
EARTH SENSE

EarthSense

EarthSense specialise in environmental monitoring and modelling of air pollution data; delivering products and services that enable the world to better understand and solve air quality issues.

The Air Pollution Problem

Air Pollution is a major environmental risk to health.

By reducing levels of air pollution, we are able to ease the burden of disease, lung cancer and both chronic and acute respiratory diseases on a global scale.

The Facts

4.2 million

Premature deaths worldwide as a result of air pollution exposure (World Health Organisation, WHO)

91%

The world's population that live in areas where air pollution exceeds the WHO's guideline limits

40,000

Premature deaths in UK as a result of fine particle pollution & toxic gases. (Royal College of Physicians)

$5 trillion

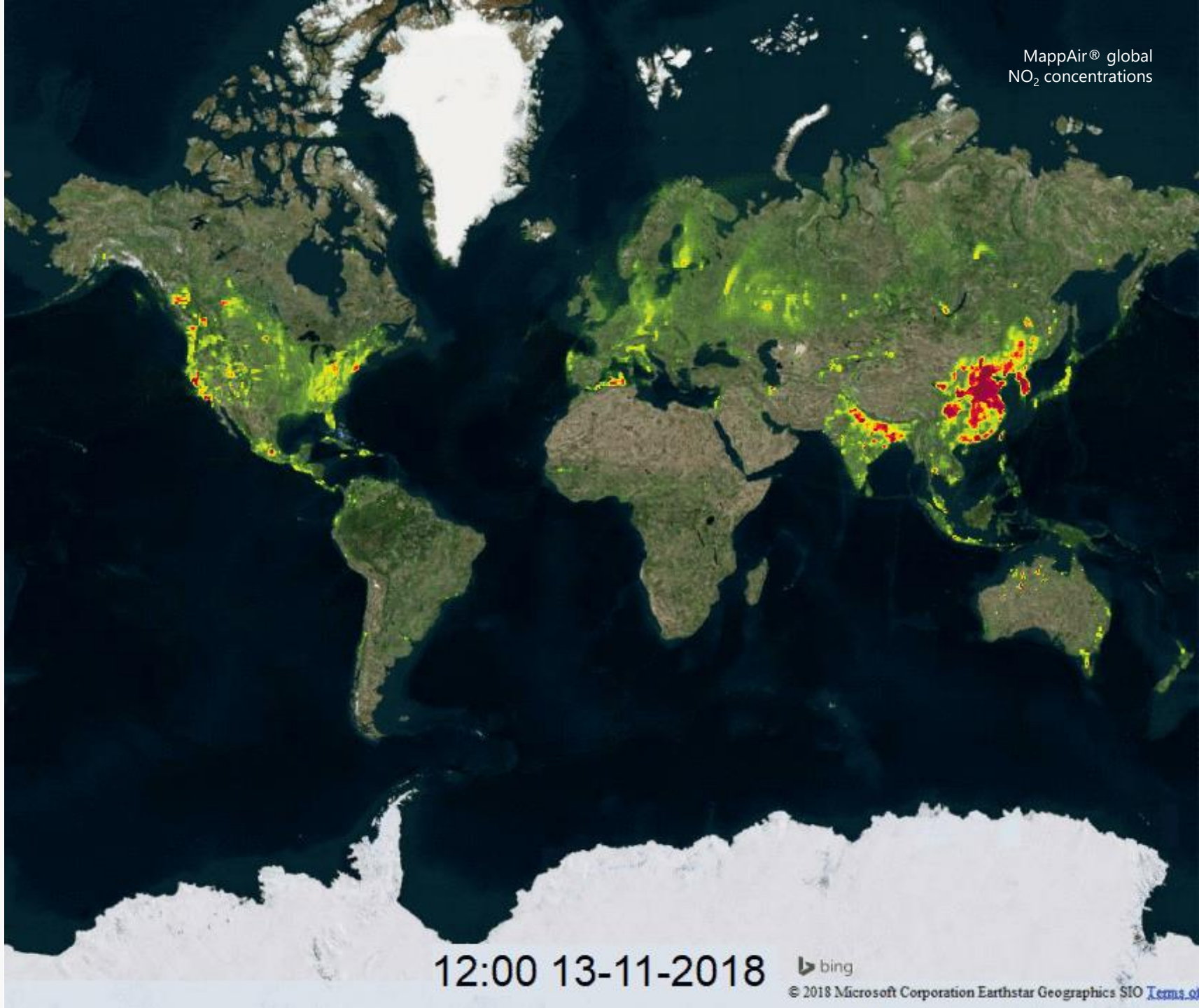
The economic cost of air pollution globally

MappAir®

Air Quality Modelling

MappAir® is the first high resolution map of air pollution providing data for Nitrogen Dioxide [NO_2] and particulate matter [$PM_{2.5}$].

Using advanced modelling techniques, MappAir provides insight into the air pollution problem from a global scale right down to a street corner.



Features

High resolution data
Available from 10m on a city scale up to 1km on a global scale

Uses Computational Fluid Dynamics [CFD] to model the flow and dispersion of pollution in built up environments

Breadth of air pollution coverage
Data is available for any locations across the globe.

Numerous data inputs
Multiple factors are considered to help build the air pollution model

Accessible data options
Through API, FTP or WMS

Historical data analysis
Identify pollution trends with historical data from 2014-2017

Source apportionment
Provides insight into the source of the air pollution

Data in near real-time [NRT]
The model takes into account real time traffic and weather data to provide a more accurate picture

Pollution forecasting
Up to three days ahead

Simplified index
For NO_2 & $PM_{2.5}$ measurements

Computational Fluid Dynamics

MappAir® uses an advanced technique called Computational Fluid Dynamics [CFD] to model air pollution.

CFD models the flow and dispersion of air in and around urban canyons; illustrating areas of stagnant air where levels of pollution can be heightened.

This complex modelling provides an accurate insight into the effects on air quality in built up environments.

MappAir® uses CFD on large scales. An industry first providing detailed air quality data for whole cities.

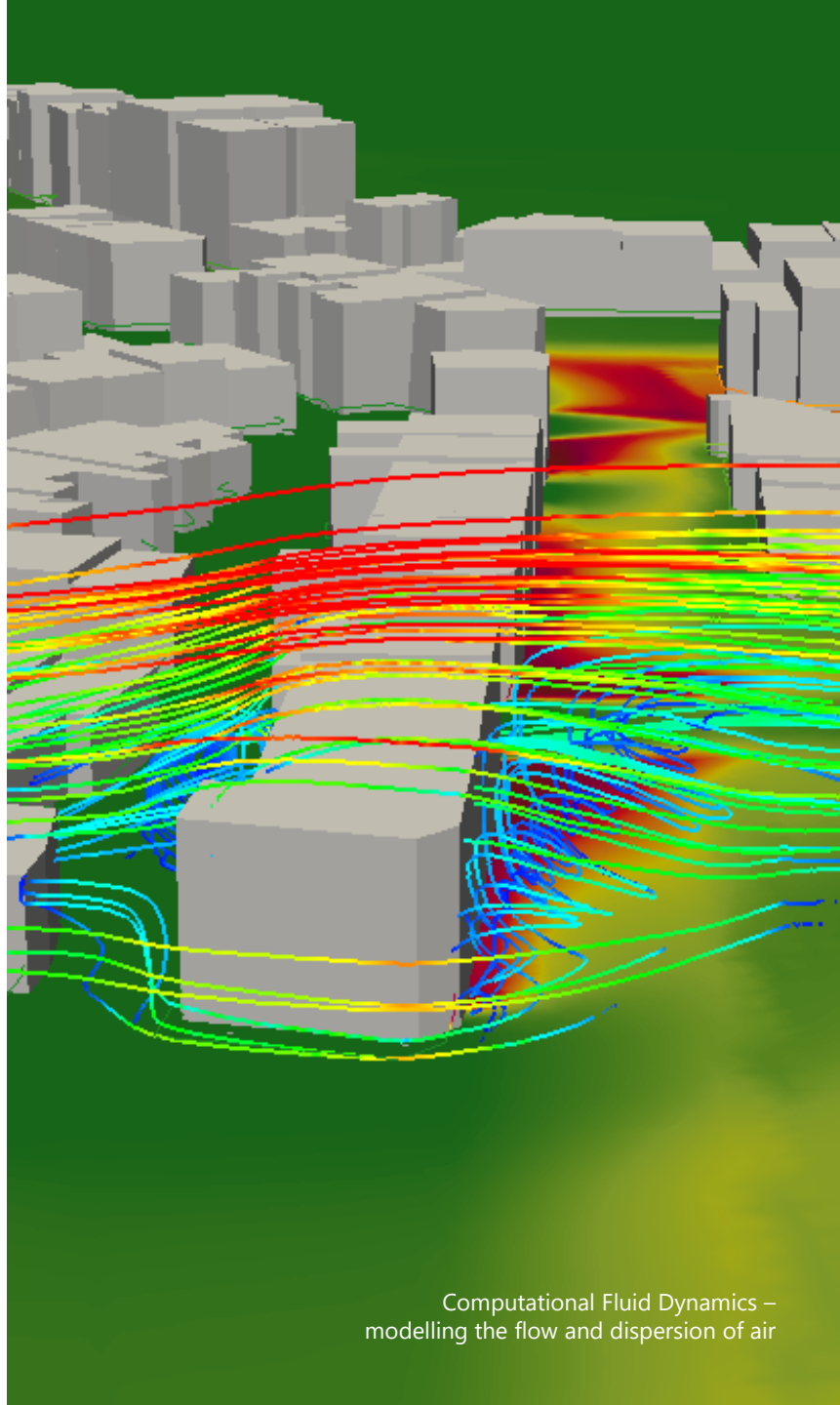
An Unrivalled Model

EarthSense CFD model has been academically reviewed and approved; featuring in published academic and white papers.

The CFD model is more accurate than traditional modelling techniques as it takes into account all 3D buildings.

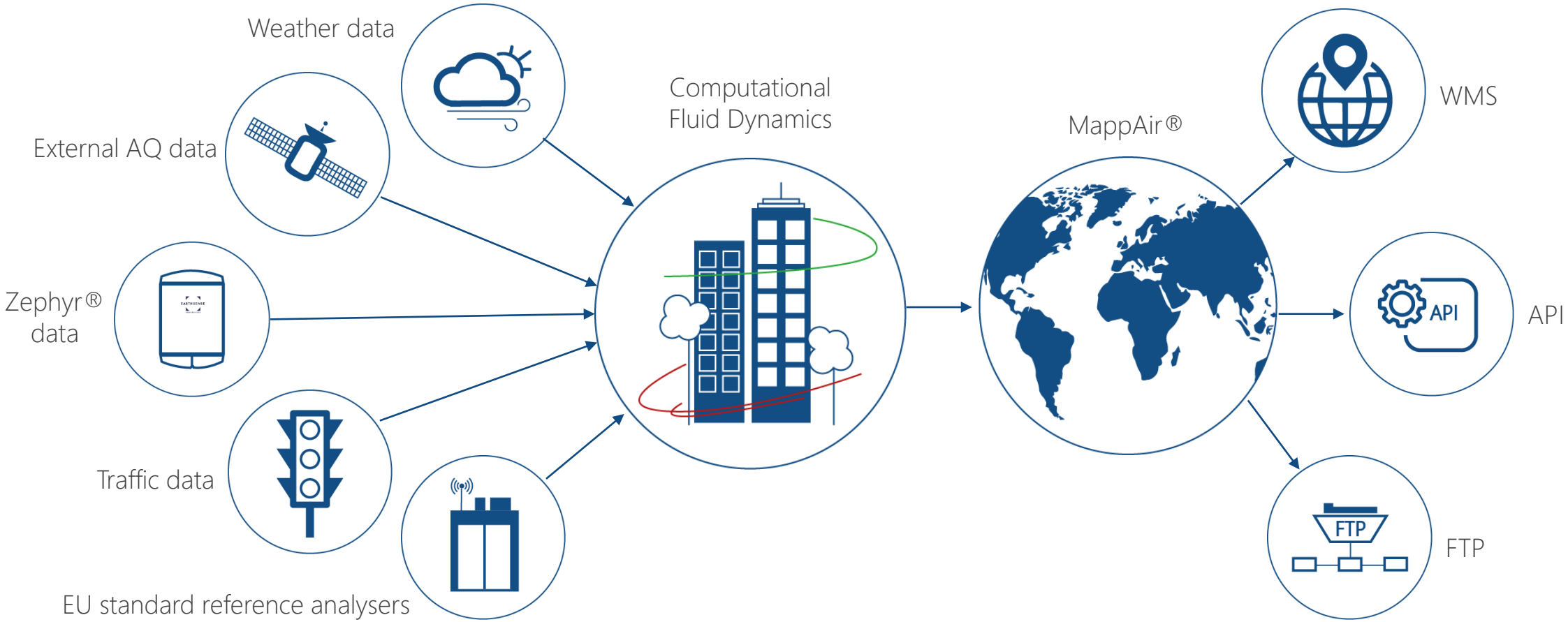
Ability to store complex calculations and apply to other scenarios – simplifying the process for quick decision making.

These complex calculations create highly valuable datasets for machine learning & AI.



Computational Fluid Dynamics – modelling the flow and dispersion of air

System Architecture

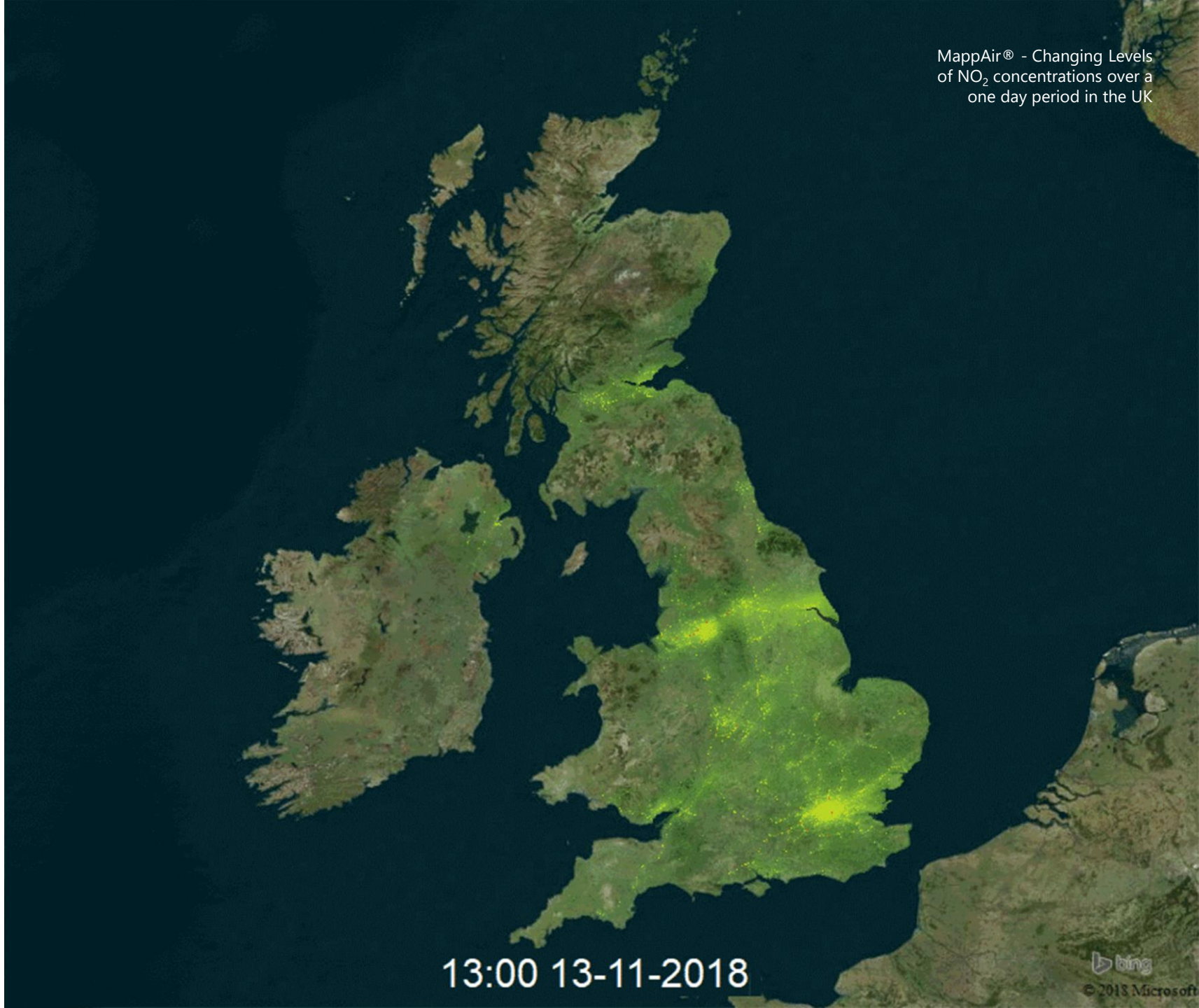


Benefits

Air pollution data is more accessible and informative than ever and is paramount in tackling the impact on human health.

Detailed insight into how your city is living and breathing provides evidence for future strategies. It allows mitigation of pollution hotspots and informs planning decisions for effective management of air pollution.

Using historical data, MappAir® has evolved to look at trends over time that will highlight the efficiency of interventions and new operational systems.



MappAir® - Changing Levels of NO_2 concentrations over a one day period in the UK

Applications

MappAir® can be used for a wide range of applications including local planning, enforcement and mitigation strategies as well as commercial applications.

Central & local governments
Environmental planning
Urban planning
Smart & connected cities
Healthcare
Automotive
Industrial emissions
Schools, colleges & universities

Traffic build up during rush-hour in central London

Scenarios

Traffic & Road Light Sequencing

Identify pollution hotspots during peak times in busy city centres to efficiently manage traffic flow and exposure to emissions.

Intelligent Transport Systems

MappAir® models are used to define a control zone or 'geofence' which automatically triggers zero emission running of hybrid vehicles in highly polluted areas.

Smart & Connected Cities

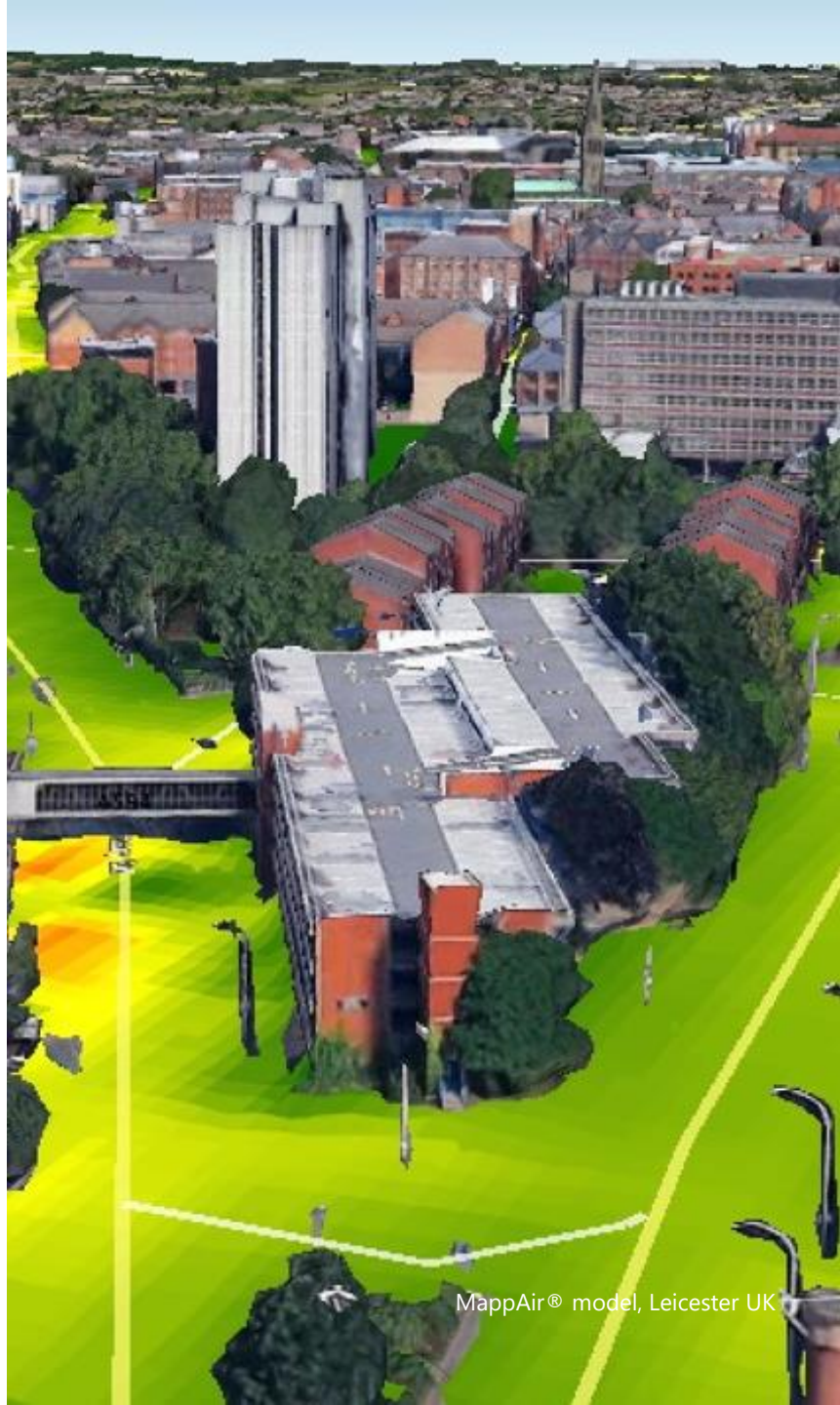
Cities have the ability to communicate peak pollution times and hotspots for local residents; offering guidance on alternate routes and forms of transport.

Clean Routing Applications

MappAir® data is used on city scales to feed into clean routing apps used by general public to limit exposure to air pollution when walking or cycling.

National Services

Nationwide coverage of air pollution enables integration into national services such as the BBC postcode checker and FCI environmental reports for homebuyers.



MappAir® model, Leicester UK

Case Study | ACCRA

Autonomous & Connected Vehicles for CleaneR Air, Leeds

A near real-time pollution model was used for trials into geofencing to trigger zero-emission running of hybrid vehicles.

Aims

Automatically activate zero-emission running of hybrid vehicles as they pass through some of the city's most heavily polluted streets.

The Trial

A near real-time MappAir® model of NO_2 concentrations was created for Leeds City Centre with input from both static and mobile Zephyr® sensors. Working with partners, MappAir® NO_2 data was communicated to a wider system to create dynamic control zones. Upon entering these zones, 7.5 tonne Range Extended Electric Vehicles (REEV) were automatically triggered to switch to electric mode to help reduce further air pollution.

A Successful Trial

The twelve-month trial proved the system to be a success. REEV's were successfully switched to electric mode when entering clean air zones in Leeds and EarthSense continue to work with partners to deliver these services.

[Watch ACCRA in action]

MappAir® model for Leeds City Council

Case Study | Future Climate Info

Environmental Reports

An industry first, including air quality data into environmental reports for homebuyers.

Aims

Create an advisory tool in environmental reports for conveyancers & solicitors during the home buying process. Raise awareness of air quality and its importance to long term health.

The Problem

Overall homebuyers spent nearly £25 billion on properties in pollution hotspots in 2017 in England and Wales. It is common to pay a premium to be nearer urban centres infrastructure & good transport links but homebuyers are paying more to breathe some of the nations more polluted air. There is a need to raise awareness for future risk homebuyers may experience.

An Advisory Tool

Using MappAir® homebuyers can access air quality data in Future Climate Info environmental reports giving a clear index rating for an area. With sales increasing by 12.5% since the inclusion of this data, homebuyers are becoming more aware of the risks of exposure to poor air quality; changing attitudes towards air pollution going forward

Premium Residential <0.25Ha

Environmental | Flood | Ground Stability | Energy & Infrastructure

Data provided by DEFRA indicates that the property is in or within 100 metres of an Air Quality Managem
AQMA is declared where the air pollutants occur above EU and Government targets, and where the coun
and follow an Air Quality Action Plan (AQAP) to improve air quality. The pollutant(s) which the AQMA was
in the table below.

Local Authority	AQMA Name	Reference	Pollutan
Westminster, London Borough of	Westminster AQMA	34	Nitrogen Matter P

Air pollution is seen as an ongoing concern as it can cause short and long term effects on health. Each c
AQAP outlining the measures being undertaken to reduce the level of air pollution to within the target lim
concerned about air pollution and want to know more about the Council's Action Plan you may wish to c
Westminster London Boro Council using the details given in Useful Contacts at the end of this report. Mo
pollution and daily forecasts are available at https://uk-air.defra.gov.uk/air-pollution/.

1.25 Air Quality Index — NOTE

The MappAir® air quality dataset provided by Earthsense includes information on Nitrogen Dioxide (NO2
Matter (PM2.5) from vehicle emissions and indications from other sources. The model gives an indicatio
pollution for 2016 at a resolution of 100 metres.

Polluted
Moderately Polluted
Slightly Polluted

The data indicates that the property is in
of 5 or Polluted. A rating of 5 means the
chance of pollution levels exceeding the
Residents should monitor air quality fore
exposure and strenuous activity appropr

For further information on air quality go
air.defra.gov.uk/

1.27 Checked Datasets

The dataset categories analysed in this section are listed below. For more information, please visit our w

Remediation Insurance	Official Contaminated Land | Register En
Artificial Ground	Potentially Contaminative Current Land
Electricity Infrastructure | Electricity Pylons	Electricity Infrastructure | Overhead Pow
Electricity Infrastructure | Power Cables and Lines	Electricity Infrastructure | Substations
Environmental Permits | Closed Mining Waste Facilities	Environmental Permits | End of Life Vehi
Environmental Permits | Industrial Sites	Environmental Permits | Waste Sites
Fuel / Petrol Stations	Landfill | Current
Landfill | Historic	OFCOM Mast Site Clearance Locations
Past Industrial Land Uses	Pollution Incidents
Potentially Infilled Land	Radon Gas
Surface Dangers or Hazards | COMAH Sites	Surface Dangers or Hazards | Hazardou

2. FLOOD (INC. FLOODABILITY RATING)

2.01 River and Sea Flood Risk — PASS

Case Study | Urban Healthy Living

Urban Healthy Living in Bicester and Belfast

Combining air quality technologies with healthcare initiatives to create clean-routing apps funded by the UK Space Agency.

Aims

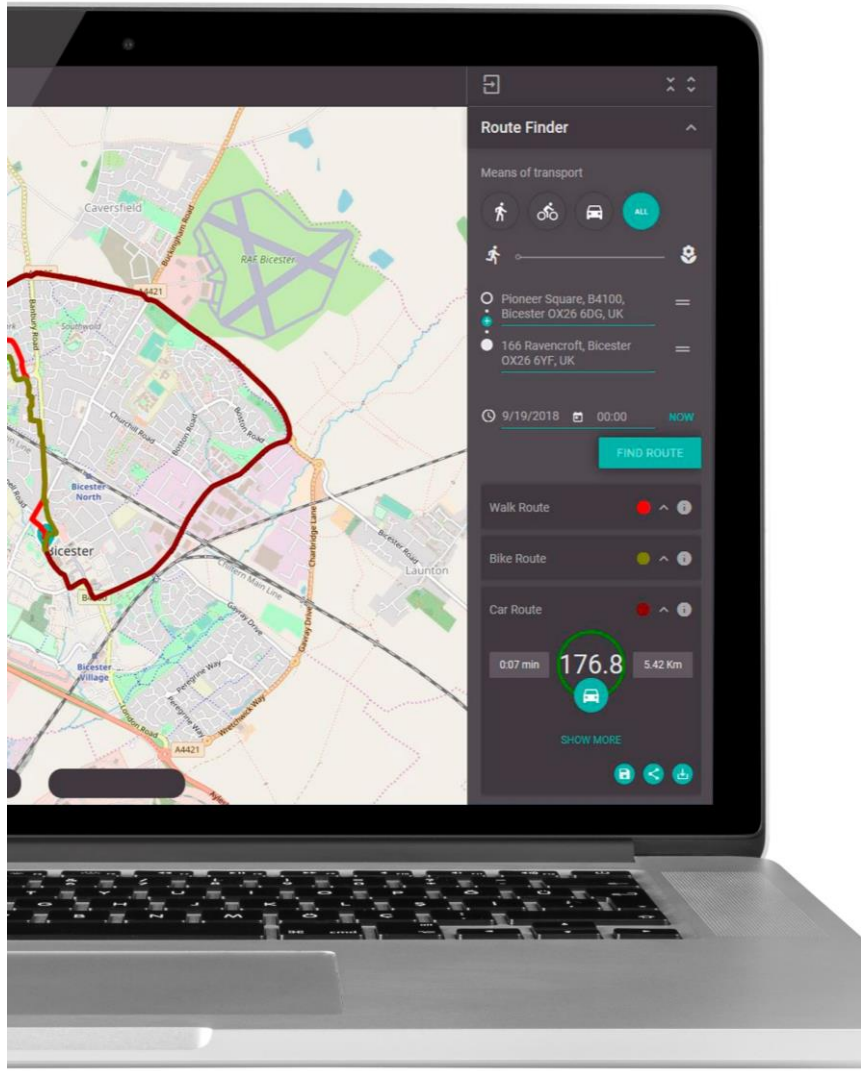
Manage traffic flow, encourage active travel and raise awareness of air pollution to improve the health of the population.

The Trial

A near real-time MappAir® model of NO_2 concentrations was created for both Bicester and Belfast combining input from static and mobile Zephyr® sensors. Working with local councils and partners, the MappAir® model takes into account traffic data including congestion and flow. This model has been incorporated into a clean-routing app providing insight into air pollution exposure when walking, cycling or driving a selected route.

A Successful Trial

Following a 6 week demonstration, MappAir® data has been successfully integrated into clean-routing apps; raising awareness of air pollution exposure levels. Providing cleaner and alternative routes for travel helps encourage behavioural change towards air pollution within communities.



Case Study | BBC Postcode Checker

Pollution Postcode Checker

MappAir® data used to power the BBC postcode checker for anywhere in England.

Aims

Highlight the country's pollution hotspots by creating an accessible tool for checking local levels of air pollution.

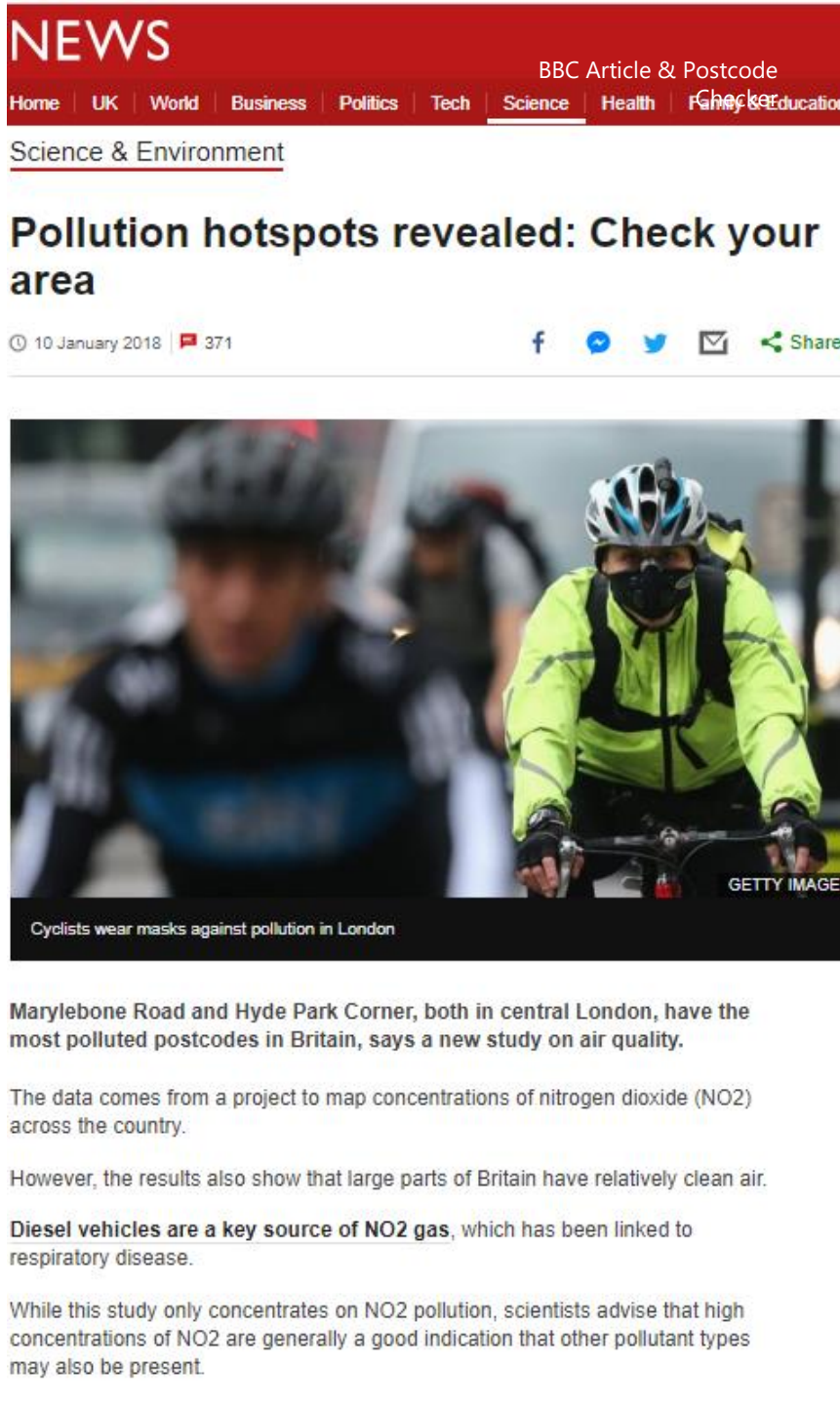
The Postcode Checker

MappAir® data powers the BBC's postcode checker by providing NO_2 concentrations for anywhere across the country; allowing anybody to access an air pollution reading for their postcode.

Readings are shown in a simple rating from 1 (good) to 6 (heavily polluted).

Results

An incredible 2 million people used the BBC's pollution postcode checker within the first 48 hours of its launch. Users of the postcode checker have not only raised awareness of the issue but increased pressure to the likes of local authorities to take action. Establishing pollution hotspots allows us to better target our solutions.



BBC Article & Postcode Checker

NEWS

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Science & Environment

Pollution hotspots revealed: Check your area

10 January 2018 | 371 | Share

Cyclists wear masks against pollution in London

Marylebone Road and Hyde Park Corner, both in central London, have the most polluted postcodes in Britain, says a new study on air quality.

The data comes from a project to map concentrations of nitrogen dioxide (NO2) across the country.

However, the results also show that large parts of Britain have relatively clean air.

Diesel vehicles are a key source of NO2 gas, which has been linked to respiratory disease.

While this study only concentrates on NO2 pollution, scientists advise that high concentrations of NO2 are generally a good indication that other pollutant types may also be present.

Our Customers & Partners

Thank You

For more information on EarthSense products and services, please head to www.earthsense.co.uk

Email us at:
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Or call on:
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