





A NEW AND INNOVATIVE WAY TO COMBATING AIR POLLUTION IN LONDON

AIR POLLUTION AND THE ENVIRONMENT

Air pollution is the release of particles and noxious gases into the atmosphere; these emissions can be natural or manmade, and are considered to have an adverse effect on human health.

The most dangerous type of emissions is manmade “**particle pollution**” – which is largely the result of the combustion of fossil fuels such as coal, oil, petrol or diesel.

Pollution might be manmade, but it is primarily the weather that dictates what will happen once it is released into the air.

During wet or windy conditions pollution concentrations remain low, either blown away, or removed from the air by rain. During still hot weather pollution can build up to harmful amounts, leading to what are known as pollution episodes.

Concentrations also increased in winter when low winds lead to a build-up of traffic pollution.

King’s College London’s Environmental Research Group identifies the following pollutants as being of most concern:

- Carbon monoxide**
- Nitrogen dioxide**
- Ground level ozone**
- Particulates**
- Sulphur dioxide**
- Hydrocarbons**
- Lead**

Each of the above has different sources and potential impacts on human health.



UK URBAN AIR POLLUTION: A PUBLIC HEALTH EMERGENCY

Air quality in UK cities has been described by leading politicians and health experts as a “**public health emergency**”.

Even at times of lower pollution, UK air quality routinely breaches World Health Organisation (WHO) recommended limits. UK Government analysis states air pollution causes 50,000 early deaths and £27.5bn in costs every year.

Deaths from air pollution are more than 20 times the number of people who die in road accidents and are only exceeded by the 80,000 who die every year because of smoking.

WHO estimates that about 80% of deaths related to outdoor pollution are linked to heart disease and strokes, while 14% are due to lung or respiratory diseases, and 6% to cancer.

Leading environmental health experts blame the air pollution crisis in the UK on the shift to diesel vehicles - which produce large amounts of nitrogen dioxide - over the past 10 years.



In 2015, Camilla Cavendish, who was head of policy at Number 10 under David Cameron, warned in a private memo that “*we [the Government] don’t yet have an answer on air quality.*”

Cavendish said the Government’s 2015 Air Quality Plan “both overclaims and underwhelms.”

In November 2016, following a legal challenge by an environmental group, the High Court ruled the UK Government must come up with a better strategy to tackle air pollution.

EXISTING EFFORTS TO TACKLE AIR POLLUTION
“OVERCLAIM AND UNDERWHELM”

URGENT ACTION IS NEEDED TO IMPROVE LONDON'S AIR

Leading environmental health experts state that central London is one of the most polluted places in the UK. Emissions from traffic are the most obvious driver for London's poor air quality, but other negative factors include, high population density, a highly-concentrated road network and high buildings.

A Kings College London study (2015) commissioned by Transport for London and the Greater London Authority states that air pollution:

- Causes 9,500 premature deaths each year;
- Costs the regional economy £3.7 bln per annum;
- Burdens the NHS with costs of £25 million in hospital admissions, including cardiovascular and respiratory diseases.

On the 60th anniversary of the Clean Air Act (1956), Sadiq Khan, the Mayor of London, said that “unlike the smoky pollution of the past, today's pollution is a hidden killer.”

The Mayor has called for “urgent action” to ensure Londoners “no longer have to fear the very air we breathe.”



Due to its location in the heart of London and size of its population, the City of Westminster suffers from particularly poor air quality.

Westminster is a key business location within London. It employs over 500,000 and its population can swell to over 1 million a day with tourists and commuters.

Westminster has an extensive public transport infrastructure: 32 underground stations; all but two London tube lines run through the borough; 79 bus services pass through borough's streets.

In 1999 the City of Westminster designated the whole of the borough as an Air Quality Management Area (AQMA) due to exceedances in NO2 and particulate matter (PM10).

In 2012, the Greater London Authority identified the following eight areas in Westminster as areas where “there is the most potential of improvements” in air quality:

- A5 Edgware Road from Avenue Hall/Marylebone/Seymour St;
- Oxford Street from Marble Arch to Bloomsbury;

- Charing Cross/Haymarket/Piccadilly/Regent Street to Oxford Circus;
- The Strand from Charing Cross to Fleet Street inc Aldwych;

Embankment Charing Cross to Tower Hill;

Victoria at Victoria St/Bressenden Place/Grosvenor Pl/Buckingham Palace Rd;

Whitehall and Parliament Square;

Marble Arch to Hyde Park Corner.

Significant growth is also projected in the Opportunity Areas of Paddington, Victoria and Tottenham Court Road, the Central Activities Zone and North Westminster Economic Development Area.

Existing and new commercial buildings (offices and retail uses) across the city will continue to generate emissions and seek sustainable design solutions to reduce emissions.

THE OPPORTUNITY FOR THE BREATH IN WESTMINSTER

Figures 1 and 2, below, spatially represent the annual mean concentrations of NO₂ and PM₁₀ in the City of Westminster 2011.

These images show that concentrations are highest along the main artery roads in the borough.

The Breath offers the opportunity to reduce air pollution in these locations.



Image 1
Annual NO₂ concentrations in City of Westminster in 2011



Image 2
Annual PM₁₀ concentrations in City of Westminster in 2011

INDOOR-RELATED POLLUTION

Pollution thrives in enclosed spaces. Everyday people spend at least 80% of their time in buildings.

In the main cities, indoor air quality is affected by domestic gas combustion from cooking and heating. Other sources of indoor air pollution include cleaning agents, tobacco smoke, mould, condensation and asbestos.

Tobacco smoke is the most harmful source of indoor air pollution, the WHO estimates that both women and men exposed to heavy indoor smoke are 2-3 times more likely to develop chronic obstructive respiratory disease.

In urban areas, where filters are not in place, outdoor air pollution also impacts upon indoor air quality (IAQ). IAQ can be improved through source control, filtration and ventilation.

WHAT IS NEEDED TO TACKLE AIR POLLUTION?

Environmental health experts, including the European Environmental Agency, warn that there are no easy answers and a range of measures are needed to tackle air pollution.

Measures range from traffic restrictions - including speed restrictions on motorways - to good public transport links and cycle lanes.

Kings College London's Professor Frank Kelly believes that a shift towards less polluting forms of transport such as electric vehicles will be necessary.

In 2010, the Mayor of London published a cleaner air strategy, which included the use of fabric filters (specifically for biomass boilers). In July 2016, Sadiq Khan, the new Mayor of London, said he wanted to improve on this strategy.

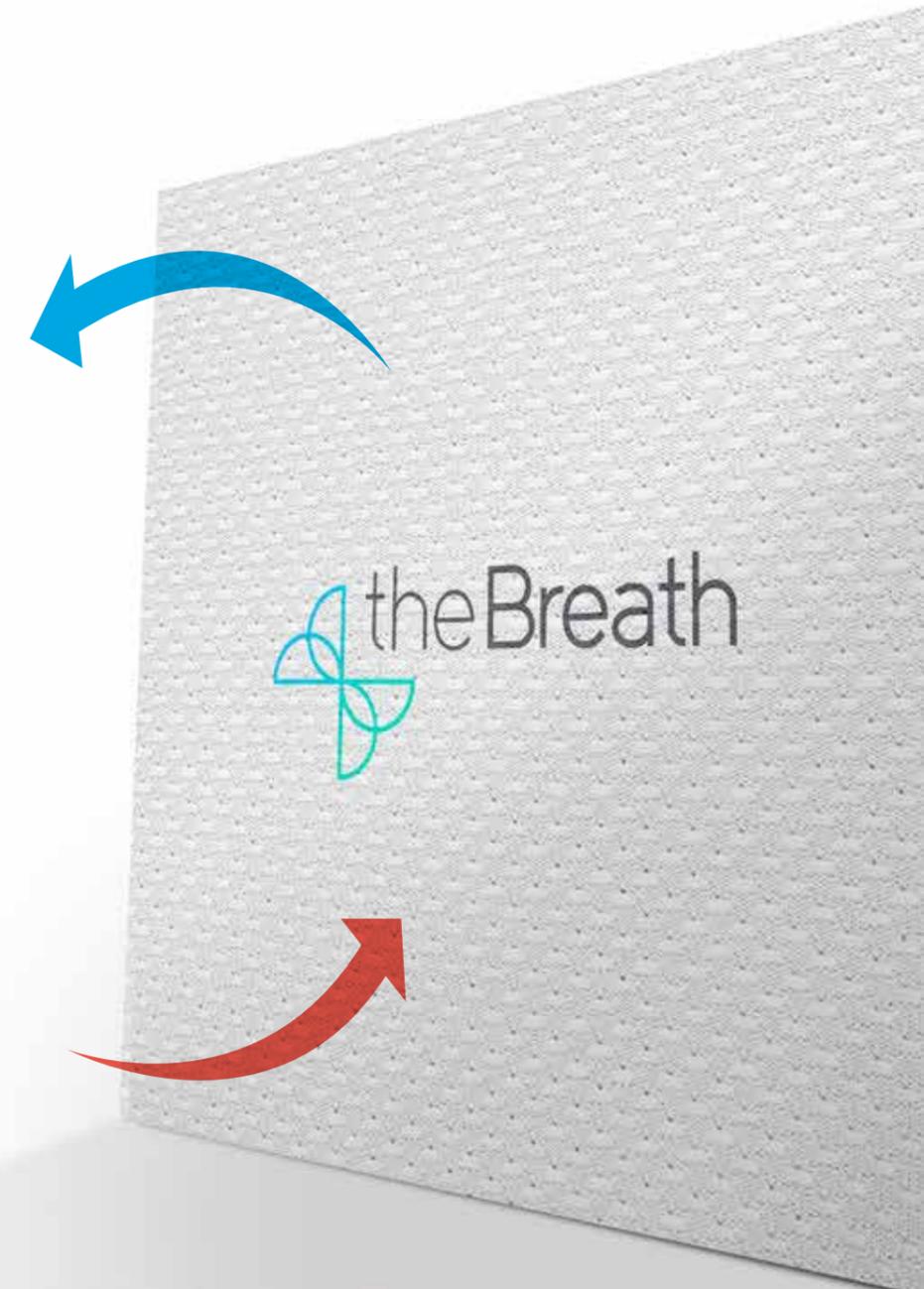


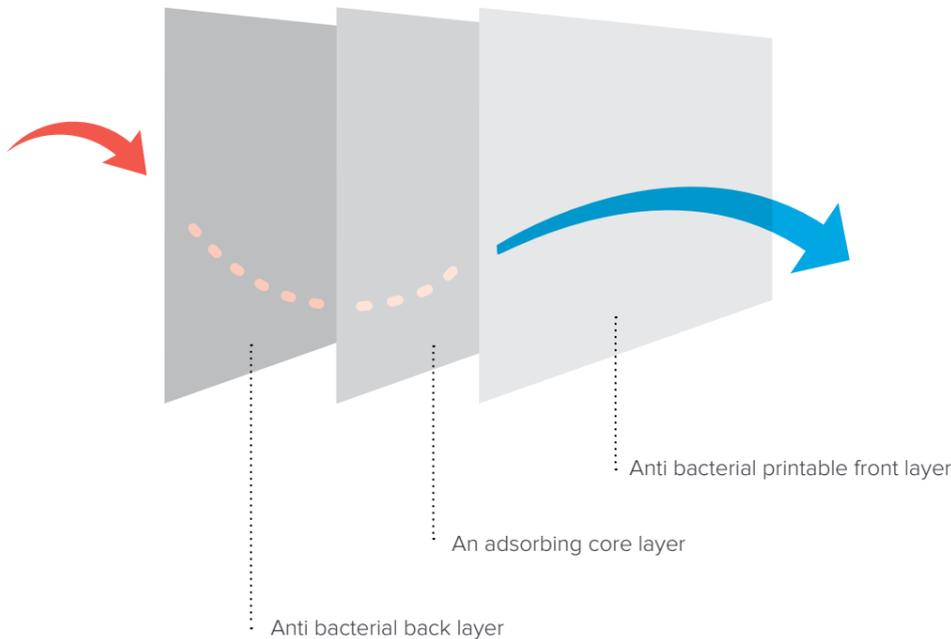
WHAT IS IT?

The Breath is an innovative environmental technology that can be used to treat and purify polluted air in cities. The cutting-edge technology is comprised of a multi-layered fabric, which includes a nano-molecular activated core that separates and absorbs harmful airborne pollutants.

THE HIGH-TECH FABRIC IS **DESIGNED TO IMPROVE LOCAL AIR QUALITY** BY REDUCING TOXIC POLLUTANTS EMITTED FROM BUILDINGS AND VEHICLES IN URBAN ENVIRONMENTS

The Breath's technology **absorbs key polluting gases from the atmosphere** such as nitrogen oxides (NOx) and Sulphur dioxide (SO₂) and Benzene (C₆H₆), a highly toxic carcinogen. By removing these gases from the atmosphere, The Breath's technology can prevent certain chemical reactions from taking place that create secondary particulates such as PM₁₀, PM_{1.0} and PM_{2.5} – which are known to have direct harmful impacts on health.





HOW IT WORKS?

THE BREATH IS COMPRISED OF THREE DIFFERENT LAYERS WORKING IN SYNERGY.

These include:

- A printable and water-resistant front layer mesh which facilitates perspiration;
- An absorbing core layer which captures and transforms the polluting molecules;
- A printable, water-resistant and anti-bacterial back layer.

Taken together, The Breath's high-tech fabric uses natural air circulation to reduce pollution.

The Breath's inventors describe it as "a passive sustainable design solution" – meaning it requires no external power source to operate and can be placed virtually anywhere (both indoors and outdoors).

PROPERTIES OF THE FABRIC



Anti-pollution:

The fabric reduces harmful airborne pollution.



Self-cleaning

The fabric is designed to dissolve airborne dirt



Anti-bacterial

The fabric's fibres prevent moulds or fungi from growing (even in north facing locations)



Water resistant

Protects buildings from rainfall whilst works are undertaken



Anti-odorous

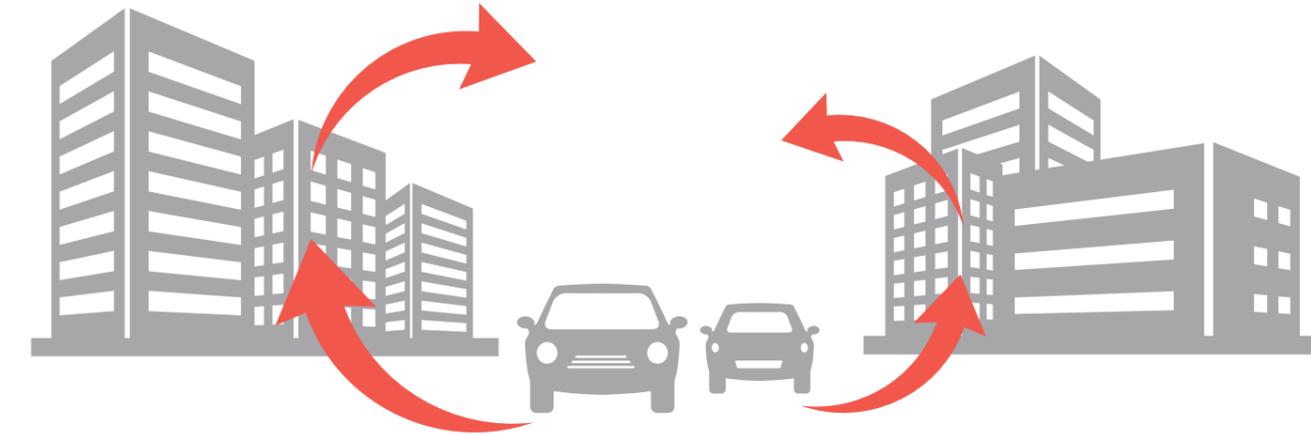
Absorbs localised unpleasant smells





THE BREATH EFFECT

URBAN CANYON EFFECT



An “urban canyon” is defined as the space above the street and between the buildings – thus creating a canyon-like environment.

Within this microclimate, pollution from vehicles and buildings is concentrated, leading to the build-up of a pollutants like:

Carbon monoxide (CO);

Nitrogen oxides (NOx);

Ground level ozone;

Secondary particulates (PM10,

PM0.1 and PM 2.5);

Sulphur dioxide (SO₂);

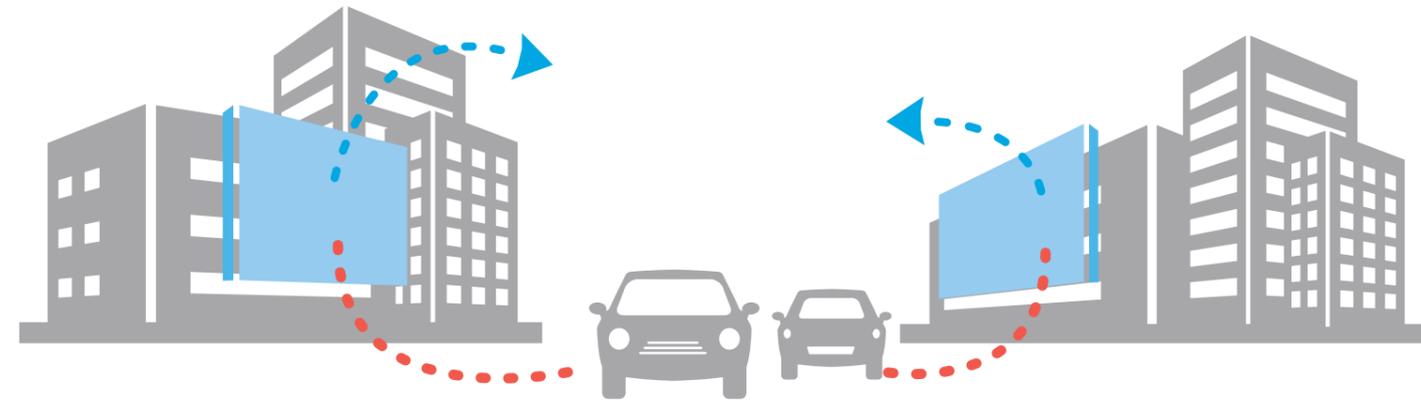
Hydrocarbons;

Lead (Pb);

Benzene (C₆H₆).

The density of buildings, roads and public transport infrastructure prevents the dispersal of the above pollutants.

BREATH EFFECT



The Breath has an optimum impact on air quality within an urban canyon – effectively removing pollution from the local atmosphere.

1. Within an urban canyon, air is circulated up into The Breath's fabric mesh.
2. As air passes through the fabric mesh, pollution is trapped in The Breath's nano-molecular activated core. The core transforms the polluting molecules, this cleans the air.



THE BREATH IN NUMBERS

The installation of The Breath in a city environment would directly tackle air pollution occurring from energy use in and around buildings - as well as absorbing vehicle pollution from the street and nearby transport infrastructure.

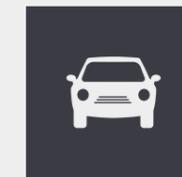


10
SQM / YEAR

10 SQM ABSORBS POLLUTION FROM



13,650
PETROL CARS



5,475
DIESEL CARS



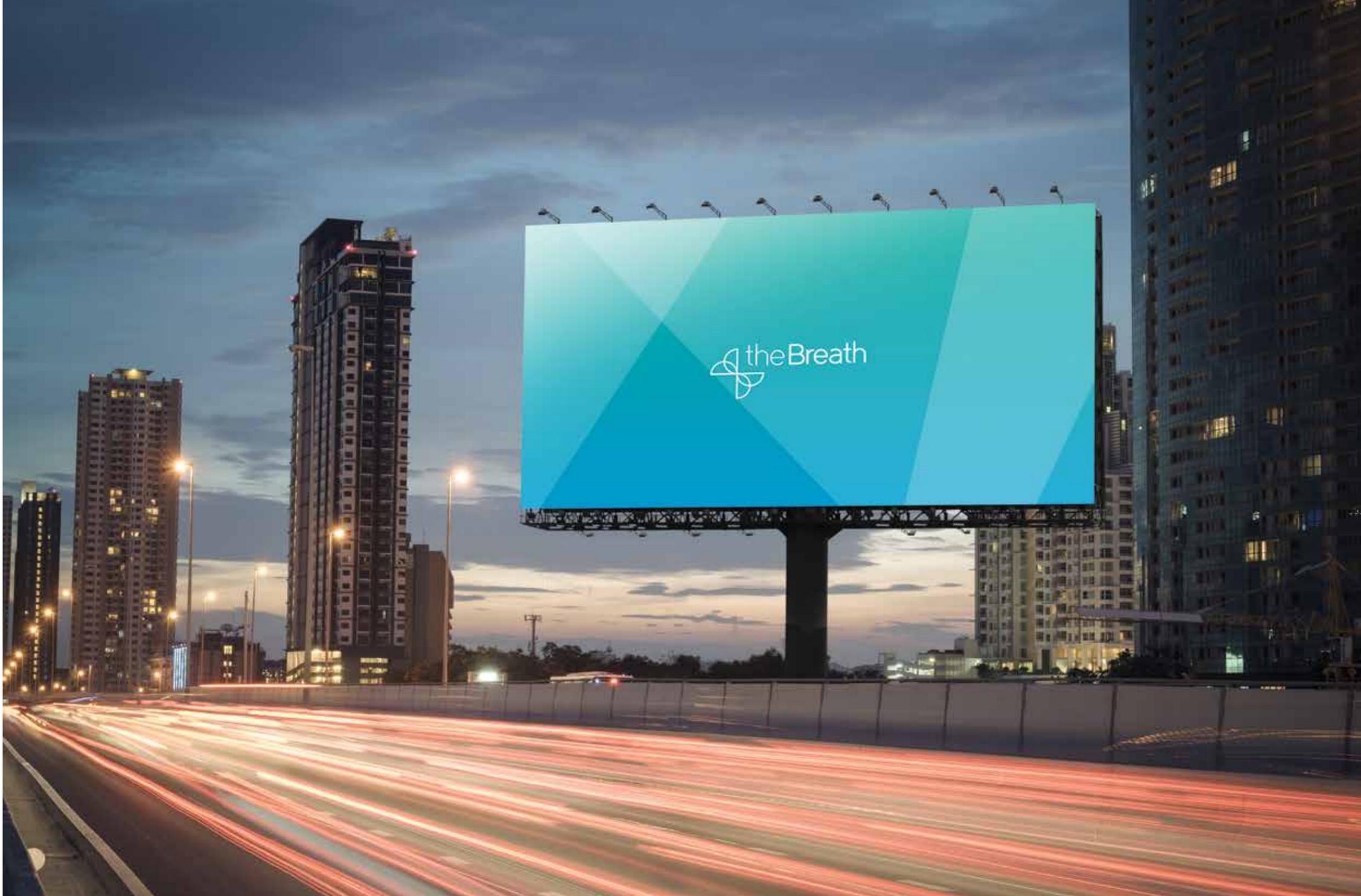
5
BOILERS

PETROL CARS - Based on VOC emission

DIESEL CARS - Based on NO2 emission

BOILERS - Based on an average boiler, emitting 6,000 mg of nitrogen oxide a month

WHERE CAN IT BE USED?

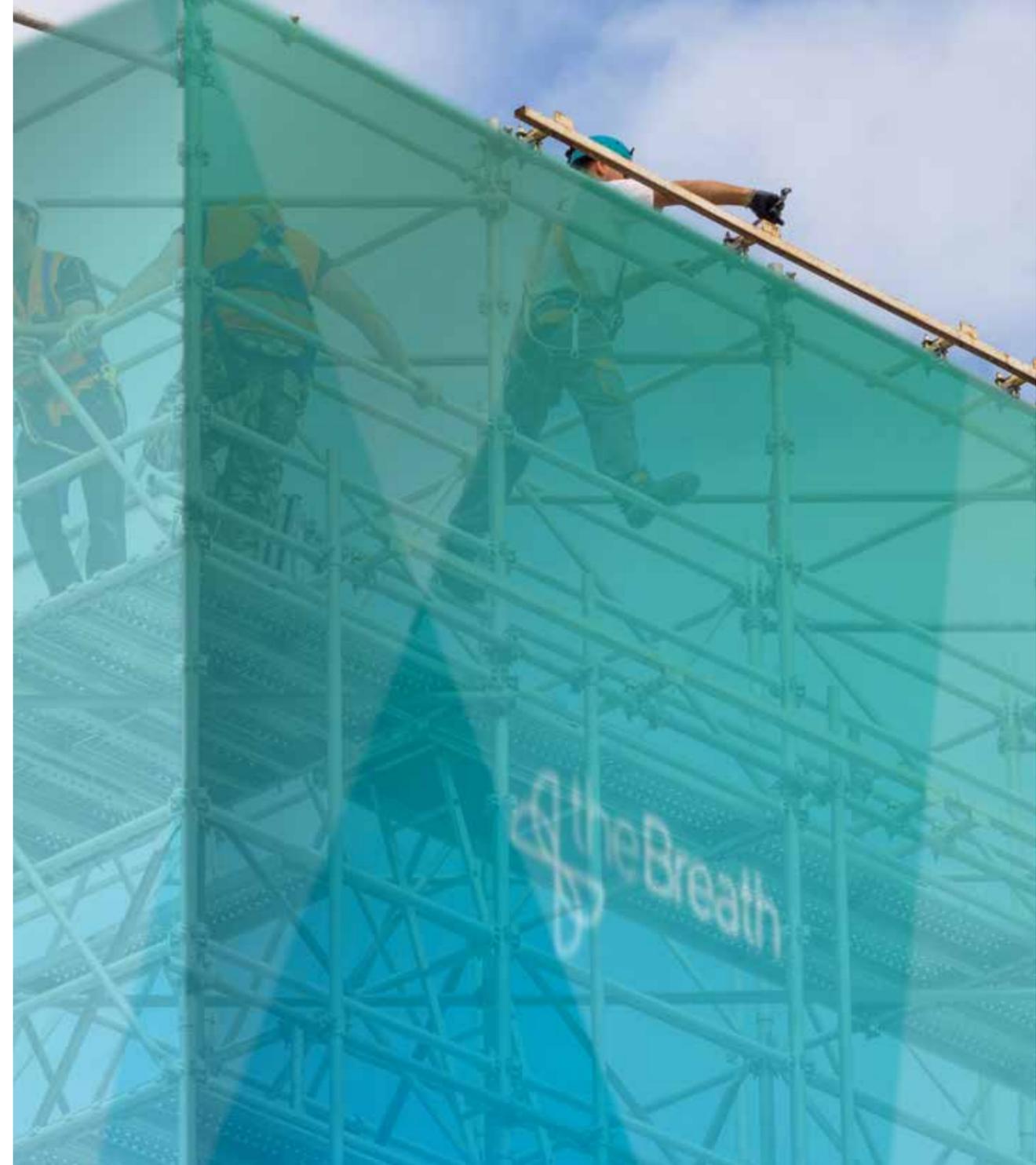
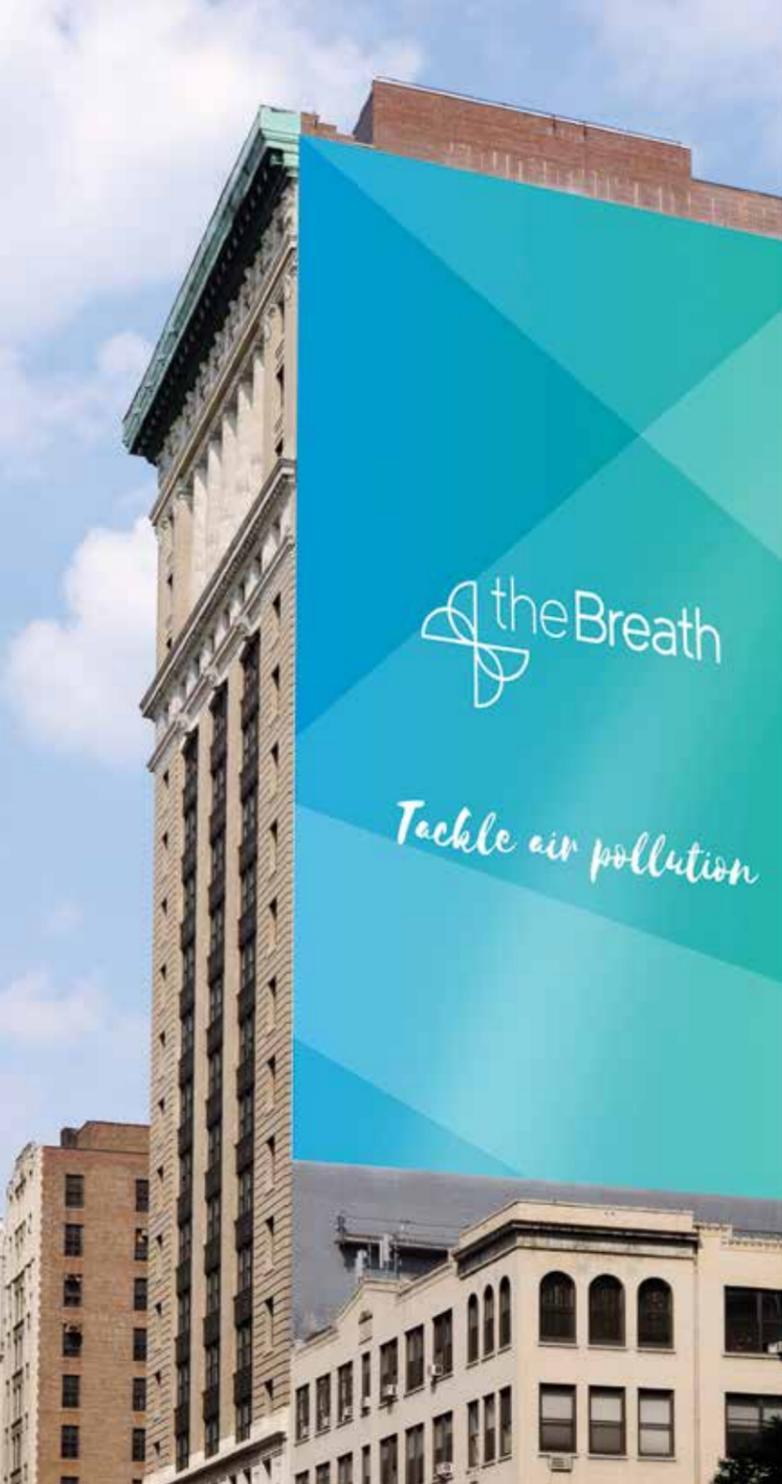


Outdoor usages

The fabric absorbs pollution from vehicles and buildings.

Outdoor usages include:

- Street advertising and billboards
- Roofs (around air conditioning units and boiler flues)
- Street signs
- Street furniture
- Bus shelters
- Kiosks
- Integrated system in ventilated facades
- Playgrounds
- Roadside pollution barrier



Indoor usages

The fabric *reduces pollutants from heating, chemical products* and dust **particles**. It can be used in both commercial and residential buildings. Indoor usages include:

- Display boards
- Signage
- Paintings
- Furniture and screens
- Offices
- Gyms
- Hotel rooms
- Hospitals
- Care homes
- Tube stations
- Shopping centres







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