Calidad del aire en escuelas pre-, durante y post-pandemia

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EXCELENCIA SEVERO OCHOA

PRE-PANDEMICS

European Research Council
Established by the European Commission

BREATHE Brain Air School investigation

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Rivas I., et al ., 2014. Environment International 69, 200–212.

	INDOOR		OUTDOOR		UB REF. STATION	
	Mean	SD	Mean	SD	Mean	SD
NO_2 ($\mu g \cdot m^{-3}$)	30	13	47	19	41	20
$PM_{2.5}$ ($\mu g \cdot m^{-3}$)	37	16	29	24	17	8
N ($pt \cdot cm^{-3}$)	15625	6673	23614	9514	14665	6034
EBC ($\mu g \cdot m^{-3}$)	1.3	0.9	1.4	1.1	1.3	0.8

NO_2 outdoor levels for the rest of schools in Barcelona = 50 $\mu g \cdot m^{-3}$

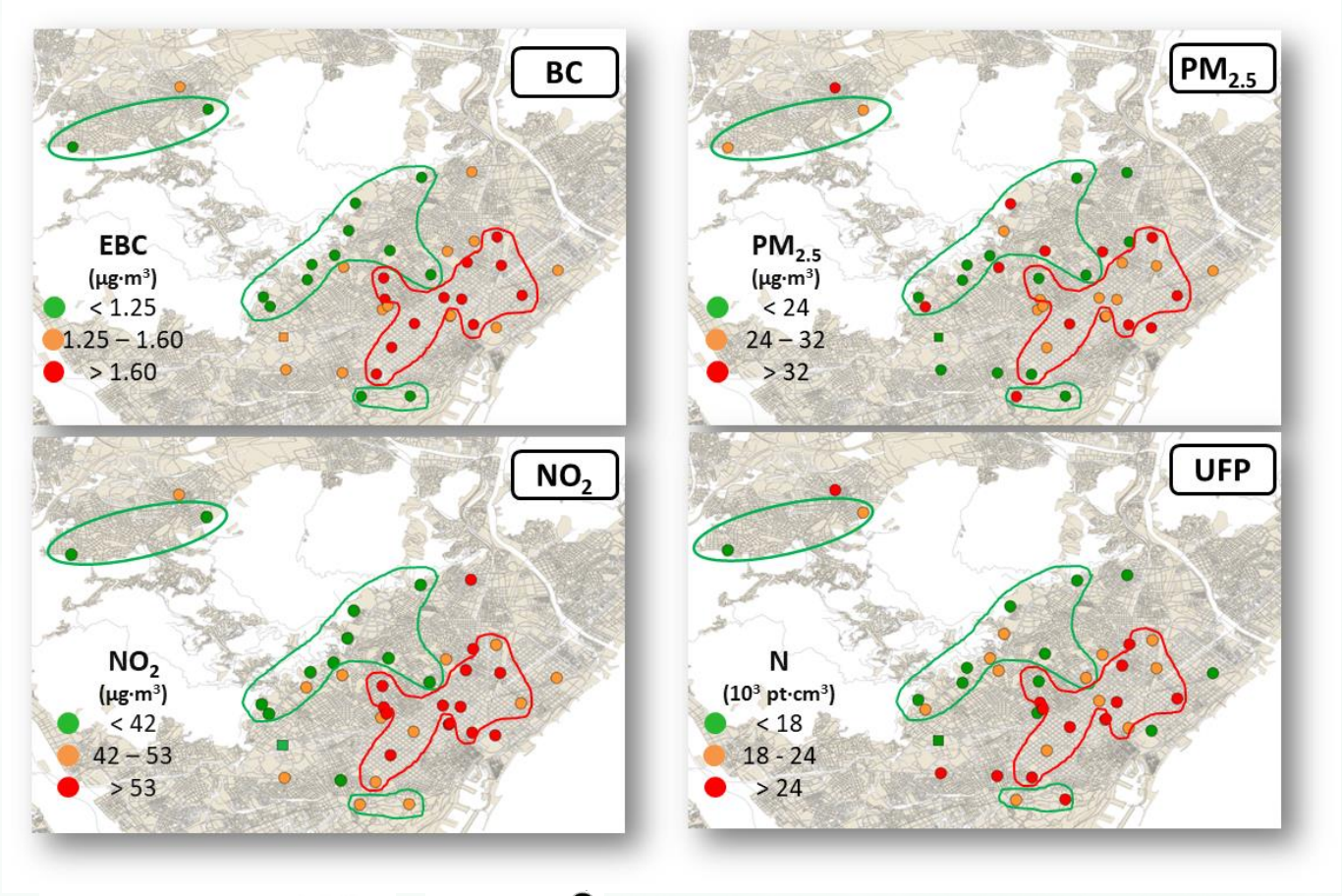
- **High levels of $PM_{2.5}$ in schools → Local (school) emission of $PM_{2.5}$**
- **Mean levels of pollutants are intermediate between traffic and urban background sites**

PRE-PANDEMICS

Rivas I., et al ., 2014. Environment International 69, 200–212.

OUTDOOR

○ BREATHE Schools □ Reference Station — Low — High EC levels perimetre OUTDOOR



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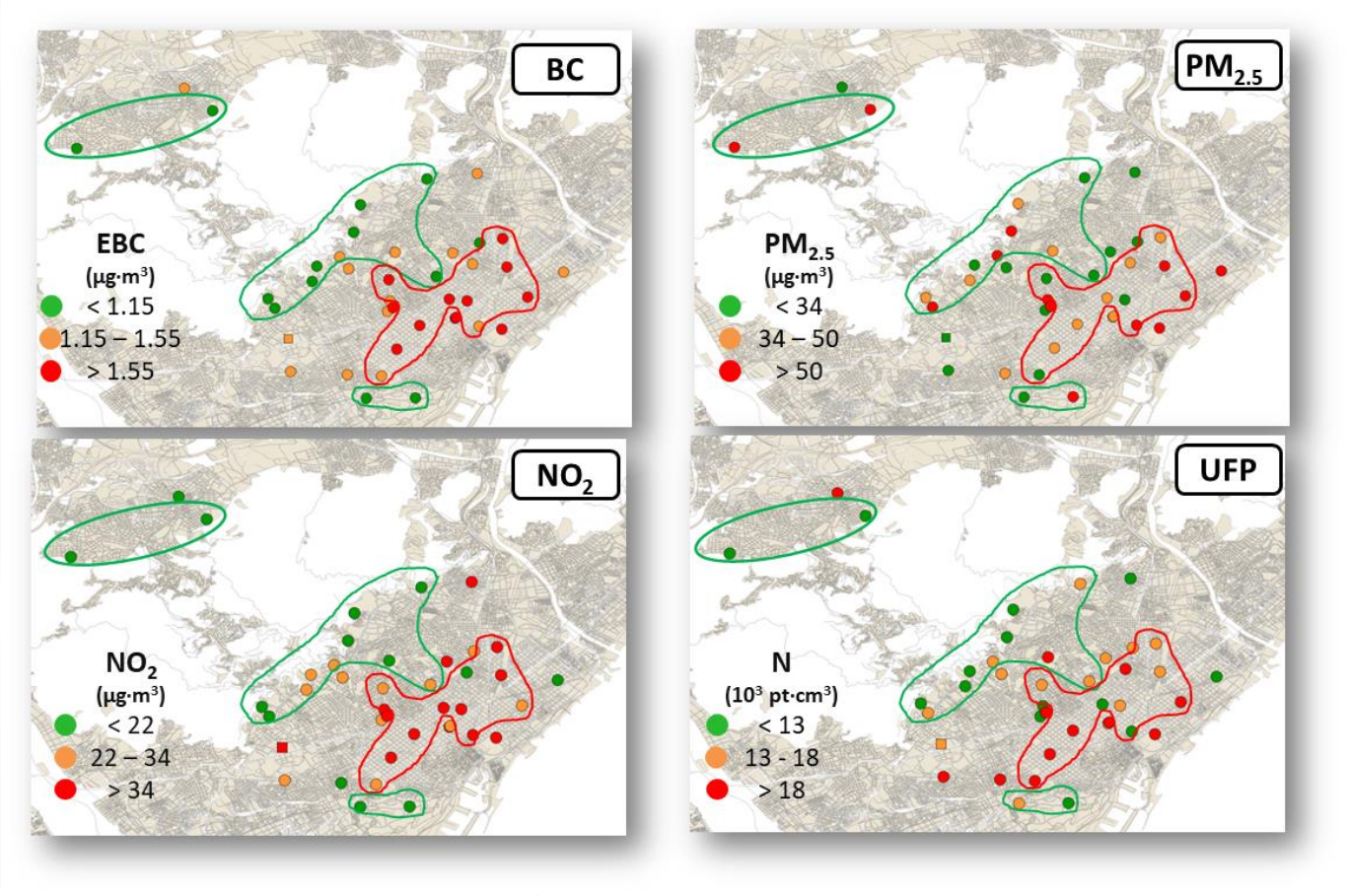
PRE-PANDEMICS

Rivas I., et al ., 2014. Environment International 69, 200–212.

INDOOR

○ BREATHE Schools □ Reference Station — Low — High EC levels perimetre OUTDOOR



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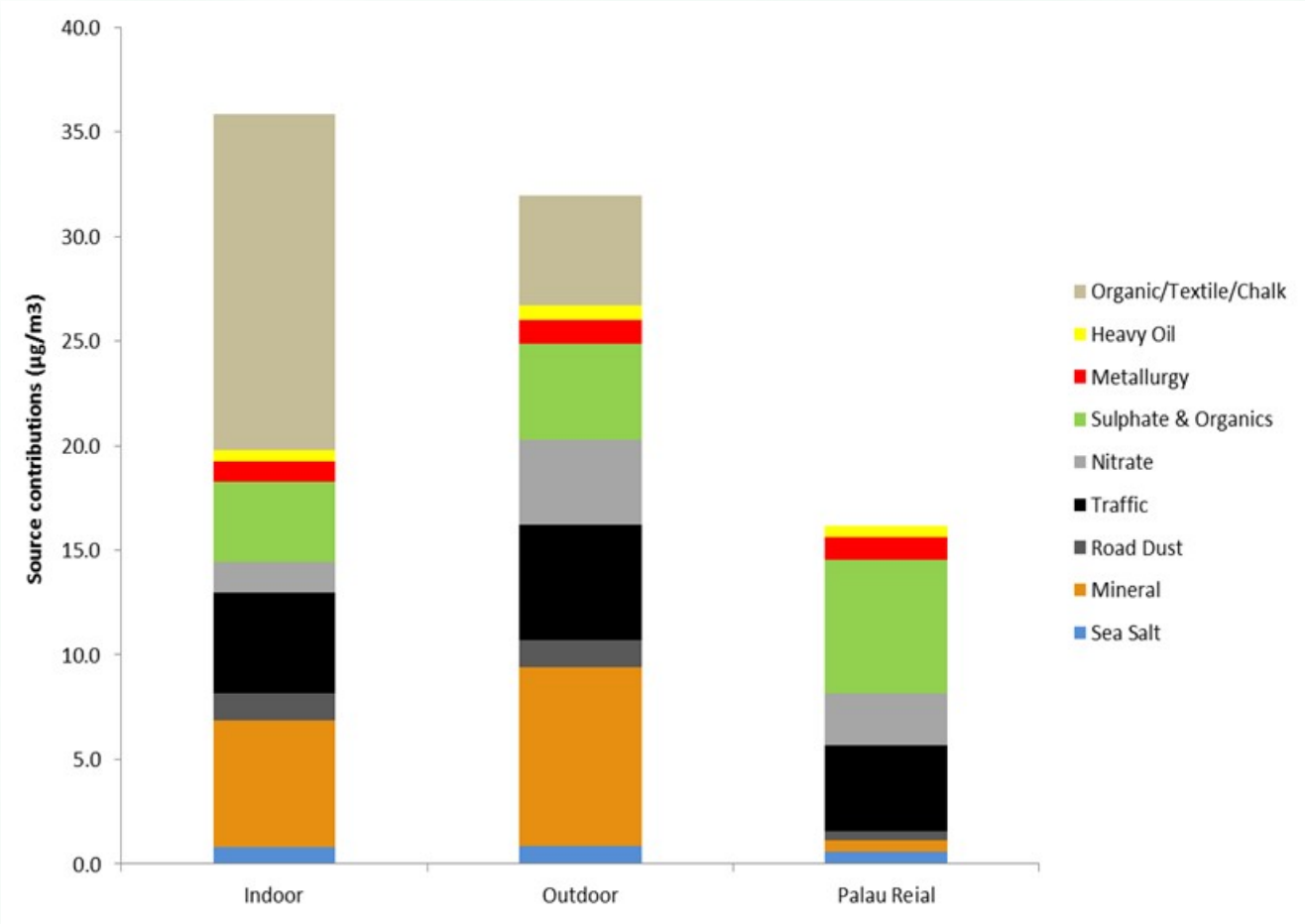
PRE-PANDEMICS

PM2.5 SOURCE APPORTIONMENT (POSITIVE MATRIX FACTORIZATION)

Amato A., et al., 2014. Sources of indoor and outdoor PM2.5 concentrations in primary schools. The Science of Total Environment, 490, 757–765



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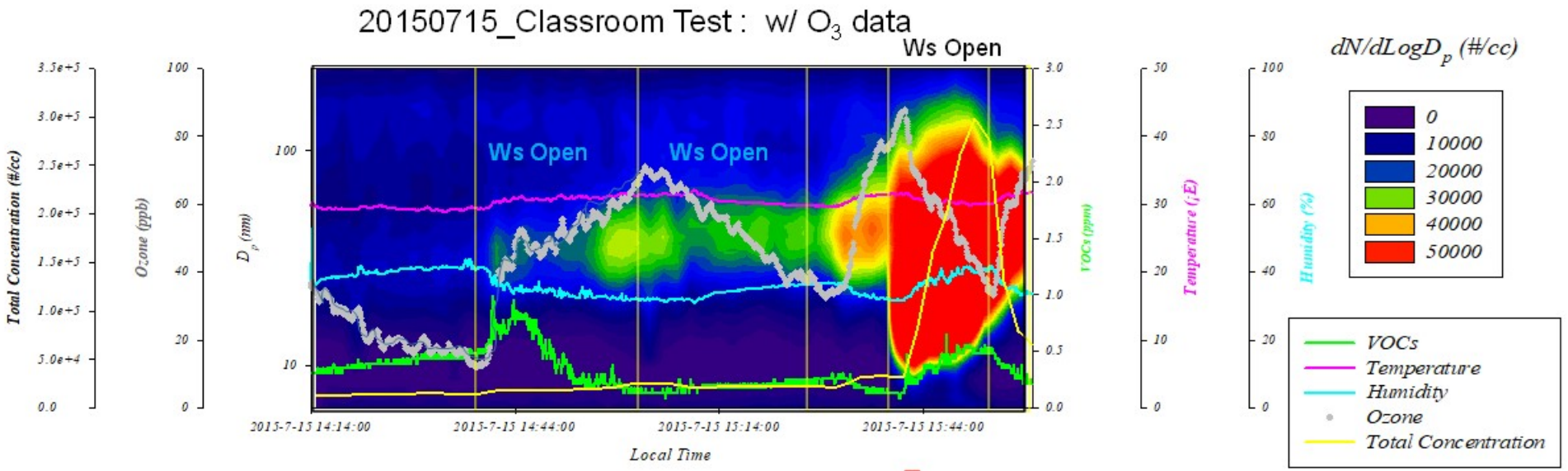
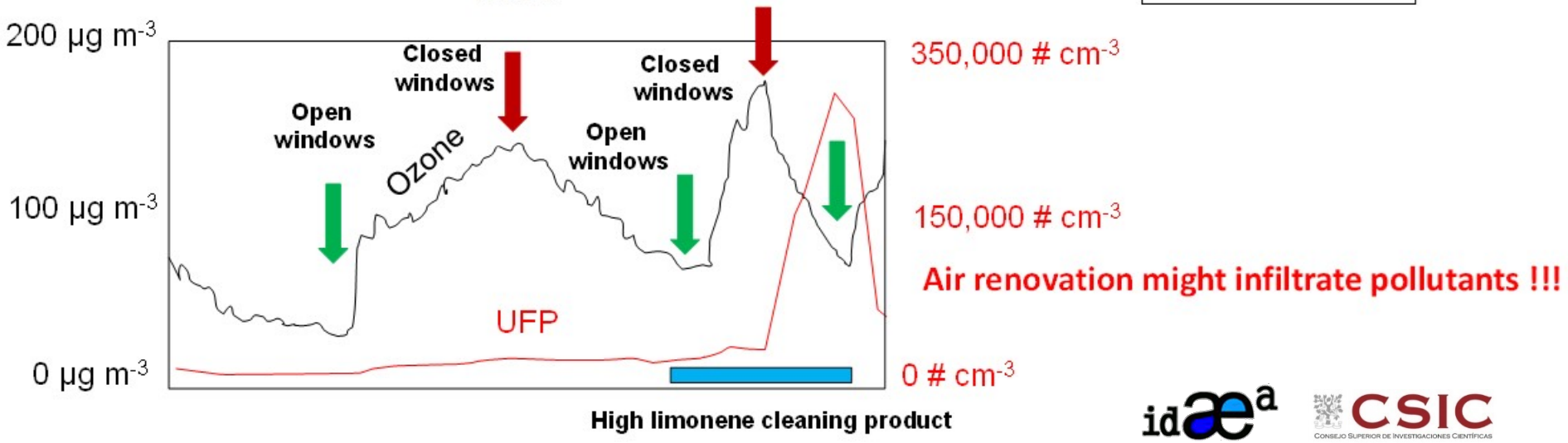
PRE-PANDEMICS

INDOOR REACTIONS WITH EXTERNAL POLLUTANTS





PRE-PANDEMICS

HOW AVOIDING AIR FROM OUTDOOR INTRODUCING POLLUTION INTO CLASSROOMS?

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How to protect school children from the neurodevelopmental harms of air pollution by interventions in the school environment in the urban context

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ABSTRACT

Recently, there has been a flurry of publications assessing the effect of air pollution on neurodevelopment. Here we present a summary of the results obtained within the BRain dEvelopment and Air polluTion ultrafine particles in scHool childrEn (BREATHE) Project, which aimed to evaluate the effects of the exposure to traffic related air pollutants in schoolchildren in Barcelona. To this end, we comprehensively characterised air quality in 39 urban schools from Barcelona and identified the main determinants of children's increased exposure. We propose a series of measures to be implemented to improve air quality in schools within the urban context and, consequently, minimise the negative effects on children's neurodevelopment that we found to be associated with the exposure to air pollution. We also aimed to list some of the actions pushed by governments and the society (including school managers, parents, and children) that have been taking place around Europe for promoting better high quality in the school and its surroundings.

RECULL DE RECOMANACIONS PER REDUIR L'EXPOSICIÓ A LA CONTAMINACIÓ DE L'AIRE EXTERIOR A LES ESCOLES DE BARCELONA

2 Agost 2019

Elaborat per l'Agència de Salut Pública de Barcelona

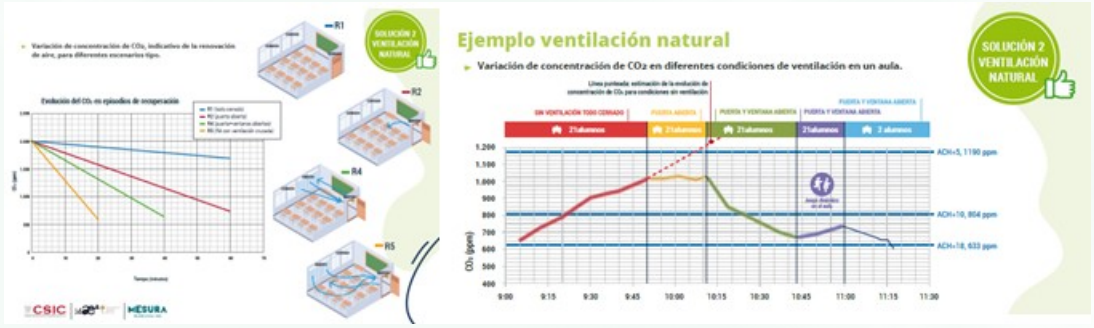
CSB Consorci Sanitari de Barcelona

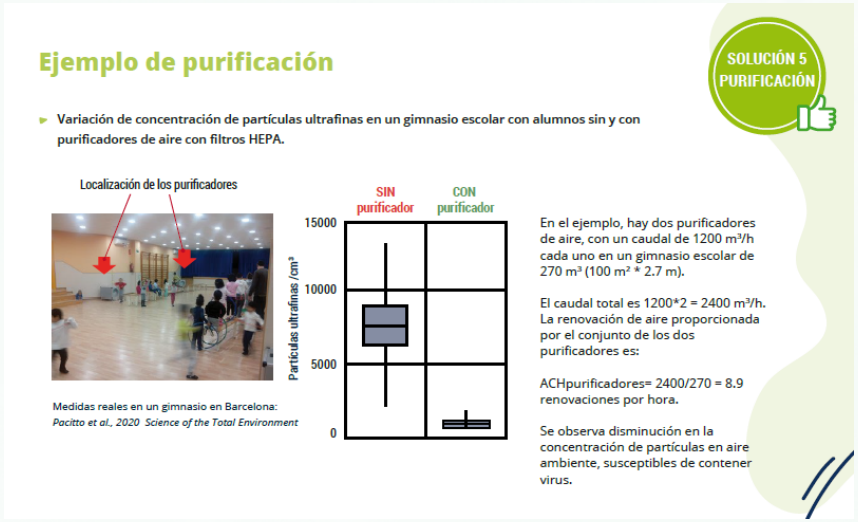
Agència de Salut Pública

Amb la col·laboració de
IDAEA-CSIC
Aiguasol
ICTA-UAB
ISGlobal
Consorci d'Educació de Barcelona
Mobilitat i Infraestructures - Ecologia Urbana - Ajuntament de Barcelona.
Departament de Qualitat Ambiental. Medi Ambient i Serveis Urbans - Ecologia Urbana - Ajuntament de Barcelona.

PANDEMICS

HOW FAVOURING VENTILATION (INTRODUCING OUTDOOR AIR) OF CLASSROOMS?





Including calculations of risk of transmisión COVID19 by teachers or children

https://indairpollnet.eu/wp-content/uploads/2021/01/Guide-for-ventilation_Indairpollnet.pdf

PANDEMICS


Guía de ventilación de espacios interiores
Comercios, Hoteles, Hostelería, Cines, Teatros, Museos y otros lugares donde se comparte el aire que se respira.
GENERALITAT VALENCIANA
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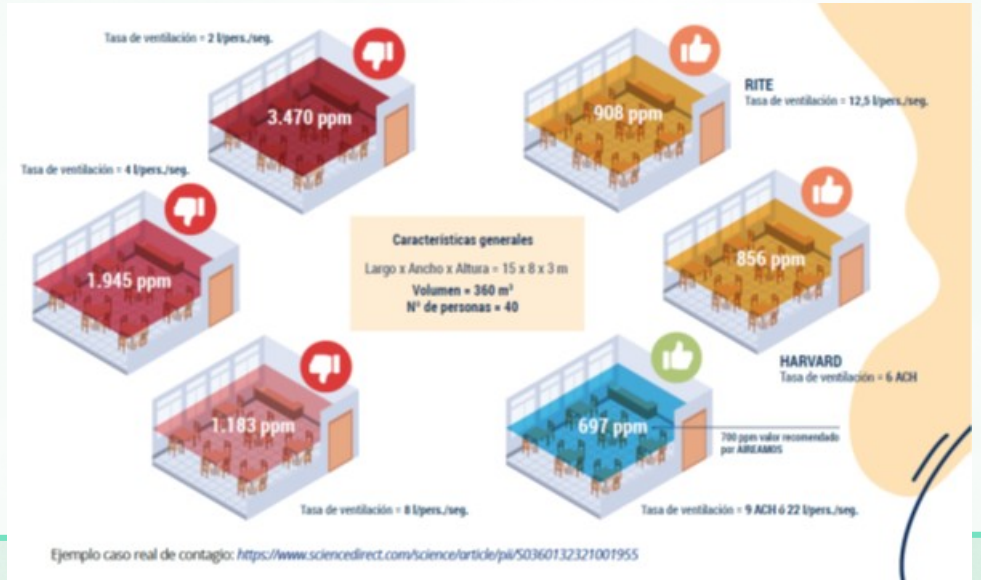
VERSIÓN 1, mayo de 2021


2. BÚSQUEDA DE SOLUCIONES
DIAGRAMA DE FLUJO PARA BÚSQUEDA DE SOLUCIONES
Las actividades en exterior son siempre preferibles al interior.
Si la actividad ha de ser en interior, es preferible en comedores con posibilidad de ventilación natural, especialmente ventilación cruzada (ventanas y puertas abiertas en lados opuestos).
Si la ventilación natural no es suficiente, generalmente se puede conseguir ventilación utilizando equipos extractores o impulsores individuales con un caudal de aire adecuado.
Cuando se dispone de sistemas centralizados de ventilación forzada, la tasa de aire exterior se debe priorizar y la recirculación se debe reducir.
Cuando todo lo anterior no es posible o no es suficiente, se debe limpiar el aire con equipos provistos de filtros HEPA.
La solución final puede ser una combinación de opciones, por ejemplo se puede combinar ventilación natural y purificación.
Para evaluar si una configuración dada es suficiente hay que medir CO2 y verificar que no sobrepasamos los niveles recomendados según número de comensales y caudal de ventilación (ver excel adjunto).
El uso de mascarillas, el mantenimiento de la distancia y las medidas de higiene siguen siendo necesarias en todas las soluciones. En sobremesas es conveniente usar las mascarillas cuando no se consume.
¿Se puede hacer actividad en exterior?
SÍ
NO
Ventilación natural cruzada
Ventilación individual forzada
Ventilación centralizada forzada
Limpiadores de aire
CSIC
MESURA
11


Tasa de ventilación = 2 l/pers./seg.
3.470 ppm
Tasa de ventilación = 4 l/pers./seg.
1.945 ppm
1.183 ppm
Tasa de ventilación = 8 l/pers./seg.
Características generales
Largo x Ancho x Altura = 15 x 8 x 3 m
Volumen = 360 m³
Nº de personas = 40
908 ppm
RITE
Tasa de ventilación = 12,5 l/pers./seg.
856 ppm
HARVARD
Tasa de ventilación = 6 ACH
697 ppm
700 ppm valor recomendado por AIRE AMOS
Tasa de ventilación = 9 ACH ó 22 l/pers./seg.
Ejemplo caso real de contagio: https://www.sciencedirect.com/science/article/pii/S0360132321001955

POST-PANDEMICS

- We need air renovation, not only to reduce the risk of transmission of flue, COVID, ……, but to reduce indoor pollution (VOCs, PM, CO,……)

BUT

- In polluted environments (PM, NO_2 and O_3) air renovation standards have to be reached with clean air, both to reduce infiltration of pollutants and the generation of new pollutants indoor by interaction with O_3

- **Both risk of transmission and air pollution have to be taken into account**

- **Pre-pandemic, climate and energy policies favoured hermetically closed houses, with black roofs (solar panels); or hermetically closed e-buses with indoor air recirculation. Pandemics demonstrated the need of the fresh air, but also numerous indoor air quality studies.**

- **Post-pandemics: Finding the equilibrium and cleaning outdoor air for air renovation**

MOLTES GRÀCIES !

2n Congrés Qualitat de l'aire

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