

# DELIVERING HEALTHY AND SUSTAINABLE INDOOR ENVIRONMENTS



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## YOU ARE WHAT YOU BREATHE

There has never been a more important time to engage with how we bring about a healthy and sustainable indoor environment. A healthy space comprises a number of aspects – acoustics, air quality, lighting and other environmental parameters like temperature and relative humidity.

In developed countries like the UK, we spend around 90% of our time indoors, whether at home, at work, or commuting between the two. Further, we spend around two thirds of our time in our homes. This means that most of our exposure to health impacting elements of that environment, such as air pollution, happens in the home, even if the pollutants were generated outdoors. When we consider that air is one of our

largest daily consumables – its quality has a significant impact on our health and wellbeing.

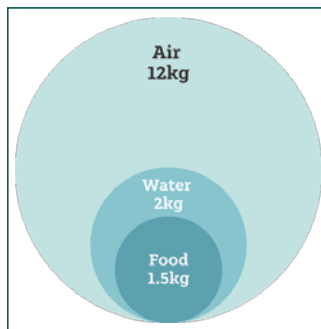


Figure 1: Average daily consumption of an individual

The effects of climate change continue to impact our everyday activities – with extreme weather events – such as high temperatures being experienced across the UK driving people to take refuge in their buildings. Drawing the curtains and sealing themselves into these indoor environments is a thing that is happening now – shifting more

of people’s time to indoor spaces at times of year which historically saw a proportion spent outdoors.

The recent Covid-19 pandemic demonstrated the importance that buildings play in keeping us healthy – and indeed how good ventilation in buildings can help reduce the transmission of the virus (and other airborne diseases). Aspects, like good ventilation also improve IAQ, where the main sources of air pollution are indoors.

Of particular concern within the net zero context, is that buildings will continue to become more airtight through energy efficiency measures to the detriment of IAQ.

The air we breathe contains many different and often invisible pollutants that as individuals we can’t sense.

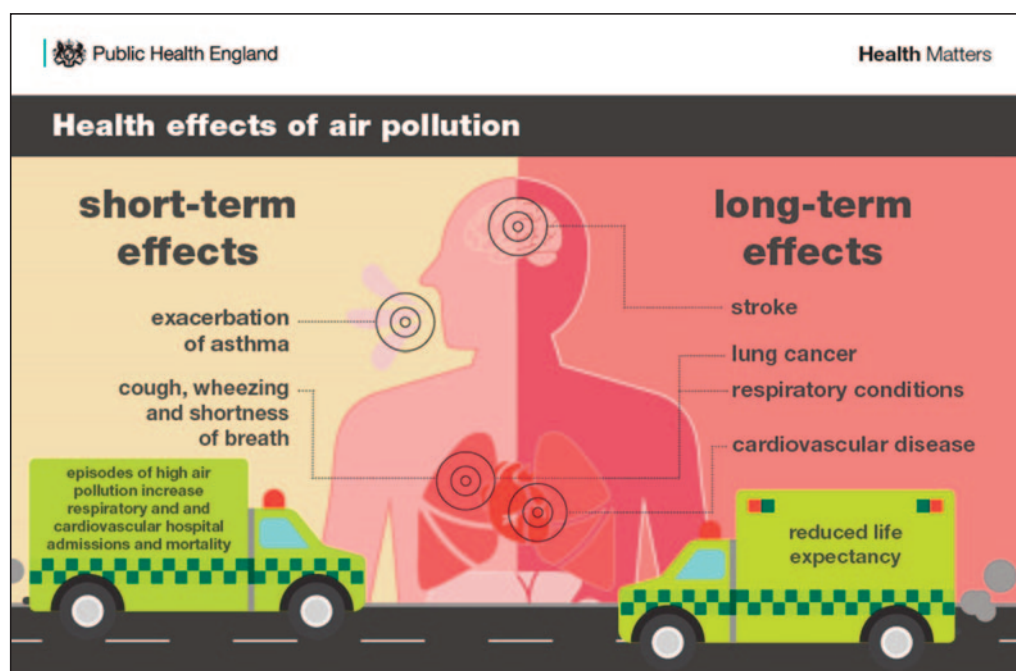


Figure 2: Health effects of air pollution: source PHE

These pollutants can bring about a range of short and long term health impacts as seen in figures 2 and 3.

Likened every breath to a sip from a glass of water. If that water you got from the tap in your home or workplace was dirty – it wouldn't be consumed and action would be taken immediately to remedy the situation given the importance of water not just for good health but our survival. Every breath that we take contains numerous pollutants and is equivalent to drinking a dirty glass of water.



Figure 4: You are what you eat, drink and breath: source google 2024.

A study undertaken by the Royal College of Physicians (RCP) highlighted that each year in the UK approximately 40,000 deaths are attributable to exposure to outdoor air pollution, which equates to an annual financial cost in excess of £20 billion to the UK economy. As part of this the area of the internal environment within buildings and the relationship between indoor air quality (IAQ) and the health of occupants was highlighted as needed further investigation.

Knowing the robust science with regards the impact poor air quality and environments have on our health and wellbeing, how can we improve our buildings and the spaces we live, rest, work, learn, play and enjoy our time in. Could we harness our buildings and indoor spaces to not only be safe places that are not causing us harm – but could even offer improvements to our health and wellbeing and in turn even a marginal

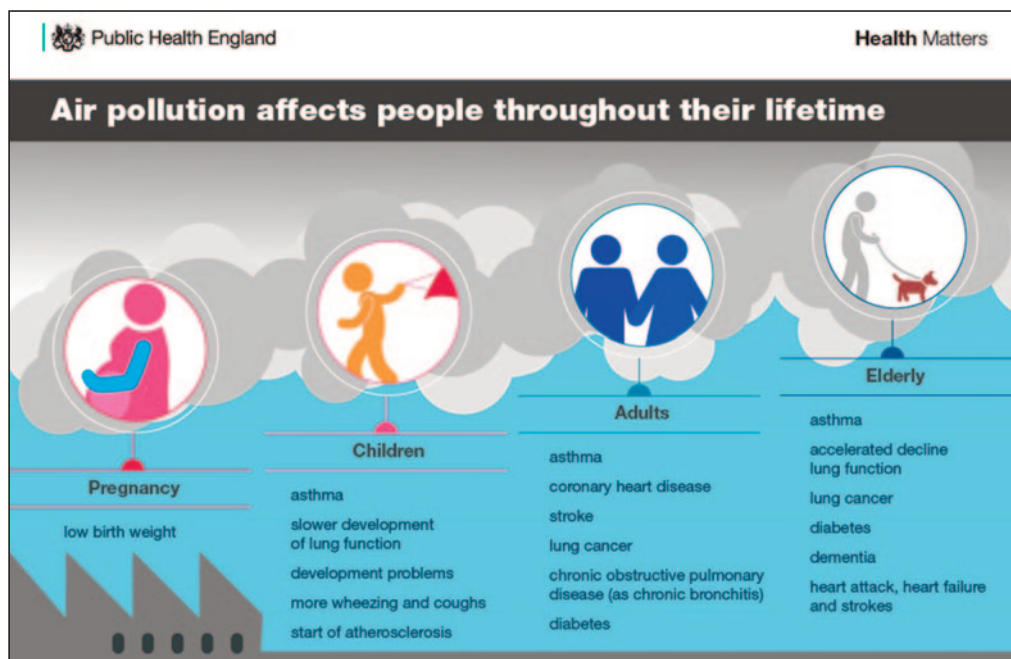


Figure 3: Air pollution affects people throughout their lifetime: source PHE

improvement could deliver significant financial benefits to the UK economy when considering the values mentioned earlier.

### MIND THE GAP

The existing limited legislation in place that influences the health of individuals within our buildings – if present at all – is in part disconnected with the latest internationally recognised limits and levels set out based on research. An example of this is

the UK's air quality objectives, or limits. When these are compared with both the 2005 and the most recent 2021 World Health Organisation (WHO) Air Quality Guidelines as illustrated in the below figure 5, it's possible to observe the disparity between the science the legislative that is informing the majority of design and operations of our indoor spaces.

### SHIFTING APPROACH

When looking at how to bring

forward a healthy and sustainable indoor space, outside of legislation, that would be required to facilitate this shift. How various stakeholders engage with the topic of health and the indoor environment is one area of opportunity.

### IDENTIFICATION AND UNDERSTANDING

Architects, building services engineers, building managers and specialist consultants, such as air quality, are some of the



Figure 5: Illustrative comparison of UK air quality objectives (limits) compared with WHO guideline values for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>

people who have a role to play in how the quality of our indoor spaces is taken into account in the design and subsequent operation of a building.

Having a firm grasp of the issue at hand and the science is the first step in moving towards a building with the desired indoor environmental quality (IEQ). This means that identifying and understanding both the outdoor and indoor environment in terms of the sources of pollution as well as the pollutants' chemistry / physics and behaviour in the environments is necessary in order to inform other professionals in the group, such as the architect and the building services engineer. This allows for effective design and subsequent operation.

## ADAPTATION AND MITIGATION

Effectively adapting the building design and applying mitigation as appropriate to address and account for the prevailing and projected quality of the air sits largely with the mechanical engineers and architect, and

they will have been and should continue to be guided by the specialist in the area e.g. air quality expert.

As with the identification and understanding stage, to realise the full potential that IEQ can offer, adaptation and mitigation should not be progressed in isolation – and the role of the specialist expert is to support the mechanical engineer and architect in the interpretation of the impacts of design decision on IEQ.

## IMPORTANCE OF COLLABORATION

The complexity of the indoor environment, with different disciplines interacting, collaborating and influencing IEQ outcomes, means that specialist experts are integral. Having a solid scientific basis on which to build is critical and means that this expertise acts as an identifiable point of reference for a project team to help navigate the growing complexities and opportunities in this evolving topic in the later design stages. This allows for a truly robust design and operation.

## NEXT STEPS

There appears a level of consensus that legislative drivers are needed to support a healthy indoor space. In parallel to this a focus should be given to both behavioural and system change – the perception and role of a building services professional and specialist – such as an air quality consultant, as part of the design, commissioning, handover and operation of our buildings needs to shift in approach to take account of the demand from consumers and growing science base.

Early consistent and ongoing considering through these stage is needed in an informed way back by robust science. How the quality of this important part of an individuals environment is communicated to them and how they are able to interact with it, needs to be improved to allow for maximum benefits to be realised.

While there may be a cost associated with better consideration of indoor spaces and the health outcomes they provide – this should be seen as

an investment. Given the significant financial costs to the UK economy – impacts to NHS, lost work days, associated with poor quality environments – alongside elements like investment attraction and retention – providing better improved indoor spaces is of huge importance given the increasing pressures and demands that our buildings are being put under.

To support in the uptake and investment associated with improved IAQ given the complexities in this area, a performance metric with a health strategy set for a building.

Strategic engagement with the topic of health and wellbeing at an early stage throughout a buildings life in a holistic way that provides cohesion and consistency between the various factors at play – acoustics, air quality, lighting, sustainability etc is needed to drive the delivery of a health and sustainable indoor space. ■