atmospheric particle removal efficiency of an in-room botanical biofilter system

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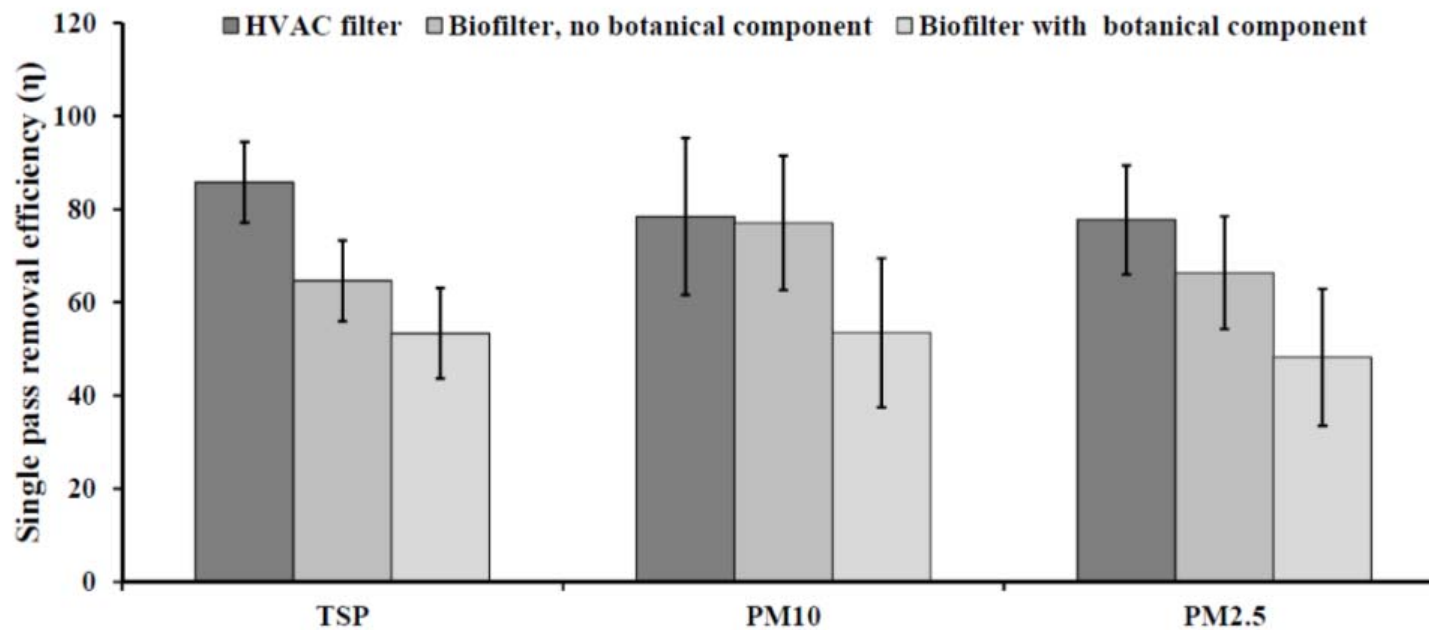


Fig 6. Calculated single-pass removal efficiency ( $\eta$ ) for TSP, PM<sub>10</sub> and PM<sub>2.5</sub>. Data is expressed as mean and SE, n = 25.



# *The Breathing Wall — moving forward*

- ✓ Performance modification trials
- ✓ Now at > MERV 11 standard
- ✓ Only with much greater capacity / low whole-of-life cost for filter
- ✓ No bioparticle emissions
- ✓ High pollution tolerance proof-of-concept

*Next:*

*We know that trees improve AQ in cities  
What will the Breathing Wall do?*



# ***Broad scale Breathing Walls are predicted to:***

Have real effects:

- city air quality
- urban noise levels
- the Urban Heat Island effect
- the habitability of urban environments



## *The Breathing Wall — Challenges*

- How much Breathing Wall do polluted sites need?
- Vandalism, maintenance, design restrictions, type approval, costs (maybe)
- Perception of 'Green washing'

### *Do more research*

- Access to trial sites
- Partnerships with government and industry
- Research funding (of course)
- Convince people





# JUNGLEFY





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