The project has received funding from the LIFE Programme of the European Union under GA number LIFE19 ENV/GR/000100

LIFEVISIONS
InnoVative photocatalytic paintS for healthy envirOnment and eNergy Saving

LIFE VISIONS ONLINE COURSE

Wednesday, 24 January 2024

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Overview

1. What is Indoor Air Quality /Indoor Environment Quality?
2. Why do we care for IAQ?
3. Which factors determine IAQ?
4. Sources & pollutants/emerging pollutants
5. How to achieve better IAQ?
6. Challenges for IAQ assessment

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Indoor Air Quality
quality of air inside buildings as represented by **concentrations of pollutants**

Indoor Environment Quality
+ lighting, temperature, humidity, noise, air renewal

health & **comfort**
of building occupants

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Why do we care for IAQ?

>90% time spent indoors

- ✓ Home
- ✓ Working place/office
- ✓ School/University
- ✓ Public buildings
- ✓ Means of transport etc.

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Legionnaires' Disease and HVAC

Sick Building Syndrome SBS has been defined a "set of adverse health or discomfort symptoms that individuals experience when they spend time indoors, and that lessen while away from the building"

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HOUSEHOLD AIR POLLUTION

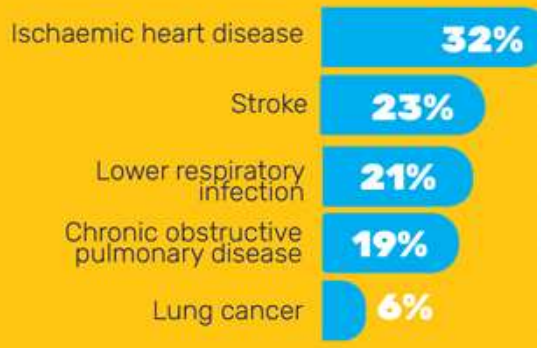
COVID-19 BRINGS INDOOR AIR QUALITY MONITORING UPFRONT

A thought leadership piece by Edward Pugh, Managing Consultant, EVORA Global

WORLD GREEN BUILDING COUNCIL

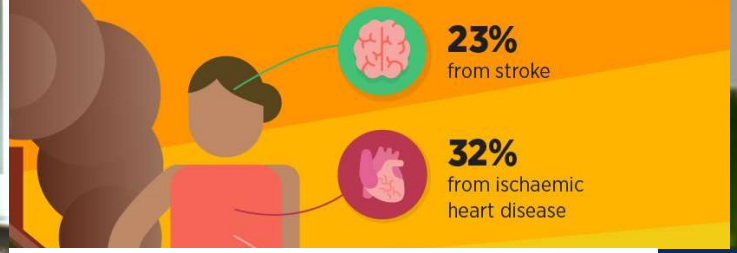
BETTER PLACES FOR PEOPLE

3 MILLION DEATHS each year



illion people

rom household air pollution (2019).
is mostly created by using
such as wood with polluting stoves,



World Health Organization

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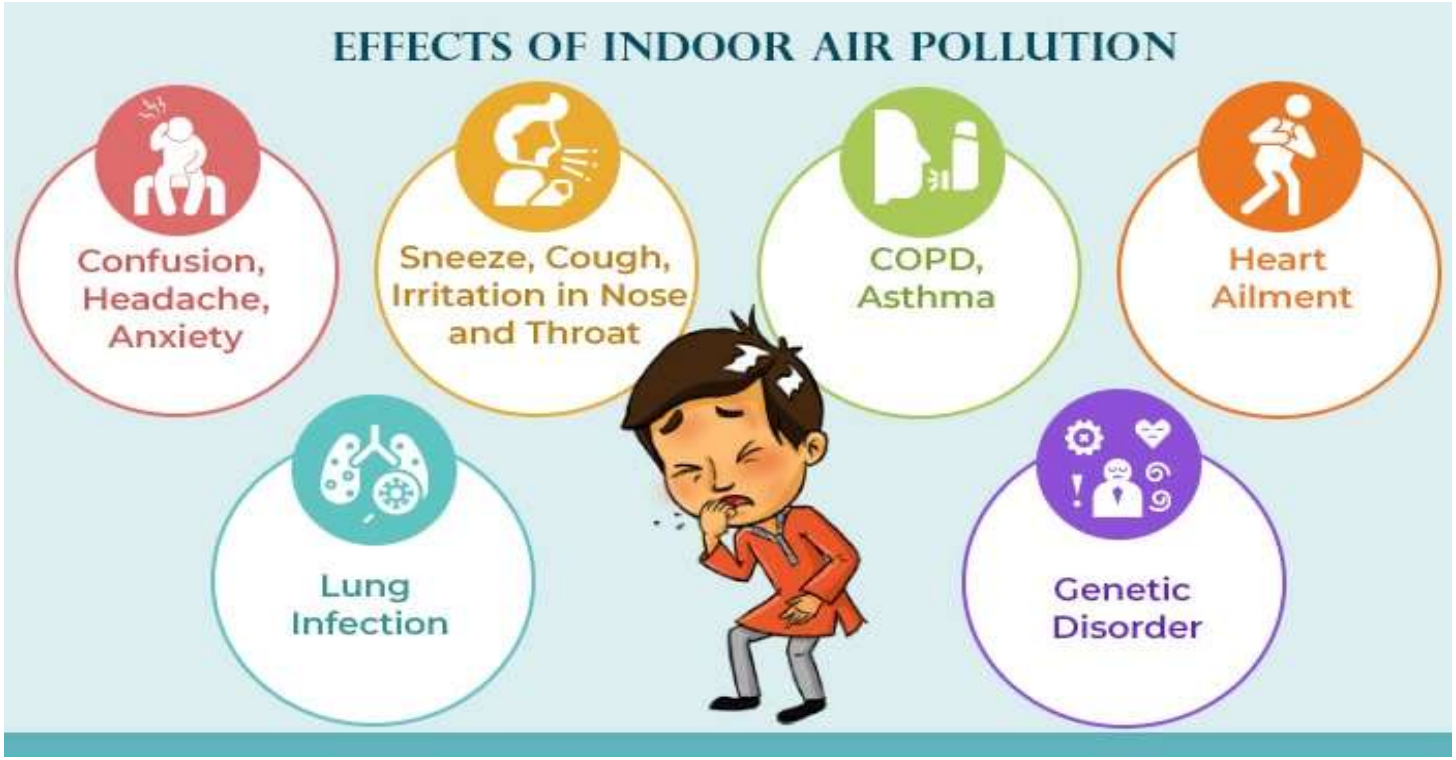

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Why do we care for IAQ?

Short- and Long-term **impacts on health /vulnerable groups** (children, elderly, pregnant, sick people)

Impact on occupants' **comfort /** reduced **productivity**

Worsening **outdoor air pollution** and **climate crisis**

Airtight (energy consumption efficient) building environments

People **stay more indoors** (pandemic, extreme events etc.)

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Which factors determine IAQ?

Outdoor air quality

Air pollution sources indoors

Occupants' activity/habits

Building characteristics

Physical parameters (light, temperature, humidity) indoors

Ventilation/air renewal

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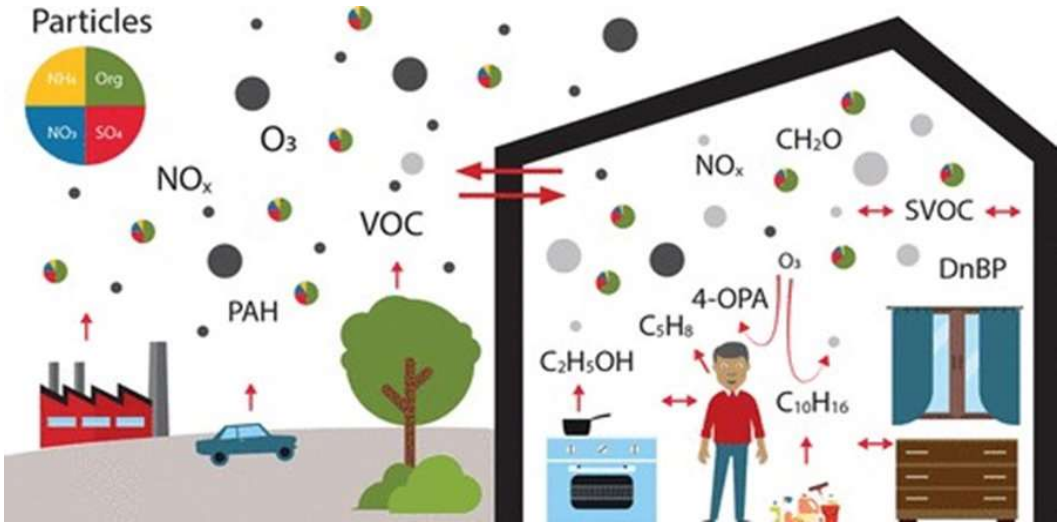
Indoor air pollutants

- **Particulate matter** (PM10, PM2.5, PM1, ultrafine)
- **Organic compounds** (VOCs, PAHs, aldehydes, ketones etc.)
- **Inorganic gases** (NOx, SO_2, O_3, CO_2 etc.)

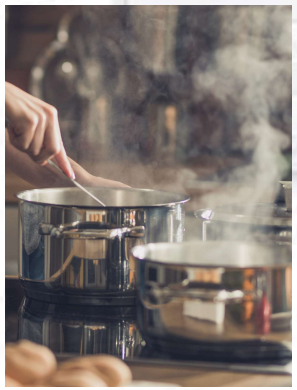


Emerging pollutants:

- microplastics
- oxidative potential
- secondary organic aerosols
- per- and polyfluoroalkyl substances (PFAS)
- brominated flame retardants
- phthalates
- dioxins

Sources of Indoor air pollution

- ✓ building materials and furniture
- ✓ combustion-related
- ✓ cooking-related
- ✓ resuspension
- ✓ cleaning and consumer products
- ✓ indoor generated secondary pollutants (photochemistry)
- ✓ outdoor environment



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Standards/Directives/limits

WHO guidelines for indoor air quality: selected pollutants
The WHO offers **comprehensive guidelines** for particulate matter, radon, Volatile Organic Compounds (VOCs), and biological contaminants. These guidelines are internationally recognized and serve as a reference for many countries' IAQ regulations.

•**International Organization for Standardization (ISO)** – ISO offers several standards related to indoor air quality, including standards for assessing indoor air quality management systems (ISO 16000-40:2019) and specifying methods to express the quality of indoor air suitable for human occupancy (ISO 16814:2008).

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Ways to improve IAQ?

- ✓ Remove or eliminate sources of pollution
- ✓ Adequate air renewal / ventilation
- ✓ Maintain HVAC filters, AC units, and fans
- ✓ Dry out damp areas
- ✓ Use of air purifiers
- ✓ Use of photocatalytic materials

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Future challenges for IAQ?

- Investigate **health effects** related to indoor air pollution exposure (vulnerable groups)
- Protect indoor air from **climate change consequences**
- Incorporate **IoT solutions to IAQ monitoring** for optimizing IAQ assessment (e.g. sensors networks, remote monitoring, alarming systems)
- Public and authorities' **awareness, mitigation actions** (schools, public buildings etc) / citizen science

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