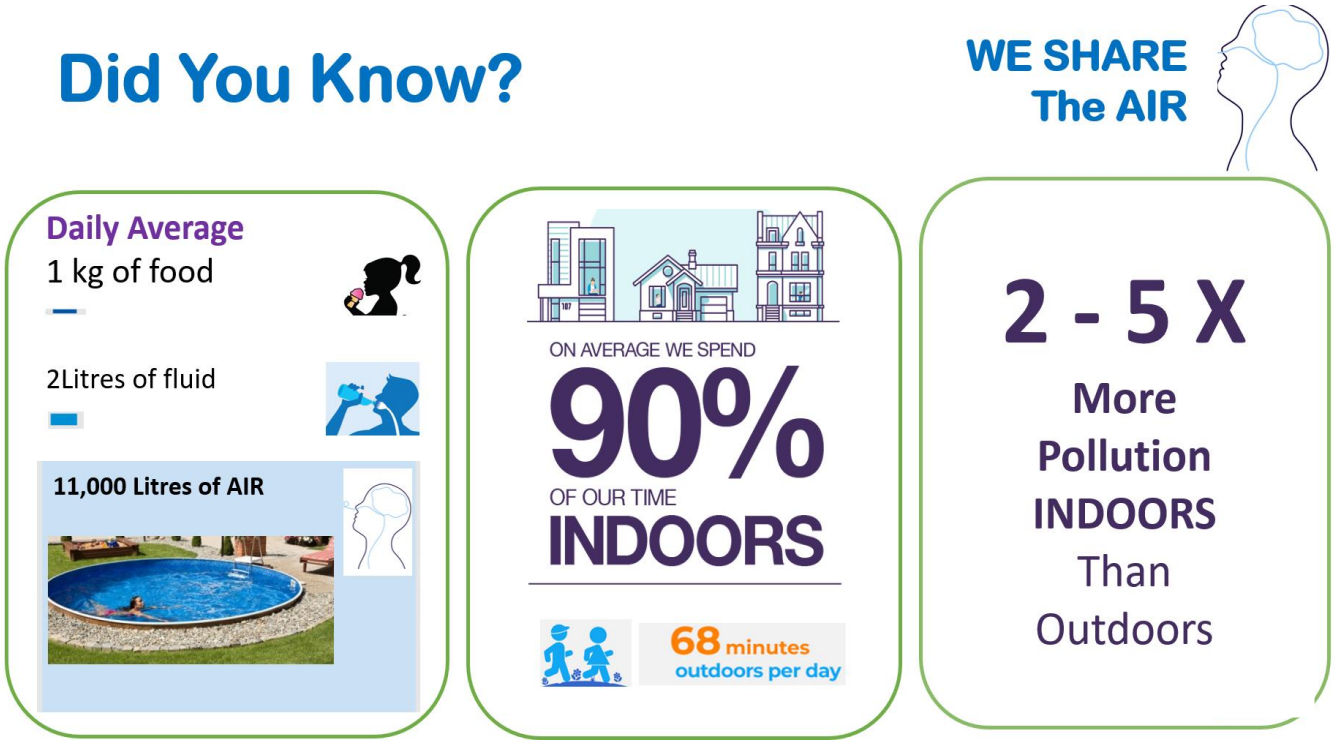
Clean Air Classrooms

Why is Air Quality Important?



We spend 90% of our time indoors, children only spend approximate 1 hour a day outdoors and yet indoor air quality can be 3.5 times on average more contaminated that outdoors. [1]

It is known that 1 in 4 UK schools are in areas that exceed WHO air pollution limits [2]
Research has also indicated that air pollution is linked to higher Covid 19 risks.[3]

We share the air we breathe indoors

Clean Air Is Essential for Our Health

The UK government has stated that air pollution is the biggest environmental threat to health in the UK, with between **28,000 and 36,000 premature deaths a year attributed to long-term exposure.**[4]

Children are particularly sensitive to the dangerous effects of toxic air pollution with chronic diseases like asthma. Asthma[5] is the most common long-term medical condition in children in the UK, with around one in 11 children and young people living with asthma[5] rising significantly. There are also concerns about long term impact of Covid 19, but research has shown simple interventions in schools have the potential to significantly improve the health of children.

The Royal College of Paediatrics and Child Health Report - 2020

The Inside Story Report [6], talks about the importance of indoor air quality at home and in schools

The inside story: Health effects of indoor air quality on children and young people

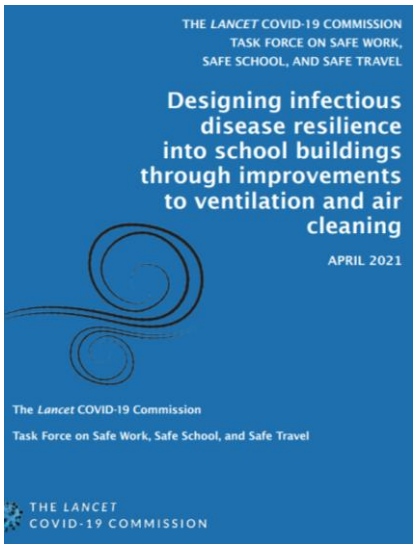
Research & Evidence team
RCPCH and Royal College of Physicians

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

In an article by England Chief Medical Officer Chris Whitty and colleagues titled 'Hidden harms of indoor air pollution'[26] they write "Indoor air pollution hasn't received the same attention even though it might cause almost as many deaths (as outdoor airpollution) globally,[27] 'In addition to pollution, respiratory pathogens, including coronaviruses and influenza viruses, can build up and spread between individuals more readily indoors — as the COVID-19 pandemic and the latest flu outbreaks have demonstrated" [26]

Air pollution dirties every organ in our bodies and impacts adversely on our climate, so we need to act to improve our health and our environment indoors and outdoors

Why is it Particularly Important to Breathe Clean Air in the Classroom?



Many research studies[7] show that ventilation and air cleaning improvements are likely to lead to improved academic performance, fewer missed school days, higher scores on cognitive function tests - estimated to be worth an **extra 6 weeks** in school each year.

Providing clean air in the classroom, is an effective way to reduce the spread of illness and disease. Schools are high in density and occupancy , up to 4 time more dense that an office workspace. [28] When children sit close to each other, by the time we notice they are sick, airborne viruses like Covid19 will have spread in poor ventilated rooms.

Children are also vulnerable with bodies growing, air quality can impact on brain and lung development. In terms of 'Pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults'[29]

Clean air will reduce risk to clinically vulnerable pupils and their families. It will help prevent risks of long covid in adults and children. With long covid increasing its even more important to breathe clean air[22]

School is a workplace too and its equally important to protect teaching and non-teaching staff from indoor air pollution and infection as well as the students.

Good air quality is a benefit for long term respiratory and cardiovascular health, neurological function, as well as significant benefits to our mental health.

What Can We Do to Improve School Indoor Air Quality?

Let the Fresh Air In

Ventilation is the means of replacing stale CO2 indoor air with fresh outdoor air. This is either by opening windows and/or mechanical systems in the ceiling. But how well is your space being ventilated? A good way to check is with the use of a CO2 Monitor

The CO2 level outdoors is approximately 415 parts per million

The aim is to achieve the indoor air as close to the outdoors. The recommended threshold for lowest risk COVID19 transmission is

CO2 < 800 ppm

Joint Union Guide To improving Ventilation in Schools and colleges[8]

It's not always possible to open windows if they are broken, sealed shut, rainy or windy outside. If a school is in an area of high air pollution[9] fresh air from outside is not possible. Achieving CO2<800ppm can be tricky especially if reliant on windows during the winter season and can lose a lot of energy out the

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

window. Many school buildings are in poor condition and require refurbishment upgrades [24] and this could include upgrades for energy efficient mechanical systems for better ventilation. This requires government investment and time to repair the buildings.

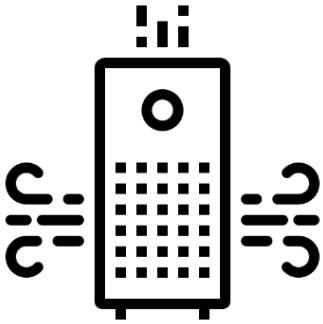
What can be done in the mean time? A quick and easy way to improve the indoor air quality is to install portable air purifying units, also known as air cleaning units. Mostly they are low energy consumption. This means In winter it 'may provide a more energy efficient strategy than opening windows wider'[10] and save on heating bills.

SUPPLEMENT with an Air Cleaner

An air cleaning unit is **an effective way to SUPPLEMENT ventilation** to significantly reduce Covid19 risks, asthma triggers, other respiratory illnesses & school absence. This supports pupil attendance & learning outcomes. **Air cleaning units based on filtration of contaminants are not a new concept!**

HEPA (High Efficiency Particulate Arrestance) filters were devised in World War II as part of the Manhattan Project[11] to filter radiation particles. With the aid of a fan, air can be pushed through a high grade performance filter to capture particles including particulate matter air pollution, pollen, dust and viruses (includes Sars Cov2)

In the UK evidence on the effectiveness of air filtration on NHS Covid wards has recently been published. [12]



A helpful website with business listing examples of education, shops, healthcare settings implementing CO2 monitors and portable air filter units www.cleanairstars.com

There is a useful Portable Air Filter Unit calculator tool to help compare a range of an air filter units on the market. DIY Air Filter unit options are also included

An air filter unit or units should be specified appropriately to suit the size of a space**. WHO recommends** for residential, office and schools spaces **at least 6 Air Changes Per hour of ventilation** in total. https://cleanairstars.com/filters [13]

Did you know you can build your own DIY Air Purifier?

Corsi Rosenthal Box

Example by David Elfstrom Mechanical Engineer

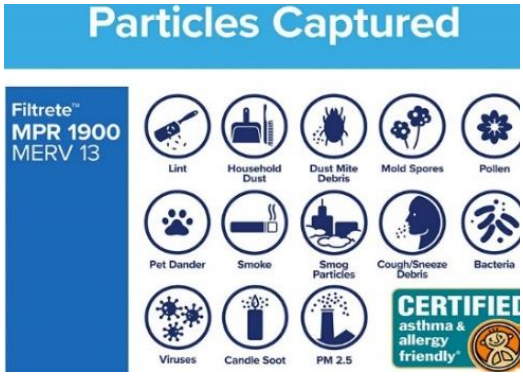
Since 2017 USA DIY air cleaners have been in research by the Environmental Protection Agency, [14] used to capture particulates from wild fire smoke

In China 2014, DIY air cleaners [15] have been used during the 'air pollution apocalypse as many people could not afford expensive commercial units. The *Corsi Rosenthal (CR) Self Build*[16] is a do-it-yourself air cleaner that can be built relatively inexpensively. It was designed August 2020 in the pandemic with the goal of reducing levels of airborne Covid virus particles in indoor settings by Richard Corsi, Dean of Engineering at the University of California. The idea combined four HVAC (Heating Ventilation and Air Conditioning) filters with a box fan to improve the efficiency of home-made air filter designs. He developed this in collaboration with Jim Rosenthal, the CEO of a US based filter manufacturer.[23]

It is a high performance air cleaner and a good alternative to more expensive models on the market. Some models require at least 2 -3 units to provide the same volume of clean air per hour. It is endorsed by the White House[17]

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

Do They Work?



Yes. In the USA there has been extensive independent testing carried out on the design[18]. It is effective at filtering out a range of airborne aerosol particle sizes which carry the viruses including SarsCov2 as well as other airborne particles such as traffic pollution, pollen, fungal spores, and bacteria. The filters are certified asthma and allergy friendly and have been tested by 3M scientists[19]

Introducing the UK Version #CorsiRosenthal Box

Perfect for a STEAM & Design Technology Project with Students

The UK version of the Corsi Rosenthal Box has been promoted by Dr Rhys Thomas, Consultant Anaesthetist in Ceredigion and Carmarthenshire schools with engineering developments and testing by Dr. Stefan Stojanovic PHD, a Test Mechanical Engineer Fluid Dynamics.
Installations appeared on BBC Wales News[25]

This was also presented at the **TAPAS -Tackling Air Pollution in Schools- Research Network** lunchtime seminar 19th May 2022[20]

A DIY Corsi Rosenthal Box Unit is capable of up to 6 air changes per hour in line with WHO recommendations [21] and a systematic literature review [30]*'The performance of portable HEPA air cleaners in naturally ventilated classrooms' 2022*

[30] **for a typical classroom** and is quiet too. It's simple to construct and has a higher Clean Air Delivery Rate (CADR) than many commercial HEPA filters for much less cost. The units can be assembled in around fifteen minutes, last up to a year and cost about £150.

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

Practical Action is happening in the UK

SOMERSET

SOMERSET Cllr Oliver Patrick has been crowdfunding for Schools in his area and for Warmhubs

London Borough of Hackney

North London: Home Ed Parents funded for their childrens play hall meet up.

Warrington

Warrington: Parents for a Highschool have been working with the Public Health team at the Council. Two large local High schools are involved using their STEM club to run a ventilation project to improve indoor air quality- one is aiming to build 50 air cleaning devices– one for each The project has been very lucky to gain significant support from local companies and also academic institutions based in the town.

London Borough Of Lewisham

Lewisham: The first DIY CR box has been built and a donation accepted by a high school. Clean Air Classrooms, Airborne Allergy Action and Ella Roberta Foundation met up to build a CR Box. This is the first of many builds to come to take practical action for access and equity to clean air in the classroom **#EllasLaw**

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

Clean Air Is A Human Right

Have a Healthy Conversation in Your School

Would you like to build A DIY Air Purifier?

Download the Story Board Build

for photographic instructions & suggested links to resources

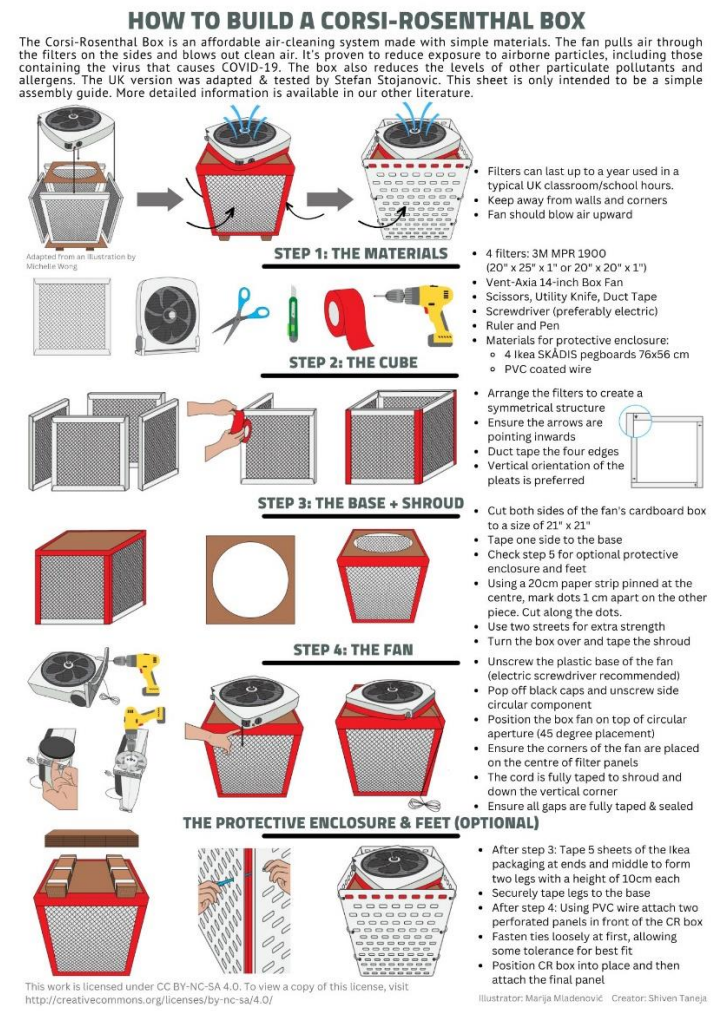
www.tinyurl.com/DIYCRBoxUK

HOW TO BUILD A UK DIY Air Cleaning Device #CorsiRosenthalBox

YouTube

For build demonstrations

www.tinyurl.com/UKDIYCRBoxExampleBuild



Download the one page instructions

by @ShivenTaneja

www.bit.ly/3W5Tadj

Proudly Supported by

Clinically Vulnerable Families

AIRBORNE ALLERGY ACTION

Long Covid Patient Action UK

HAZARDS CAMPAIGN

Clean Air Classrooms

The COVID-19 Safety Pledge

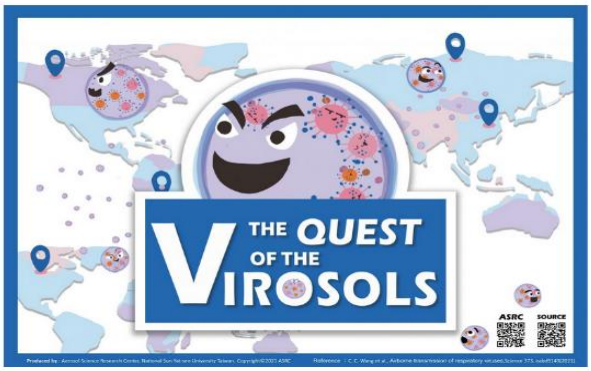
@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

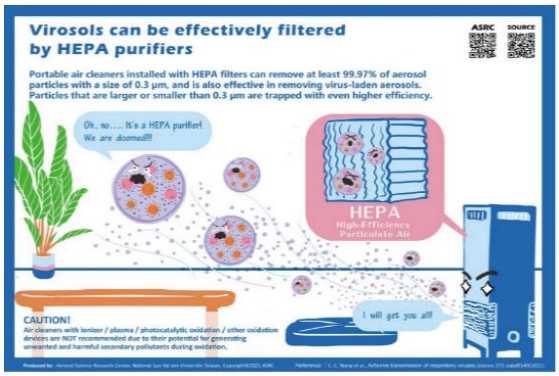
School Resources to support your DIY CR Box activity

SAMHE Project- Seeking 'Pioneer Schools'

Sign up your school to a research project and get a free Air Quality monitor. It can show how your Corsi Rosenthal Box is cleaning the air! https://samhe.org.uk/get-involved

The Quest of the Virasols Cartoon





http://aerosol.nsysu.edu.tw/en/scopes/108

Indoor Air Quality Working Party Resources

Indoor Air Quality Working Party Resources for Parents: https://theinsidestory.health/information-sheets/

Indoor Air Quality Working Party Resources for Schools: https://theinsidestory.health/worksheets/

Global Centre For Clean Air Research

TOP 10 FACTS Fact 5 CO2 Monitors and Air filtration Systems

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk

www.surrey.ac.uk/sites/default/files/2021-01/mitigating-childrens-exposure-to-traffic-pollution-english-version.pdf

References:

1. Clean Air Day: New research - Indoor air pollution 3.5 times worse than outdoor air pollution and at its peak can be up to 560 times higher
https://www.cleanairday.org.uk/files/press_release_indoor_v_outdoor_air_pollution_final_13_may.pdf

2. Air Quality News, 1/4 of UK schools exceed WHO air pollution limit
https://airqualitynews.com/2021/06/17/1-4-of-uk-schools-exceed-who-air-pollution-limit/

3. Long-term air pollution linked to greater risk of COVID-19 hospitalisation | Imperial News | Imperial College London
https://www.imperial.ac.uk/news/229233/long-term-pollution-linked-greater-risk-covid-19/

4. **Public Health England publishes air pollution evidence review**
https://www.gov.uk/government/news/public-health-england-publishes-air-pollution-evidence-review

5.*NHS England Childhood Asthma** ***https://www.england.nhs.uk/childhood-asthma/

6. **Royal College of Paediatrics and Child Health, Inside Story Report: Health effects of indoor air quality on children and young people**
https://www.rcpch.ac.uk/resources/inside-story-health-effects-indoor-air-quality-children-young-people

7. THE LANCET COVID-19 COMMISSION TASK FORCE ON SAFE WORK, SAFE SCHOOL, AND SAFE TRAVEL Designing infectious disease resilience into school buildings through improvements to ventilation and air cleaning APRIL 2021
https://static1.squarespace.com/static/5ef3652ab722df11fcb2ba5d/t/60a3d1251fcec67243e91119/1621348646314/Safe+Work+TF+Designing+infectious+disease+resilience+April+2021.pdf

8. A Joint union guide to improving ventilation in schools and college Advice for safe opening Revised January 2022, Coronavirus crisis
Workplace checklist ***https://neu.org.uk/media/17036/view***

9, **Providing the public with most accurate air pollution data available in the UK www.*addresspollution.org/***

10. ,**Protect Covid 19 National Core Study** *How we know that HEPA filter based air cleaners are likely to be beneficial for reducing transmission of respiratory infections*

11. Washington Post, From the Atomic Bomb Proect Comes an Air Filter That Works
https://www.washingtonpost.com/archive/lifestyle/wellness/1986/09/16/from-the-atomic-bomb-proect-comes-an-air-filter-that-works/806132aa-e202-409f-80e0-9f743886fd70/

12. Air filters on wards remove almost all airborne Covid virus- Cambridge University Hospital
https://www.cuh.nhs.uk/news/air-filters-on-wards-remove-almost-all-airborne-covid-virus/

13. Clean Air Stars- Portable Air Filter Calculator ***https://cleanairstars.com/filters***

14. Environmental Protection Agency Research on DIY Air Cleaners to Reduce Wildfire Smoke Indoors
https://www.epa.gov/air-research/research-diy-air-cleaners-reduce-wildfire-smoke-indoors

15. Bloomberg UK, Beijing's DIY Clean Air Movement: If You Can't Buy an Expensive Air Filter, Build One
https://www.bloomberg.com/news/articles/2014-05-15/beijing-s-diy-clean-air-movement-if-you-can-t-buy-an-expensive-air-filter-build-one

16. DIY box fan filters – Corsi-Rosenthal box
https://cleanaircrew.org/box-fan-filters/

17. White House 23 March,2022 *'Lets Clear the Air On Covid'* **https://www.whitehouse.gov/ostp/news-updates/2022/03/23/lets-clear-the-air-on-covid/**

18 Corsi I, Cappa C, et al 2022 ***Characterizing the performance of a do-it-yourself (DIY) box fan air filter***
https://www.tandfonline.com/doi/full/10.1080/02786826.2022.2054674

19. 3M News Centre: 3M scientists: This Corsi-Rosenthal box movement is legit
https://news.3m.com/2022-02-24-3M-scientists-This-Corsi-Rosenthal-box-movement-is-legit#:~:text=DIYers%20were%20using%203M%20Filtrete,a%20more%20holistic%20ventilation%20strategy

20. TAPAS Network *Lunchtime Seminar, Thursday May 19 2022, Dr Rhys Thomas & Stefan Stojanovic talk about air filtration in schools and the DIY Corsi Rosenthal Thomas self builds.* *https://tapasnetwork.co.uk/lunchtime-seminars* *and* *https://youtu.be/QmAMqqsbbcY*

21, World Health Organization, Road map to improve and ensure good indoor ventilation in the context of Covid19 *https://www.who.int/publications/i/item/9789240021280*

22.*Office of National Statistics UK** ***Prevalence of ongoing symptoms following coronavirus (COVID-19) infection in the UK: 5 January 2023 **https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/prevalenceofongoingsymptomsfollowingcoronaviruscovid19infectionintheuk/3november2022**

23, Rosenthal J August 2020, A Variation on the "Box Fan with MERV 13 Filter" Air Cleaner https://www.texairfilters.com/iaq-research-practice-in-action-the-corsi-rosenthal-box-air-cleaner/

24, Schools Week August 2020, Belger Tom **,** ***'Risk of imminent failure': 1 in 3 schools need 'immediate' repairs*** https://schoolsweek.co.uk/risk-of-imminent-failure-1-in-3-schools-need-immediate-repairs/

25, BBC News 9 March 2022 ***Covid: Homemade purifiers in Welsh schools to clean air*** https://www.bbc.com/news/uk-wales-60681348.amp

26. Lewis A, Jenkins D, Whitty C, 8 February 2023, ***Hidden harms of indoor air pollution — five steps to expose them*** https://www.nature.com/articles/d41586-023-00287-8

27. The Guardian, Ian Sample Science editor February 2023, *'Indoor Air Quality should be Monitored in Public Places says Chris Whitty* https://www.theguardian.com/environment/2023/feb/08/indoor-air-quality-should-be-monitored-in-public-places-says-chris-whitty

28. Sasan S, Runming Y, Feng Y, Hazim A, William B, Yang Bi, et al, *'Indoor air quality and health in schools: A critical review for developing the roadmap for the future school environment,'* Journal of Building Engineering, Volume 57, 2022, 104908, ISSN 2352-7102, https://doi.org/10.1016/j.jobe.2022.104908.

29 Philip J. Landrigan (2005) ***Children as a Vulnerable Population, Human and Ecological Risk Assessment***: An International Journal, 11:1, 235-238, DOI: 10.1080/10807030590920051

30 Sutherland A, Ackley A, Phipps R, Chen S, Jermy M (2022). *'The performance of portable HEPA air cleaners in naturally ventilated classrooms' 2022* https://ir.canterbury.ac.nz/handle/10092/104049

@cleanairclassrm
cleanairclassroomuk@gmail.com
www.cleanairclassrooms.co.uk