# West Midlands Air Quality Conference

Working in partnership for cleaner air in the West Midlands

West Midlands Combined Authority | Greener Together

# Welcome

## Siobhan Bassford

Chief Communications and External Affairs Officer

West Midlands Combined Authority | Greener Together

# Welcome

# Richard Parker

## Mayor of the West Midlands

West Midlands Combined Authority

Greener Together

## Keynote speaker

# Professor William Bloss

Professor of Atmospheric Science at the University of Birmingham

West Midlands Combined Authority

Greener Together

WM-AIR

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@WMAIR_UOB

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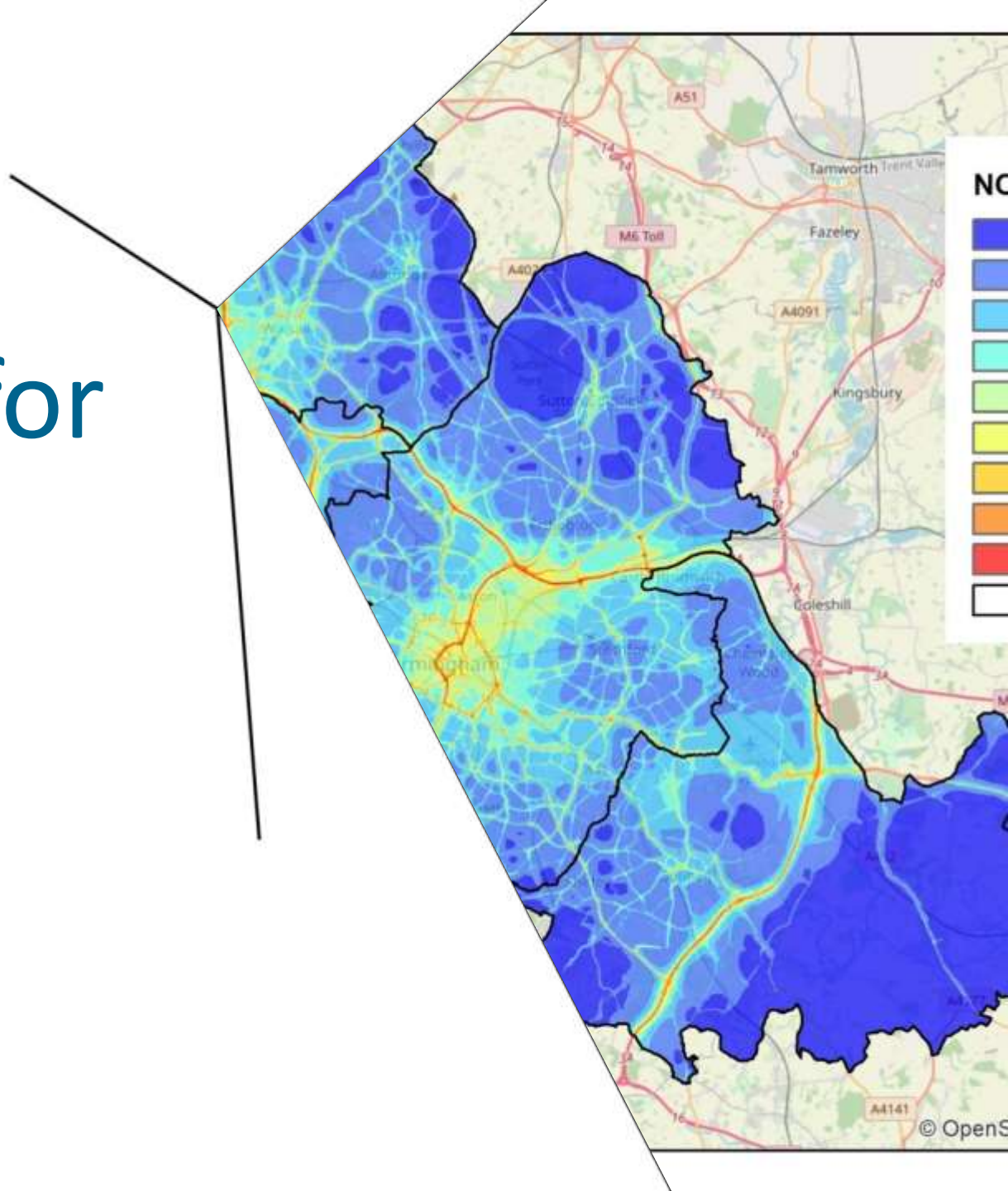
# Towards Cleaner Air for the West Midlands

William Bloss & the WM-Air Team

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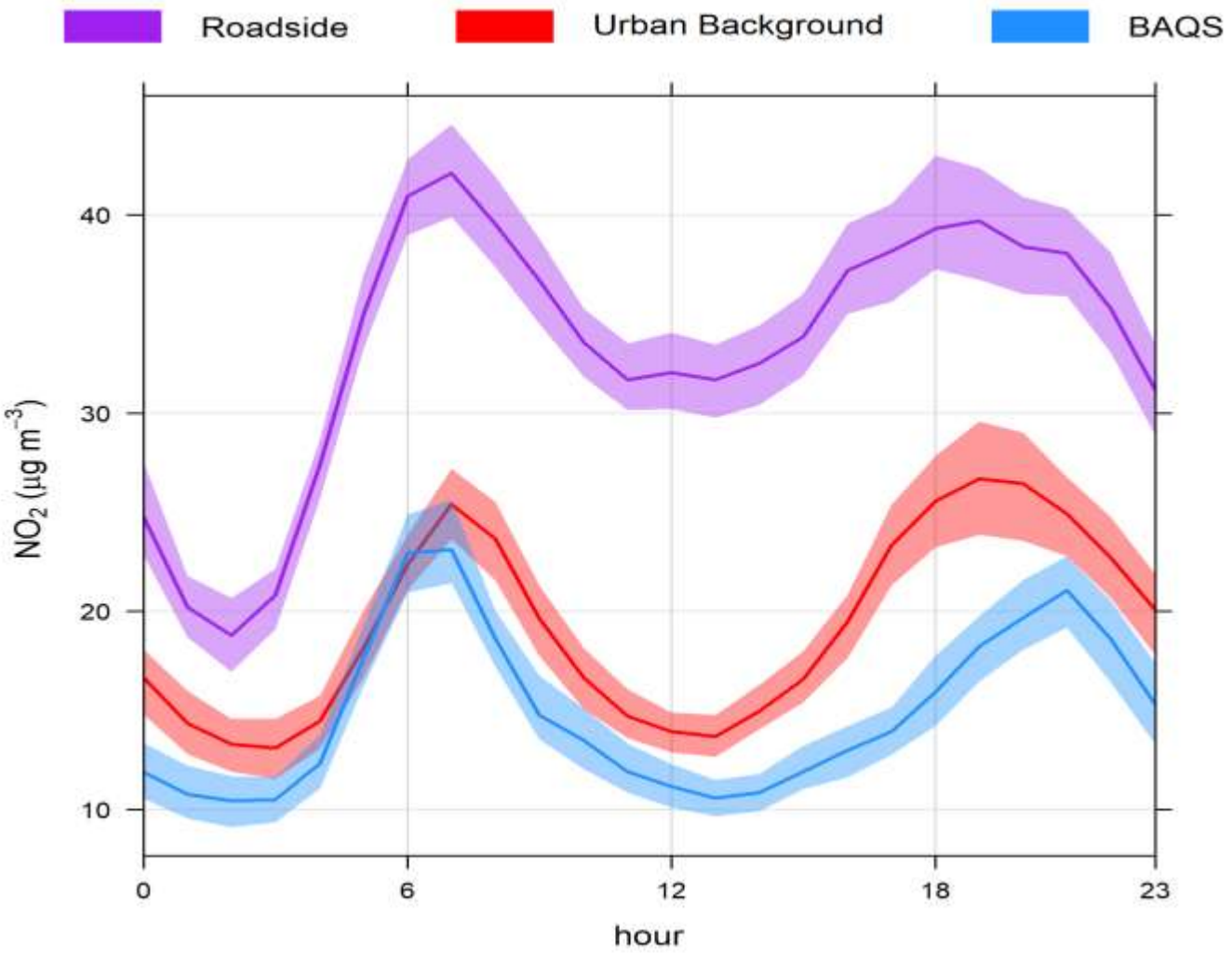
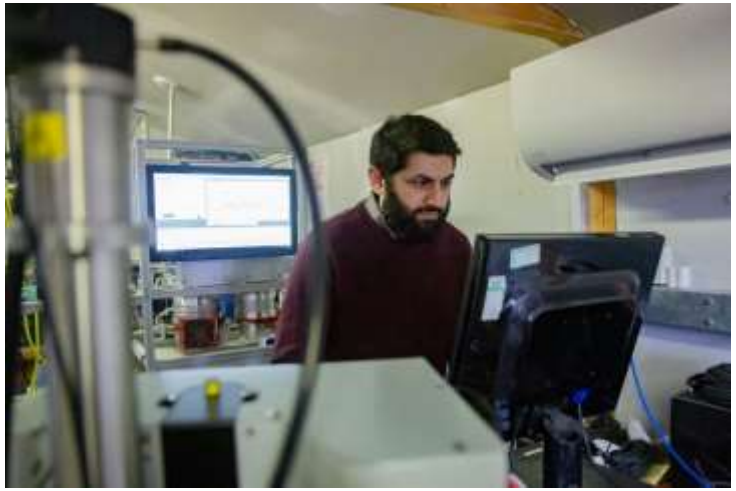
# WM-Air Partnerships

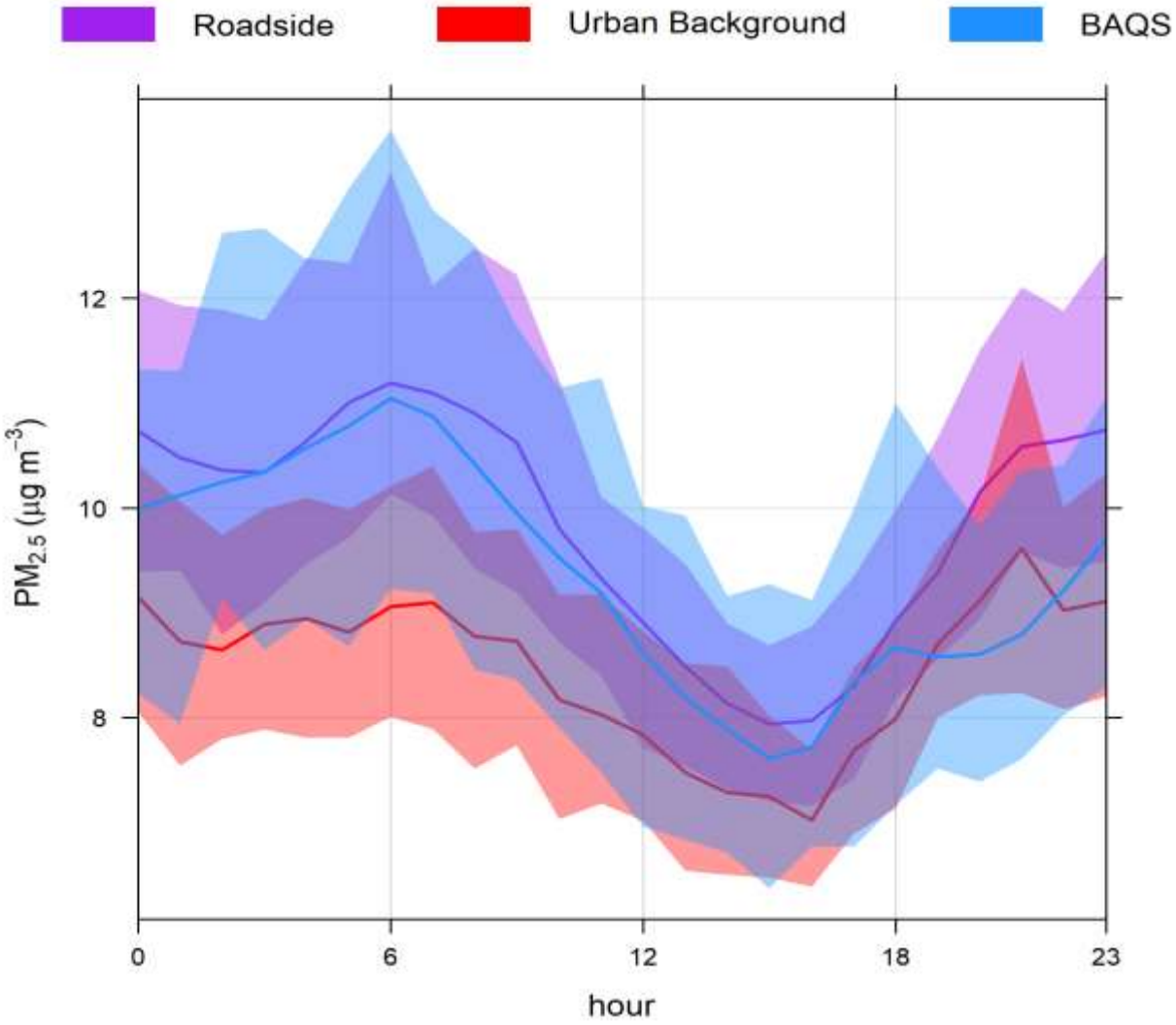
*Not exhaustive !*

# Air Pollution & Time of Day: $NO_2$

# Air Pollution & Time of Day: **$PM_{2.5}$**





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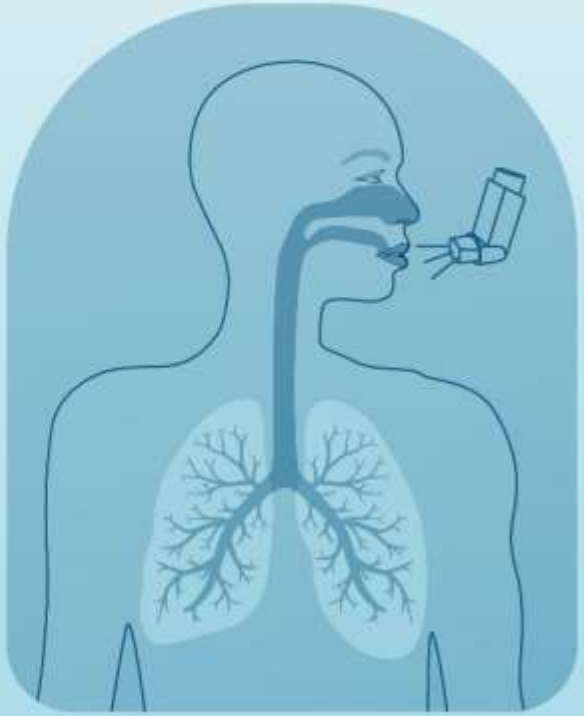
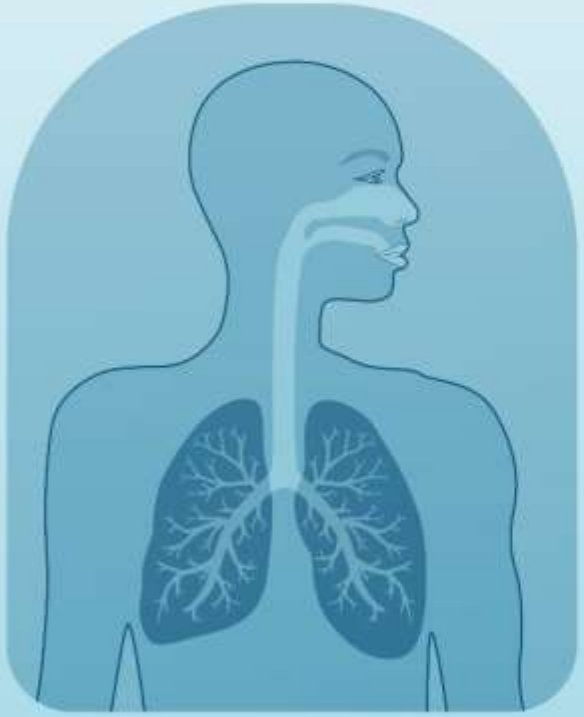
# Health burden due to air pollution

## Air pollution causes up to 2,300 early deaths each year in the West Midlands, as well as:

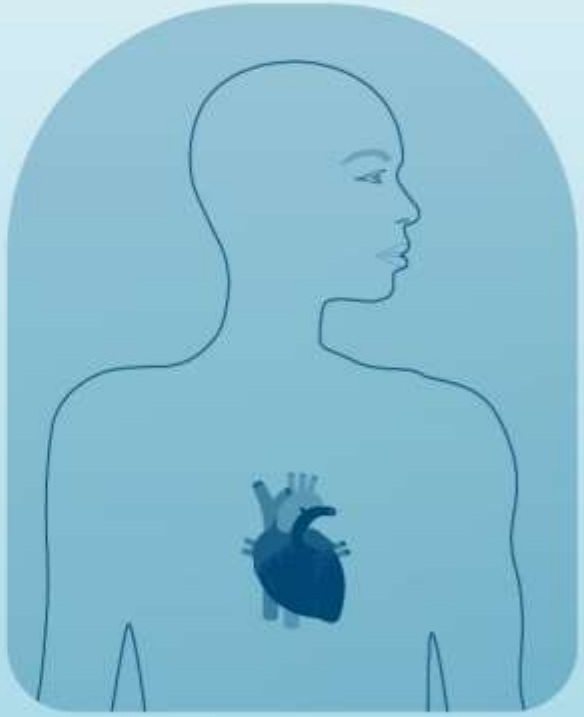
Stroke in up to 1,000 people each year



Asthma in up to 3,300 people each year



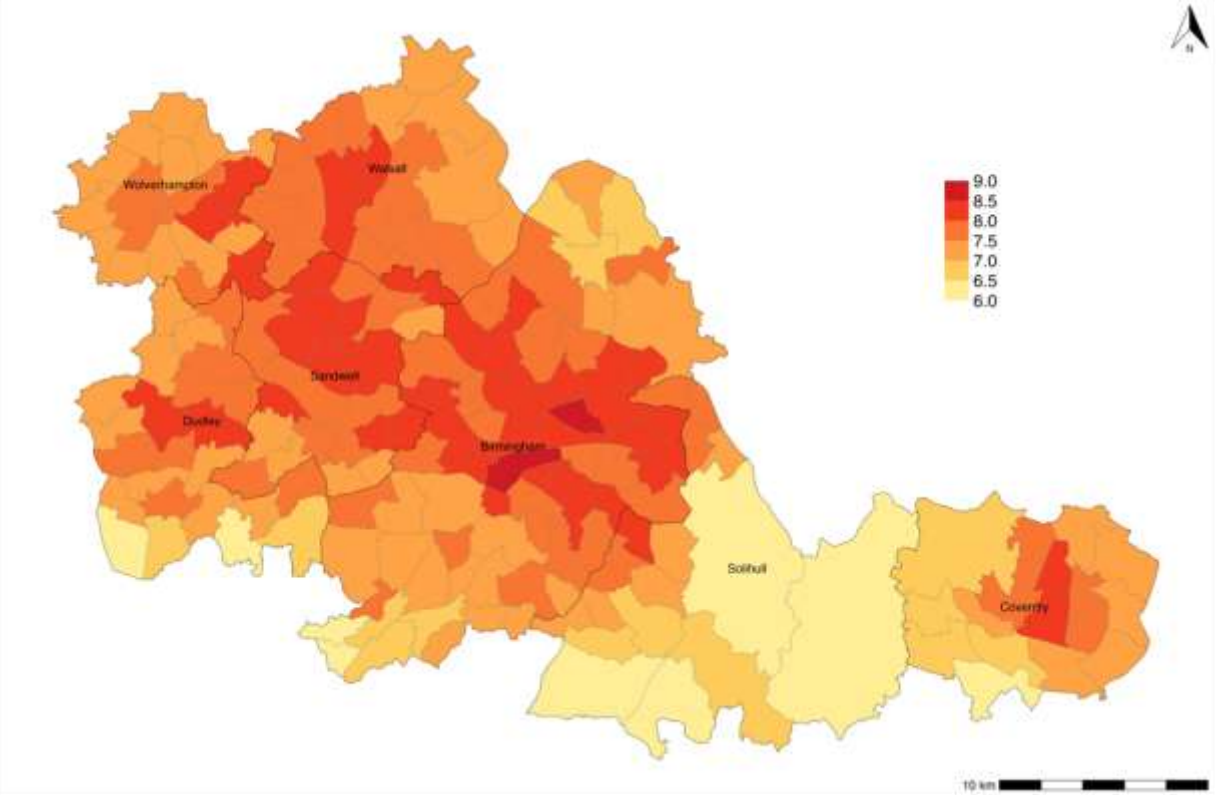
Lung cancer in up to 300 people each year



Heart disease in up to 1,400 people each year

# Health Impacts: West Midlands

## Percentage of mortality attributable to air pollution in the WMCA area

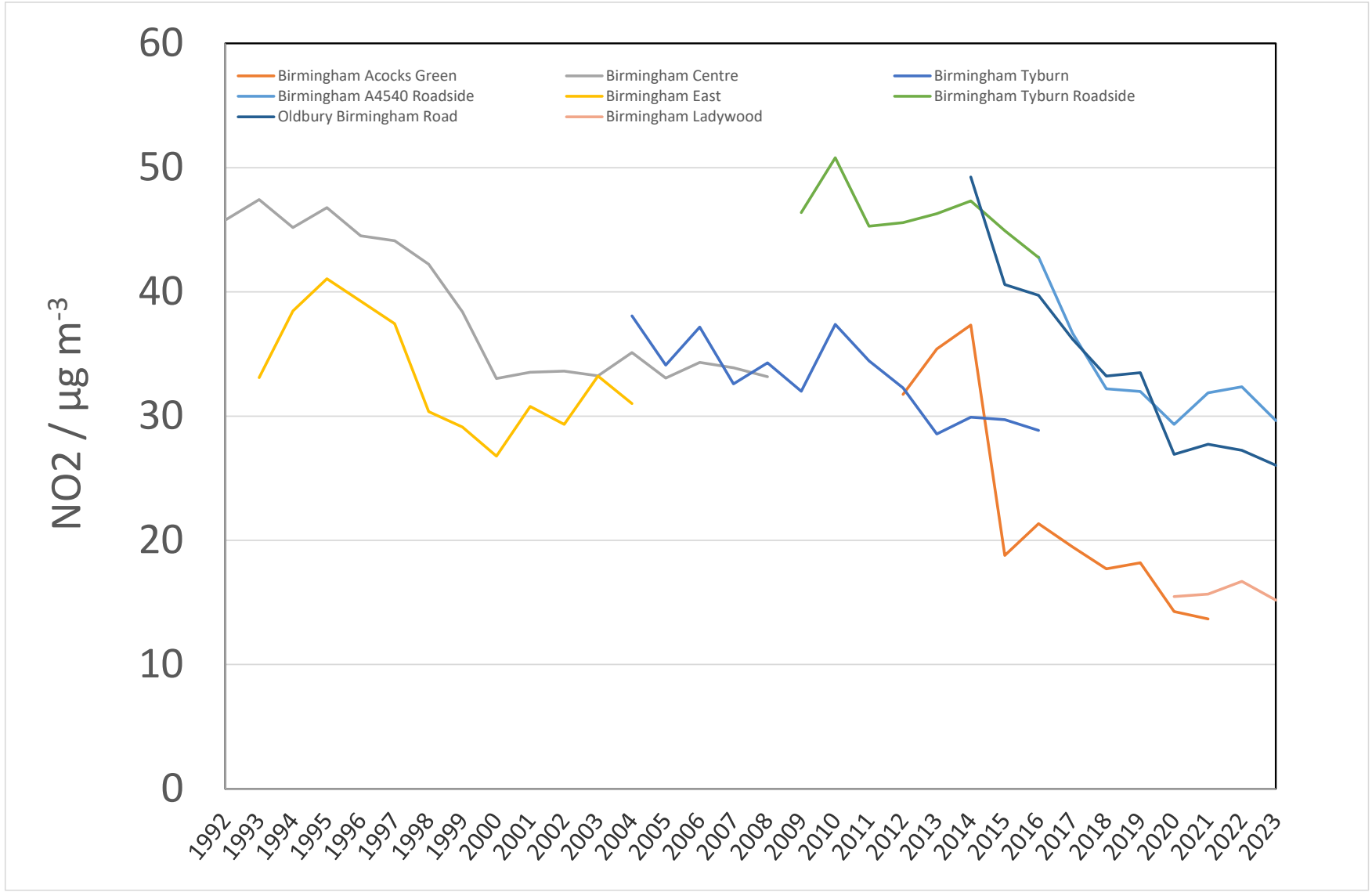



Calculations from the WM-Air AQLAT tool – James Hall, Suzanne Bartington & colleagues


DOOM
GLOOM

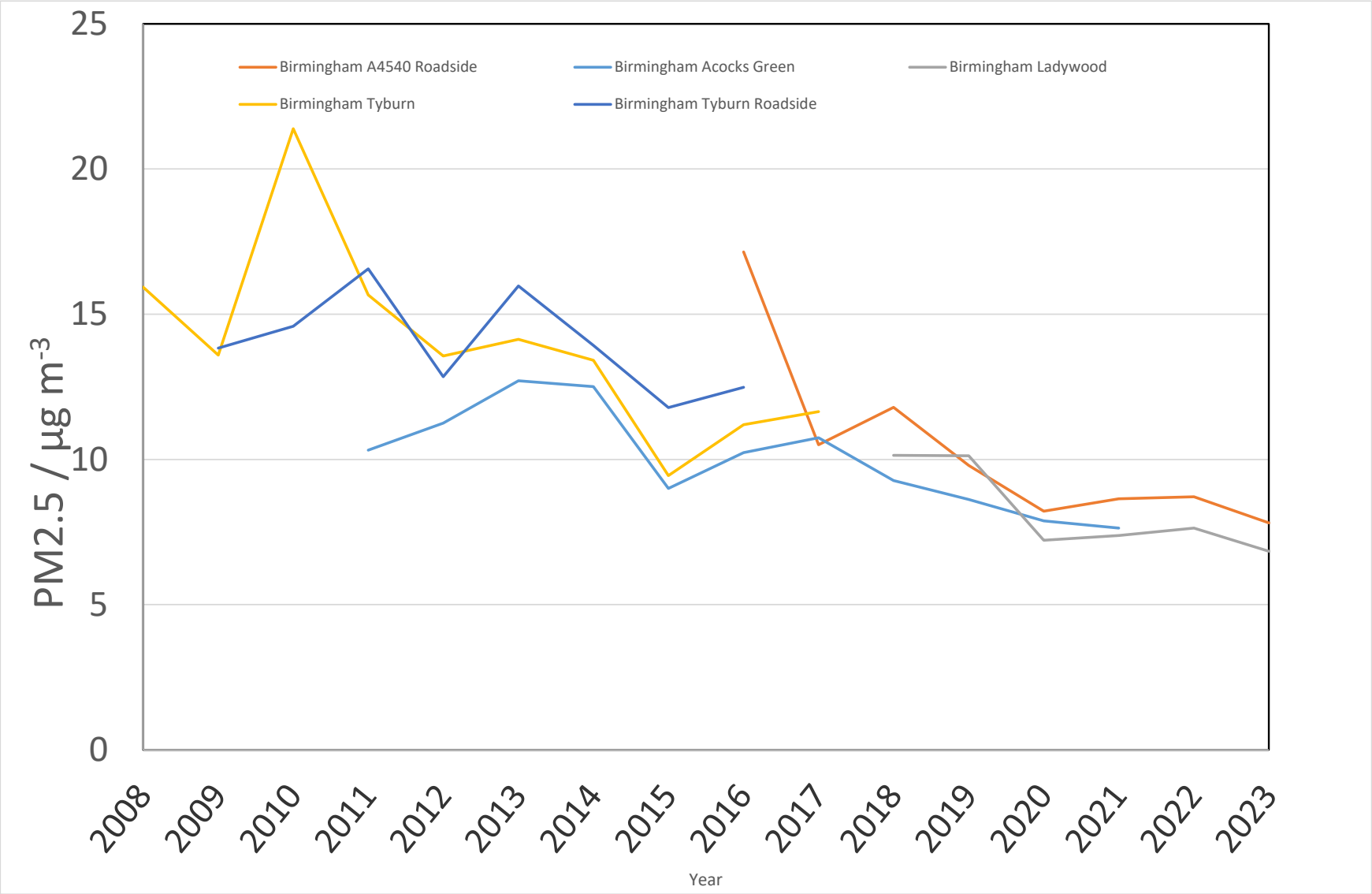
# Regional Trends in Air Quality

$NO_2$



# Regional Trends in Air Quality

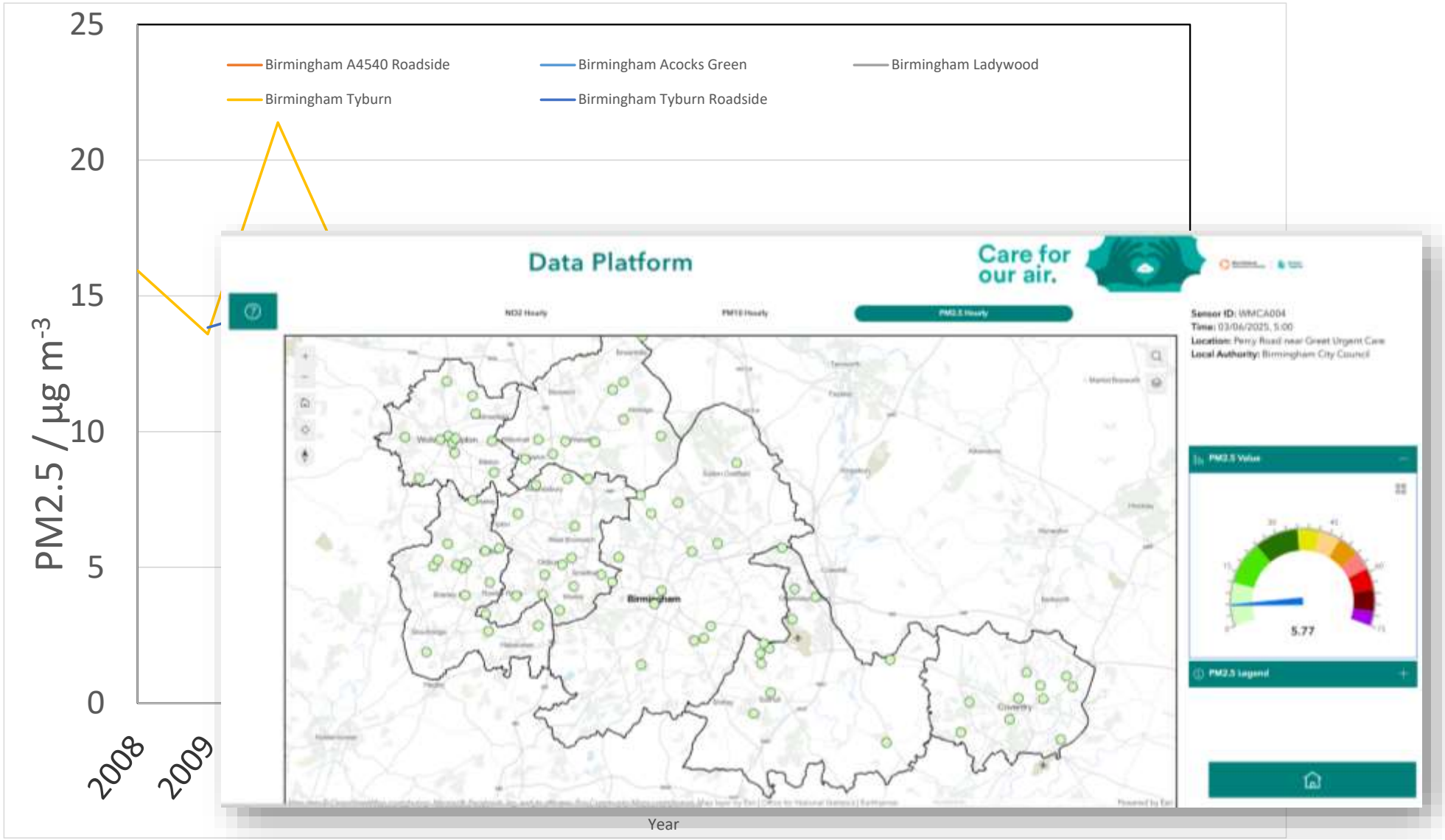
$PM_{2.5}$



Use new sensor network…

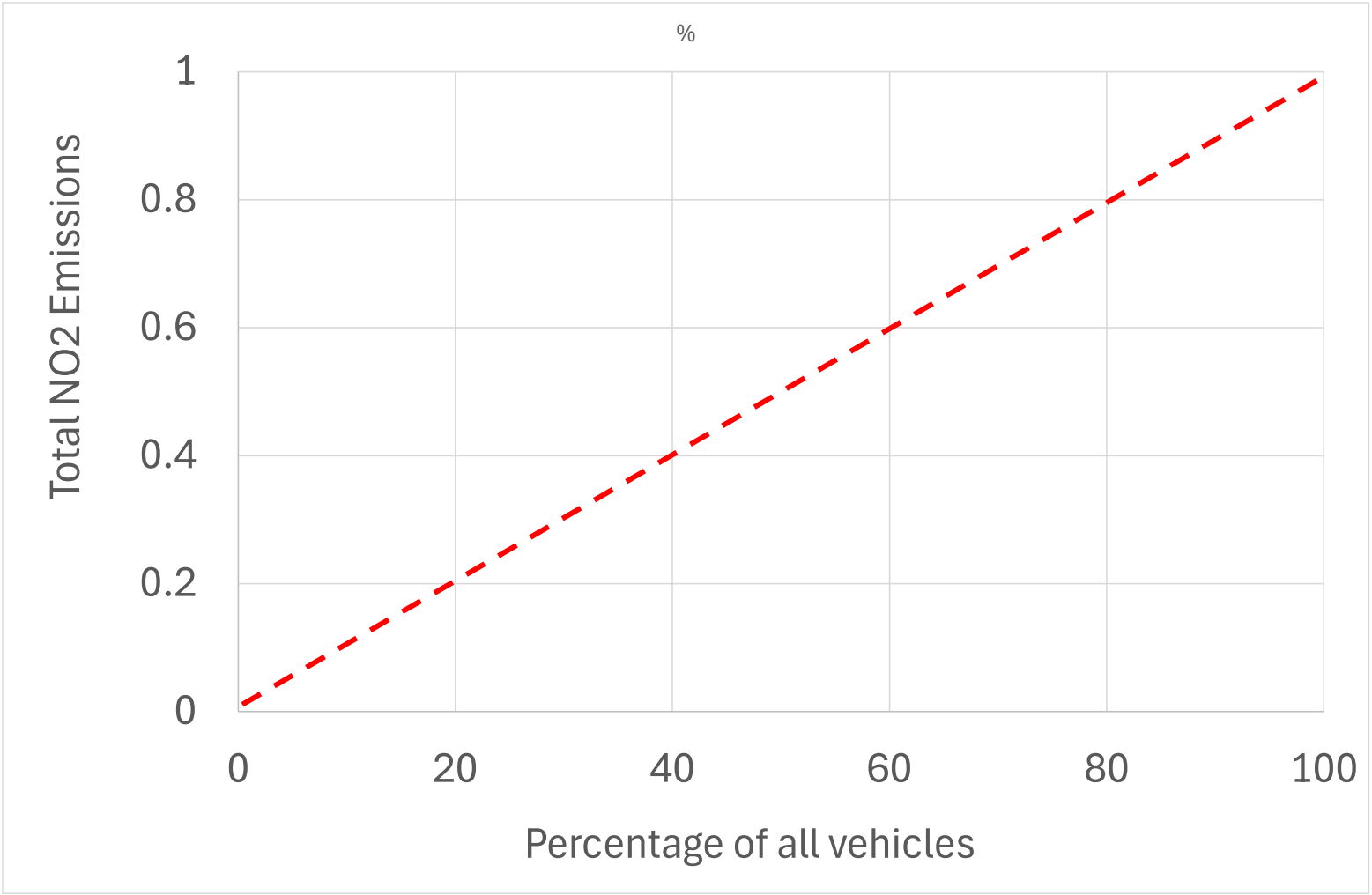
# Regional Trends in Air Quality

$PM_{2.5}$



# Cumulative Emissions

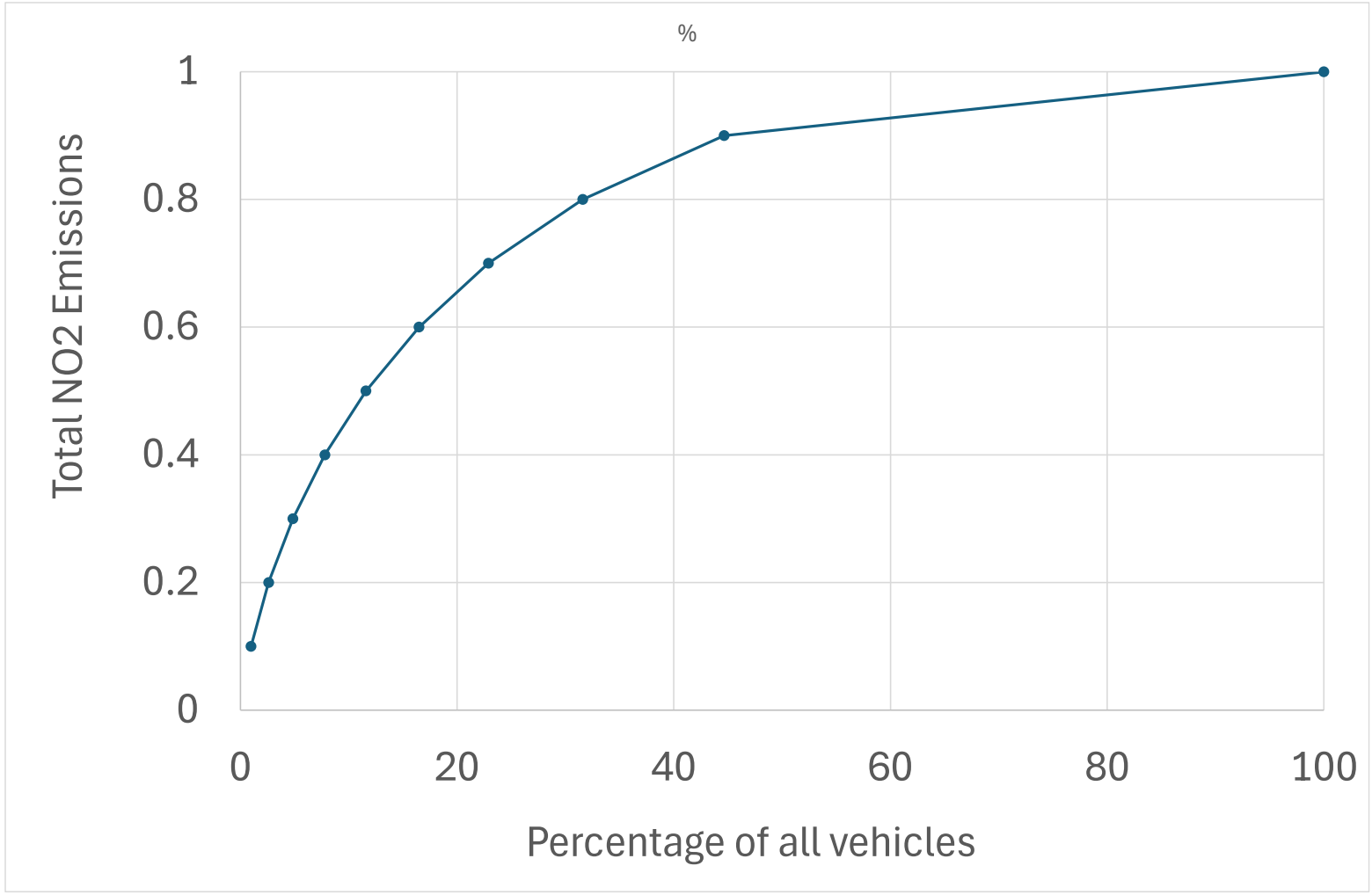
- Diesel Cars



# Cumulative Emissions

Target “super-emitters”

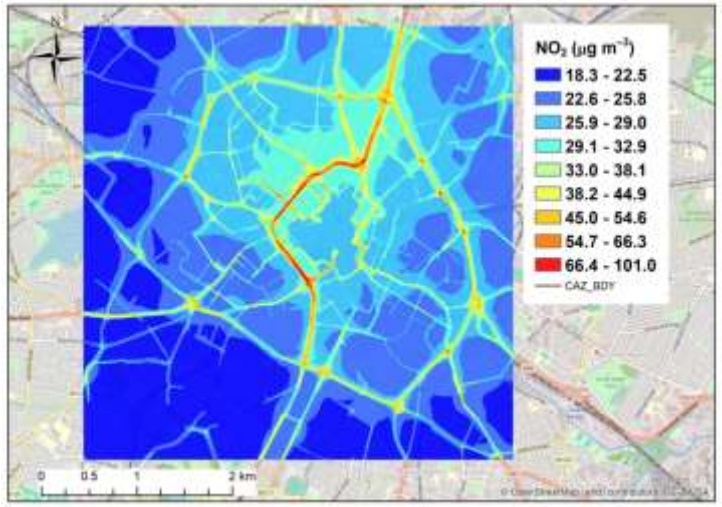
- Diesel Cars




- WM-Air measurements: Omid Ghaffarspand, Francis Pope

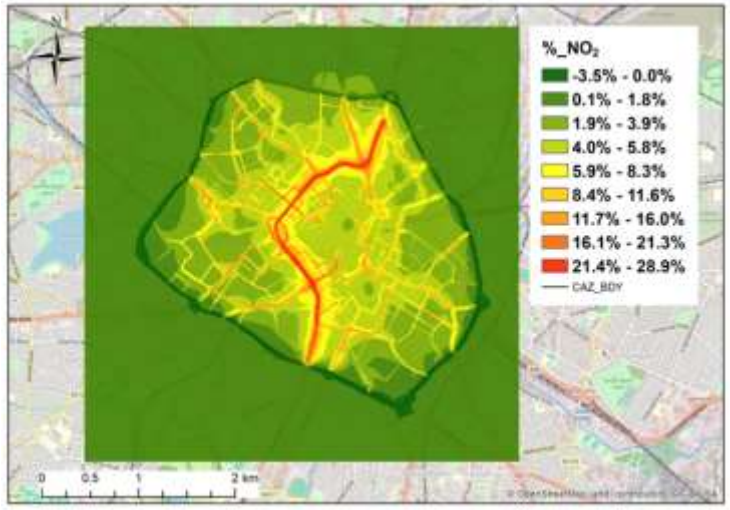
# Clean Air Zone

Pre-CAZ




Post-CAZ:

- Fleet change
- CAZ traffic levels
- Ring road effects



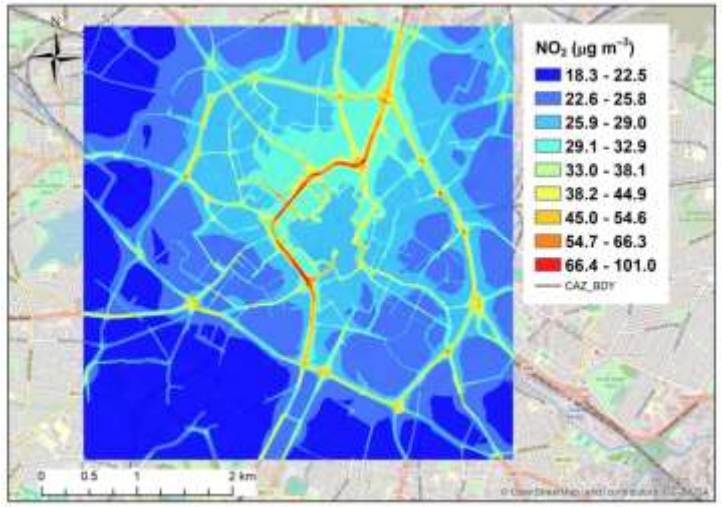


WM-Air modelling by Jian Zhong, CERC

# Clean Air Zone

- CAZ works – to get city centre $NO_2$ < 40 µg $m^{-3}$
- No measurable effect on $PM_{2.5}$ (as expected)
- CAZ area is small…

Pre-CAZ

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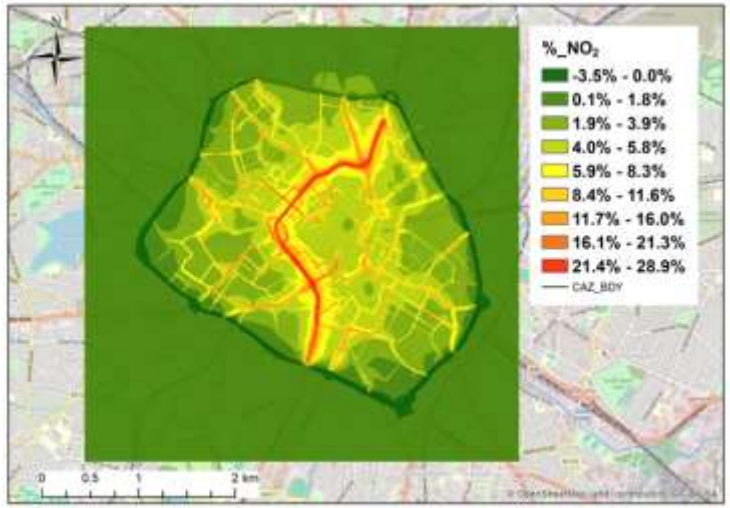



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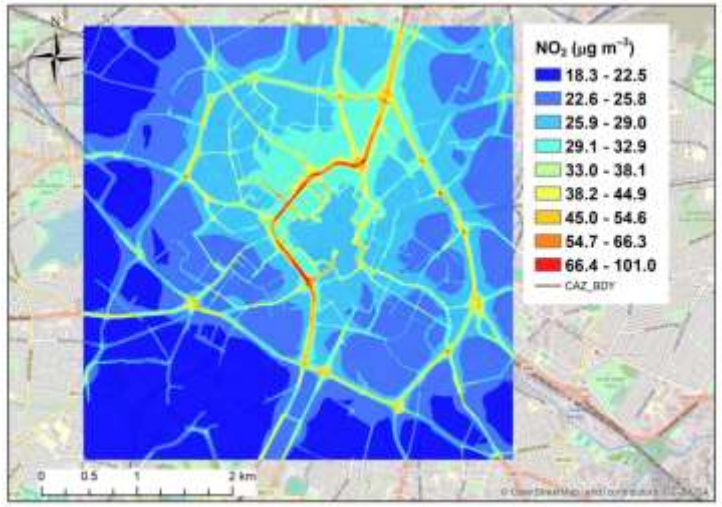


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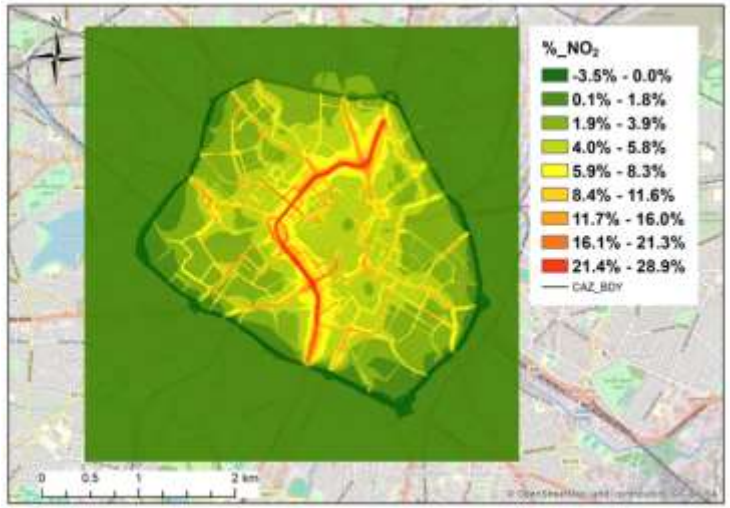
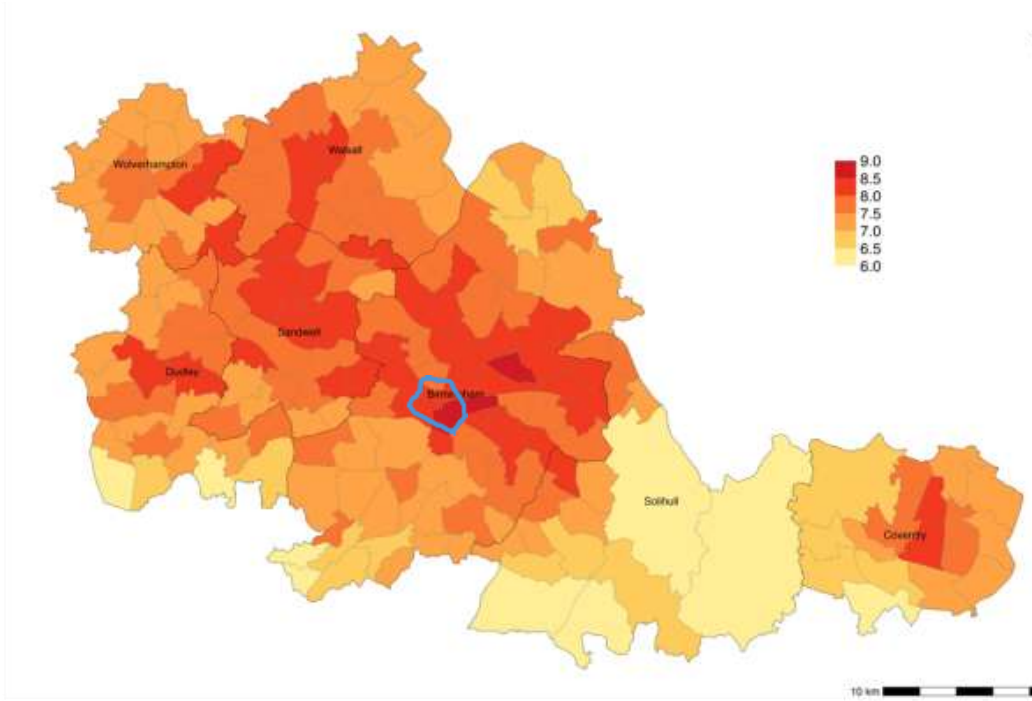


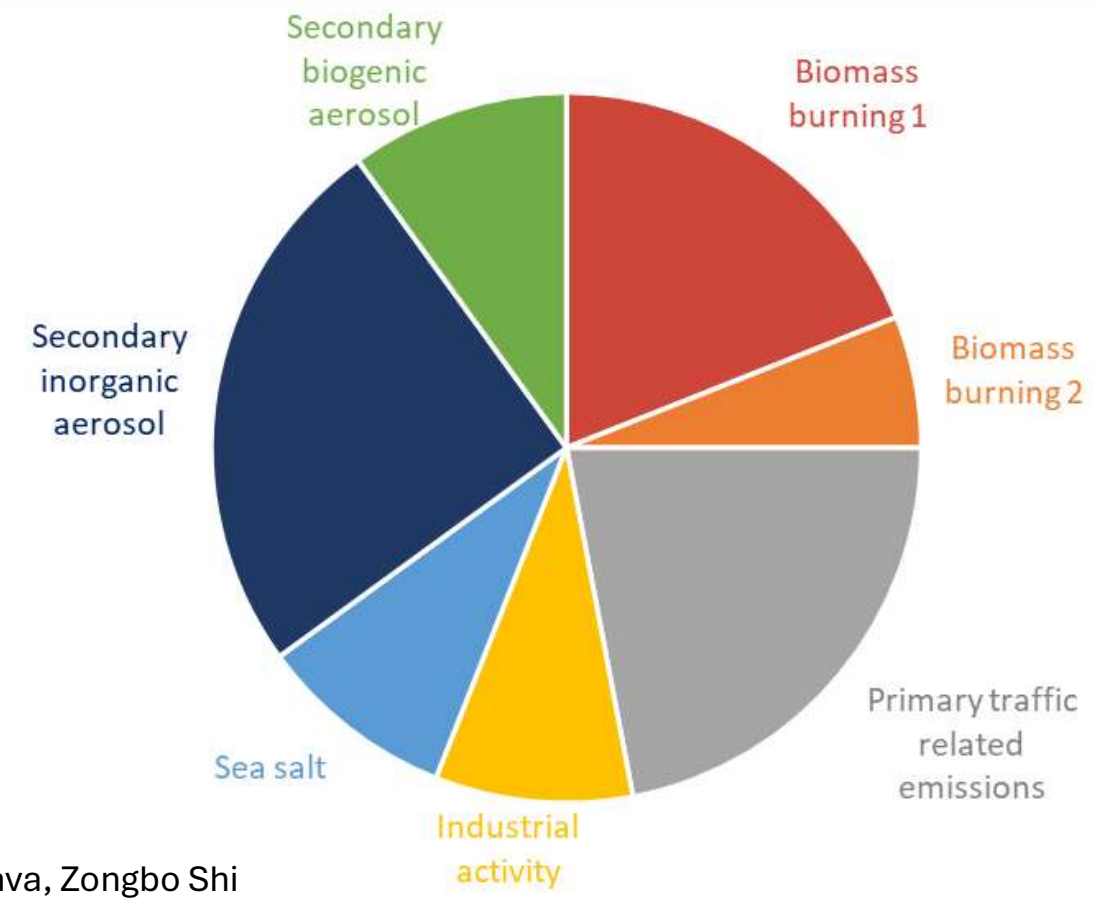




WM-Air modelling by Jian Zhong, CERC

# $PM_{2.5}$ Sources

- Sources of $PM_{2.5}$ in West Midlands air
- Derived from WM-Air measurements

| Factor | Contribution to $PM_{2.5}$ / % |
|---|---|
| Biomass Burning 1 | 19 |
| Biomass Burning 2 | 6 |
| Primary Traffic-related | 22 |
| Industrial | 9 |
| Sea Salt | 9 |
| Secondary Inorganic | 25 |
| Secondary Biogenic | 10 |




Analysis by Deep Srivastava, Zongbo Shi

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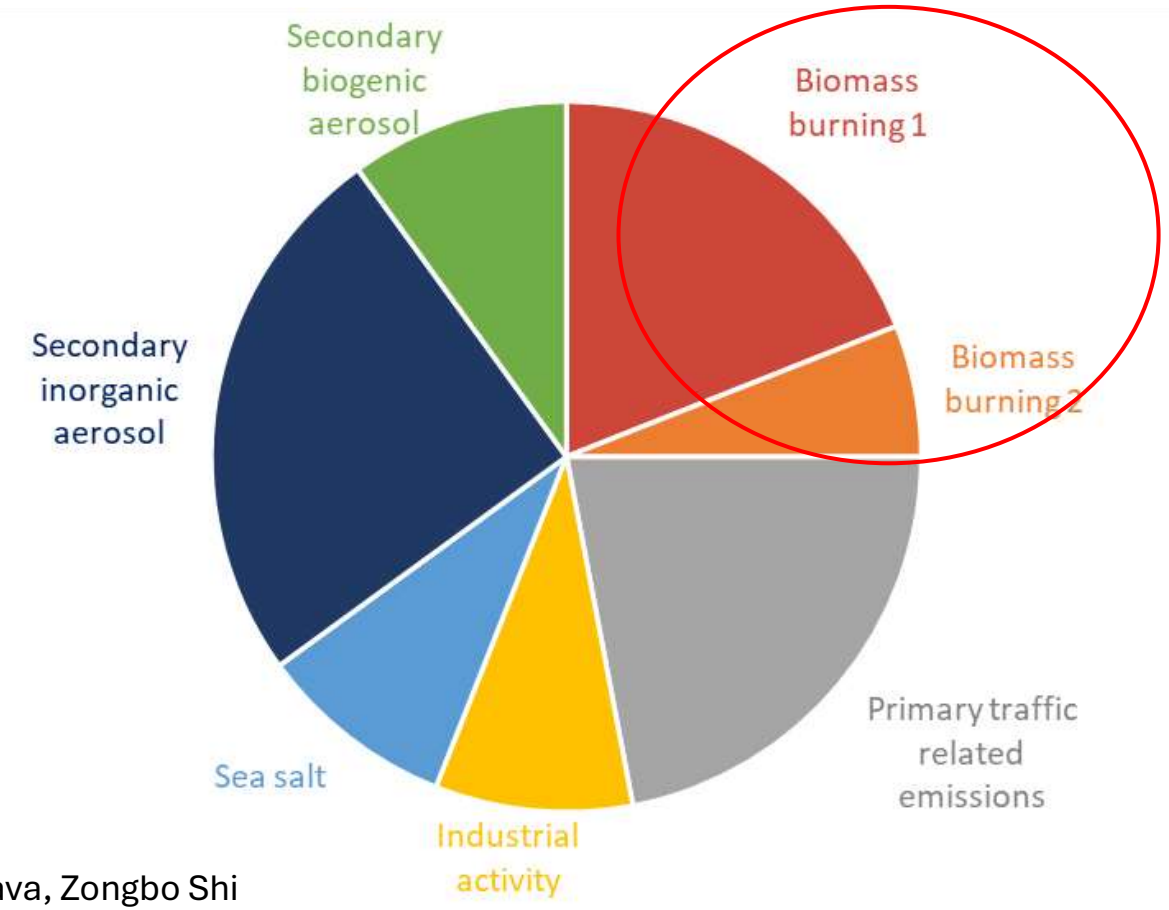


Analysis by Deep Srivastava, Zongbo Shi

# $PM_{2.5}$ Sources

- Not just traffic
- Behaviour Change

- Sources of $PM_{2.5}$ in West Midlands air
- Derived from WM-Air measurements

| Factor | Contribution to $PM_{2.5}$ / % |
|---|---|
| Biomass Burning 1 | 19 |
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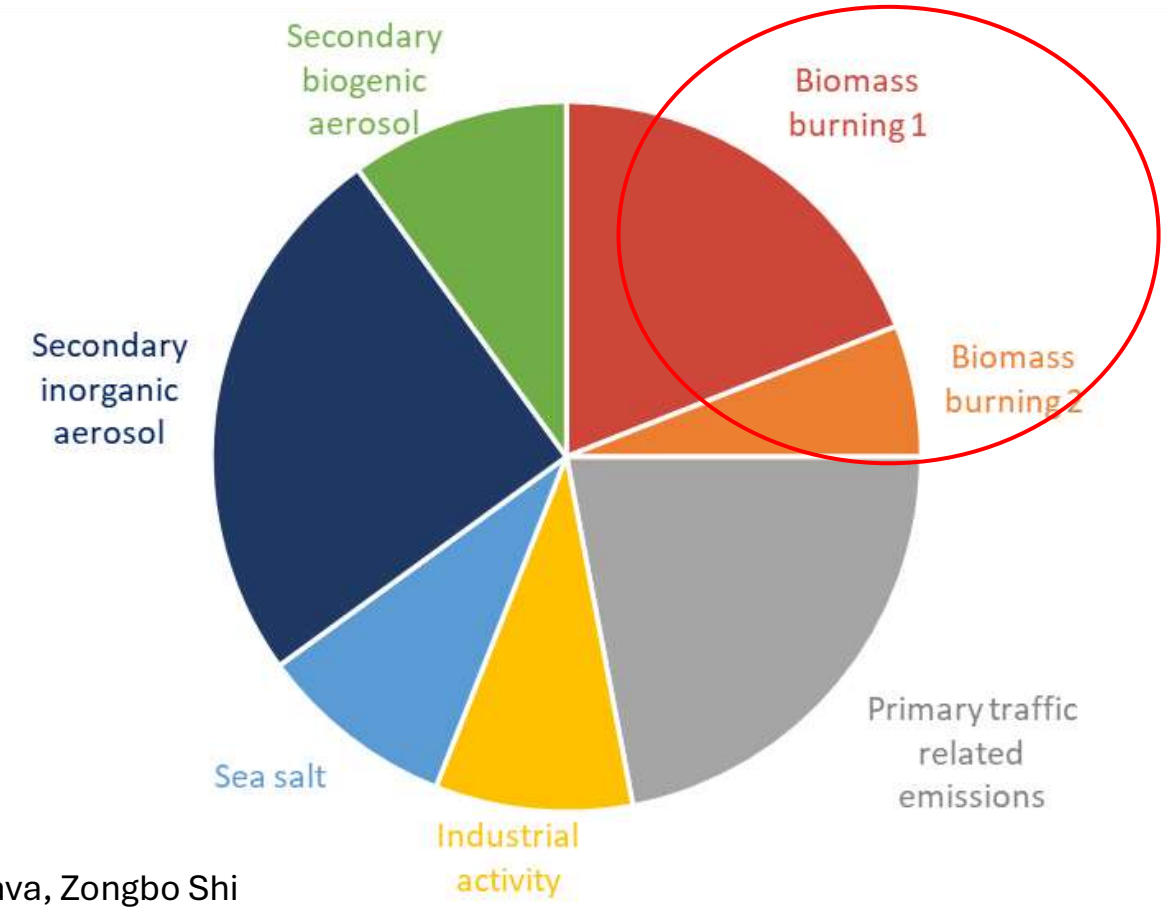
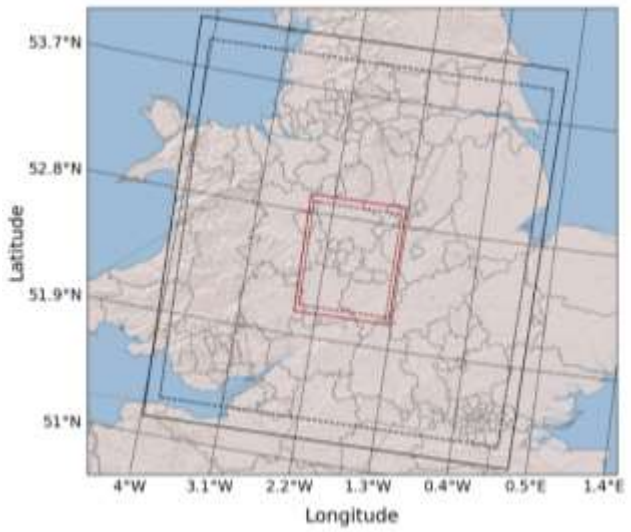
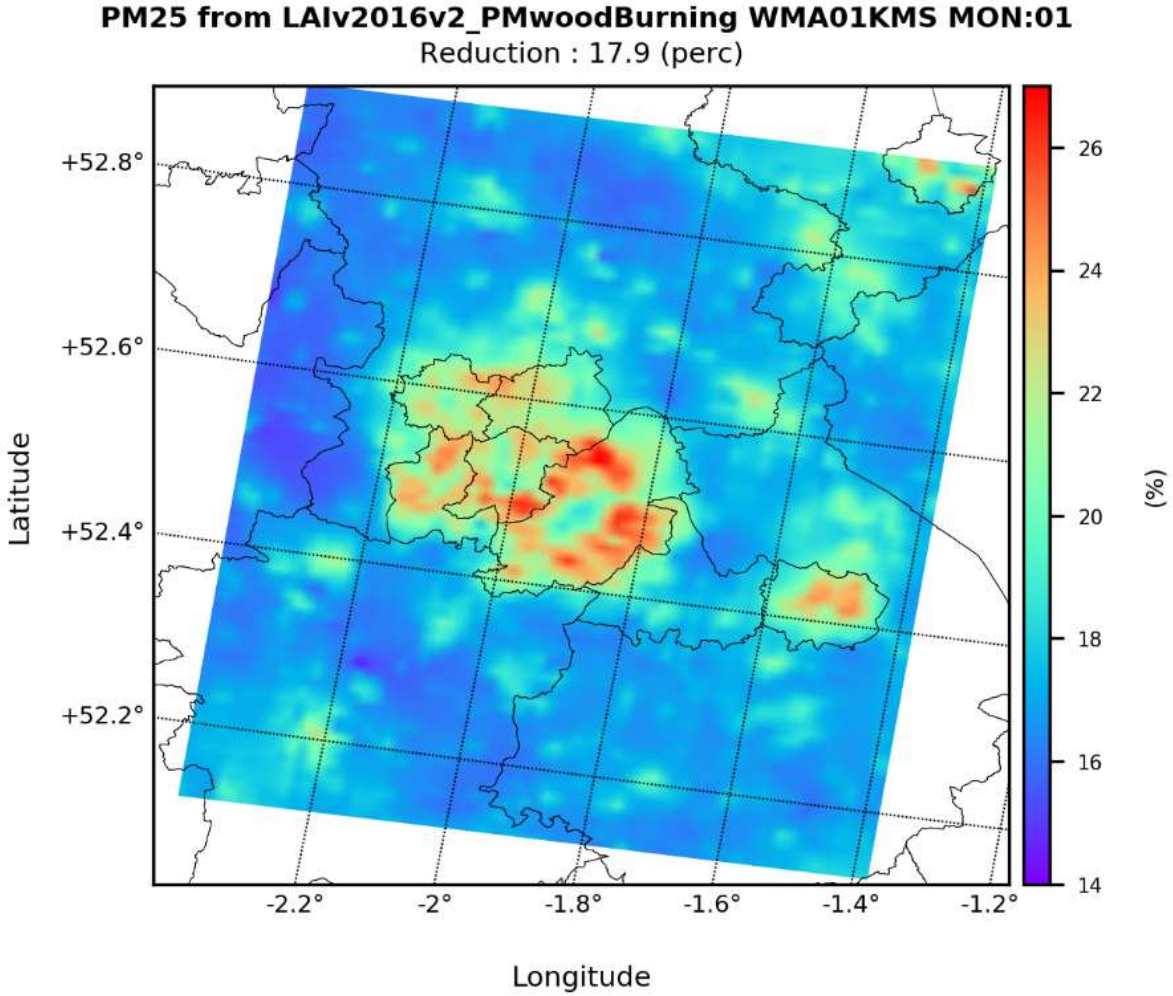



Analysis by Deep Srivastava, Zongbo Shi

# Regional Action

- Model: Reduce solid fuel emissions by 85%, *in the WMCA only*



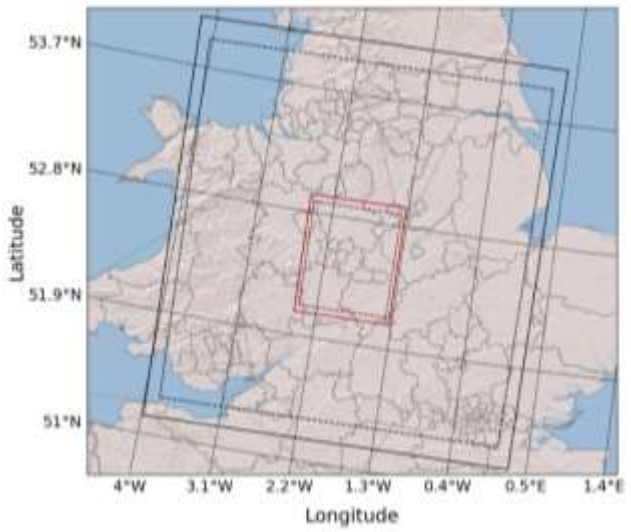



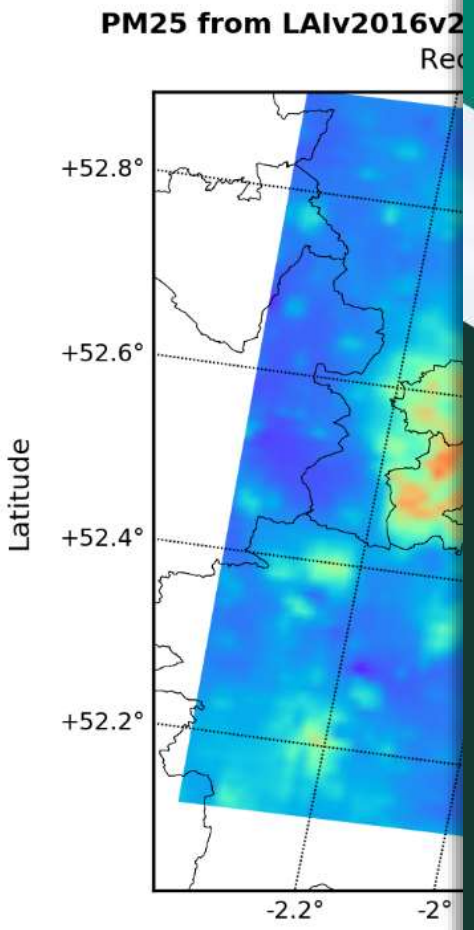

WM-Air modelling by Andrea Mazzeo, Jian Zhong, CERC

# Regional Action

Local and Regional actions can be very effective
WMCA AQ Framework: Mechanisms

- Model: Reduce solid fuel emissions by 85



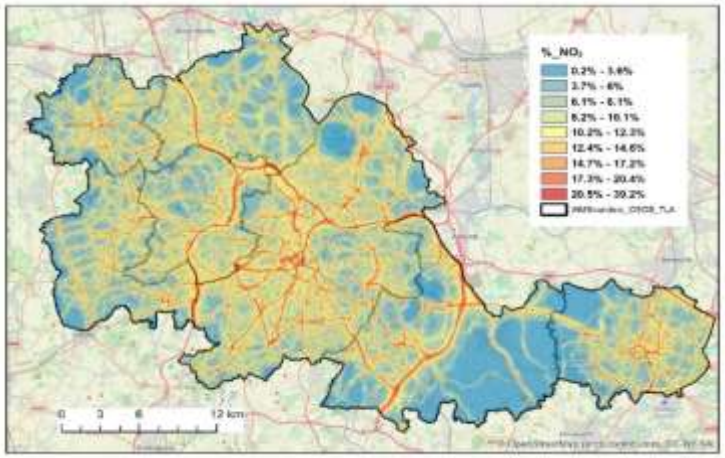





WM-Air modelling by Andrea Mazzeo, Jian Zhong, CERC

# Air Quality and Climate Change

- Fossil fuel combustion – source of $CO_2$, and of many air pollutants
- Net Zero policies can deliver a “win-win”




$NO_2$ change:

Bus & 50% Light Vehicle electrification

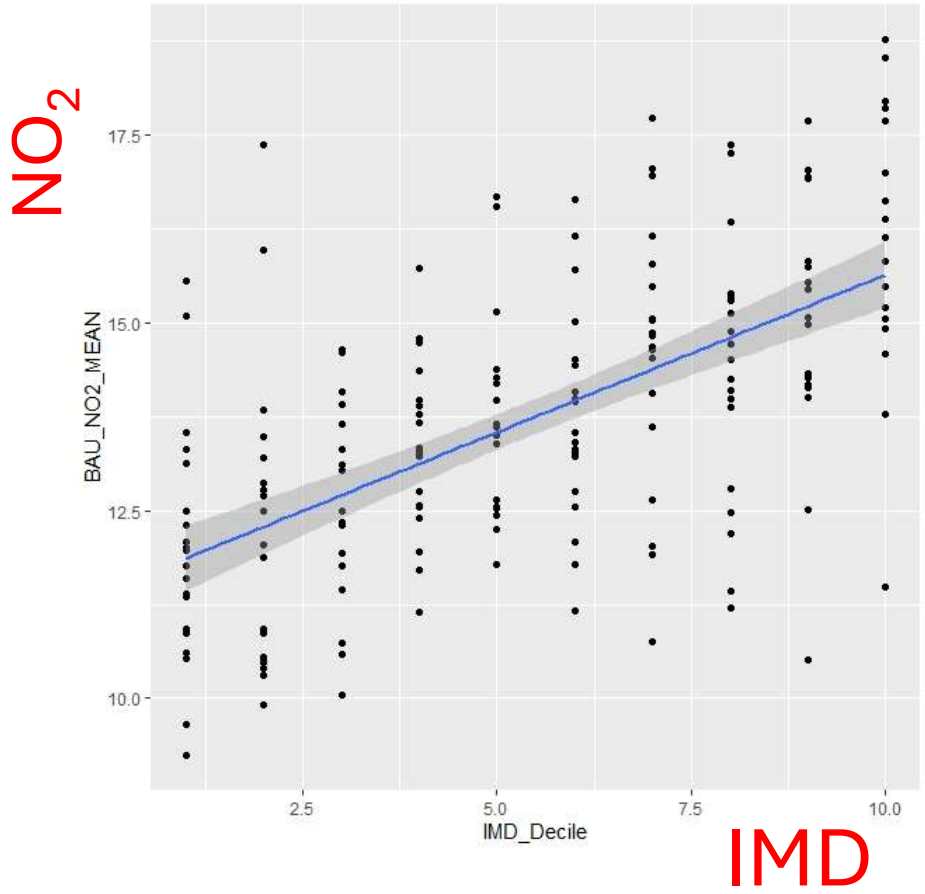
- Who Benefits ?

Local and Regional Action = Local and Regional Clean Air / Health+

Net Zero simulations by Jian Zhong

# Who is impacted ?

- Ward average $NO_2$ vs Index of Multiple Deprivation (IMD)




IMD analysis by James Hodgson

# Ambition

- National limits (Air Quality Objectives)

  $NO_2$ 40 $\mu g\ m^{-3}$

  $PM_{2.5}$ 20 $\mu g\ m^{-3}$ (10 $\mu g\ m^{-3}$ and 35% reduction by 2040)

- World Health Organisation guidelines (protection of health)

  $NO_2$ 10 $\mu g\ m^{-3}$

  $PM_{2.5}$ 5 $\mu g\ m^{-3}$

Can we go further or faster ?

Can we reduce the environmental health inequalities between communities ?

# Reflections from WM-Air

- Air pollution causes a substantial regional health burden…

…but our air is getting cleaner

- Data: to identify pollution sources, nudge behaviour… sensor network
- CAZ, Woodburning, in-vehicle (indoor), scope for regional action

- Air Quality and Climate Change – but the AQ benefits are local
- Least advantaged communities bear the greatest air pollution burden

- Targets and ambition

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UKRI Natural Environment Research Council

# CLEAN AIR SCIENCE FOR THE WEST MIDLANDS

# WM-AIR

6 year programme

2·9 million people

REGIONAL IMPACT

- economic growth
- increasing life expectancy: reducing health inequalities
- improving air quality

2,300 early deaths

## 3 THEMES

1 UNDERSTANDING air pollution challenges

- live sensors
- sampling
- telematics

2 CAPABILITY to support clean air measures & policy

- MODELLING
- DATA
- TOOLS

60 policy contributions

3 APPLICATION to specific policy scenarios

What if ...?

not just about TRAFFIC...

WHERE?

WHO?

## 150 OUTPUTS

- OBSERVATIONS
- EMISSIONS
- MODELLING
- HEALTH
- ECONOMICS
- URBAN DESIGN & GREEN INFRASTRUCTURE

TOOLS

Air Quality Lifecourse Assessment Tool

AQ LAT

health & economic implications

WM Air Quality Framework

WMCA

AQ: Healthcare Settings

A+E

NHS

POLICY briefing notes

WMCA & BCC

CLIMATE RISK & Vulnerability Assessment

SPORT & Sustainability

Edgbaston Cricket Club

Commonwealth Games

Birmingham County F.A.

CLEAN AIR ZONE TOOL

BCC

PLANNING guidance

- REDUCE
- EXTEND
- PROTECT

SCHOOL resources

£4m NERC funding

over £40m leveraged investments

40 impact case study partnerships

20+ CROSS-SECTOR PARTNERS

Network of over 300 people

sounding out

20 stakeholder events

ENGAGEMENT

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think big picture. co.uk

# Keynote speaker

## Dr Abigail Whitehouse

Senior Clinical Lecturer and Respiratory Paediatrician, Queen Mary University of London

West Midlands Combined Authority | Greener Together

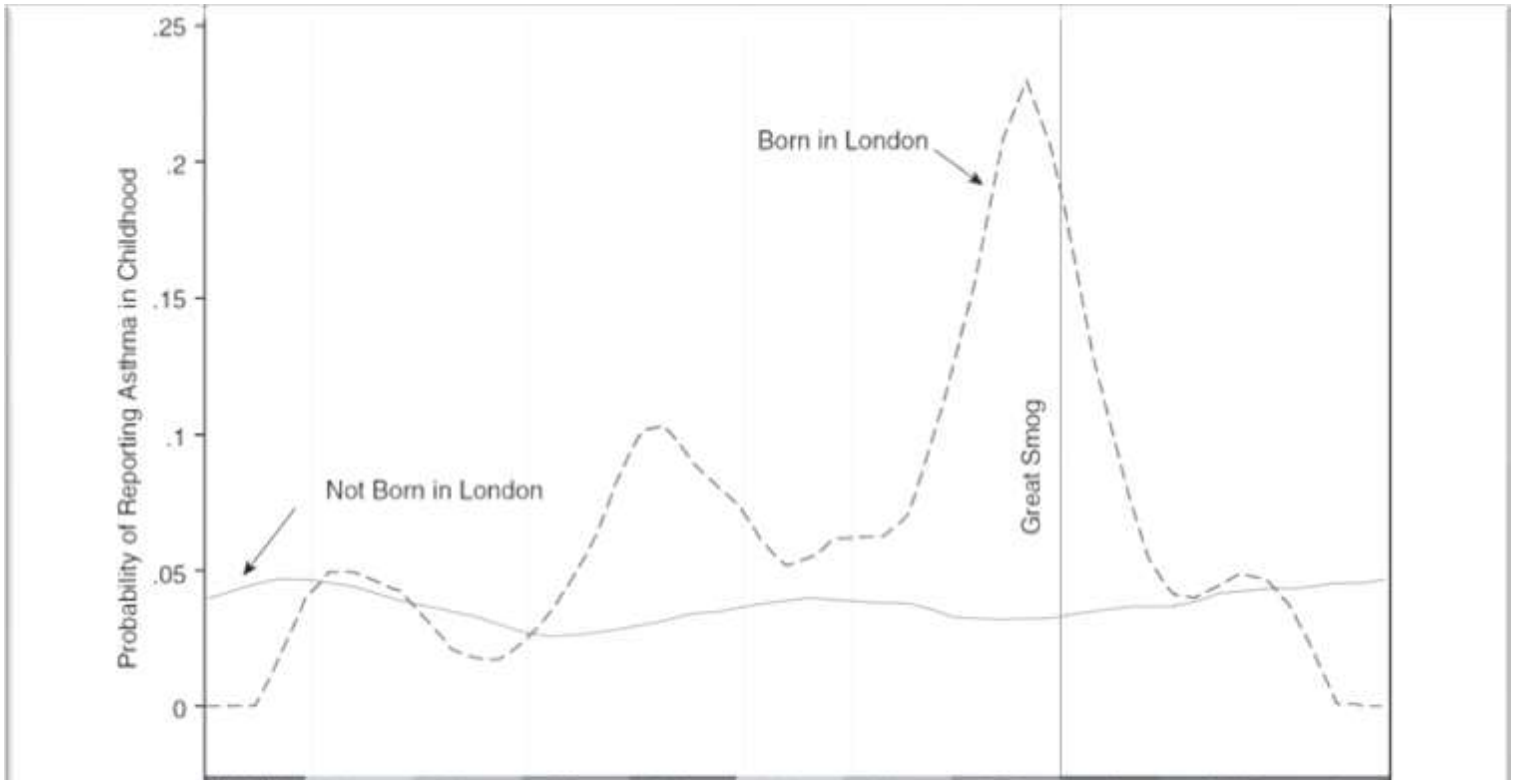
# Translating research into clinical practice

## The Children's Environmental Health Service

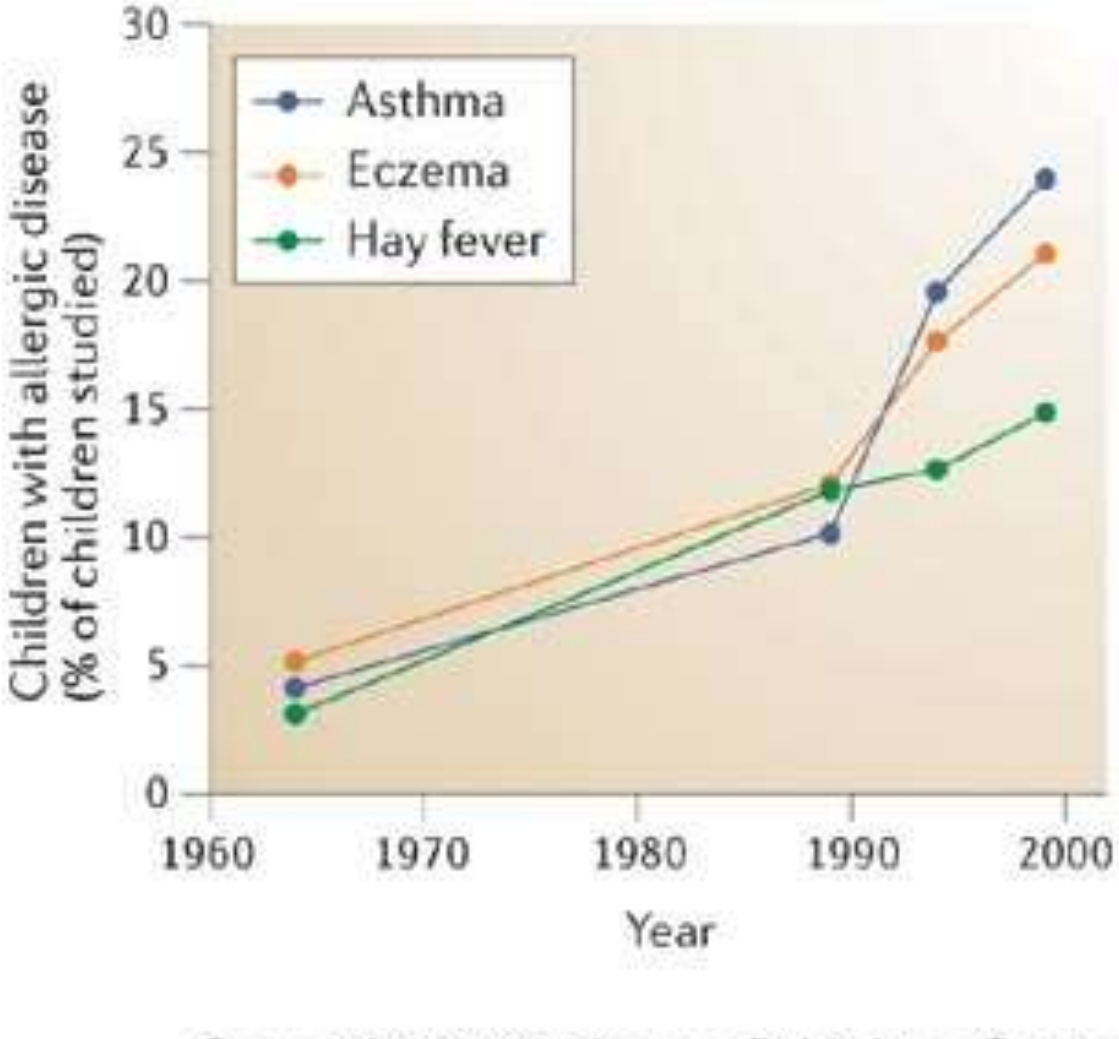
Dr Abigail Whitehouse
Senior Clinical Lecturer and Honorary Paediatric Respiratory Consultant
Queen Mary University of London (QMUL) and Royal London Hospital

# What is the problem we are trying to address?

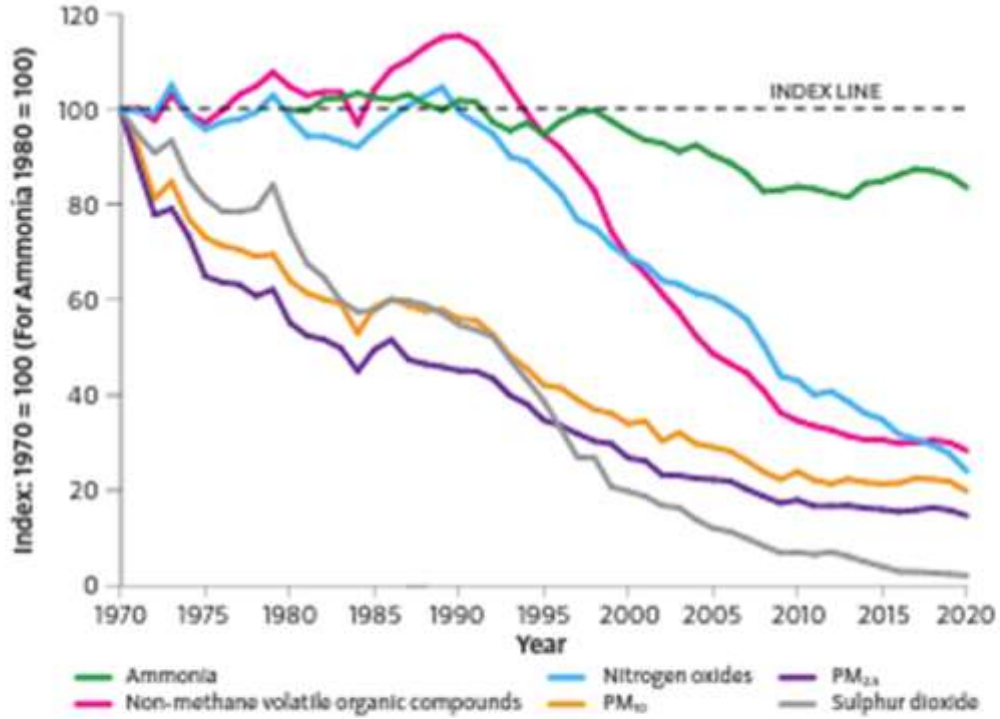
# CHILDHOOD ASTHMA




| Age at the Time of Great Smog: | 6 Years Old | 5 Years Old | 4 Years Old | 3 Years Old | 2 Years Old | 1 Years Old | <1 Year Old | In Utero | Not Exposed to Great Smog | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date of Birth** | **1945** | **1946** | **1947** | **1948** | **1949** | **1950** | **1951** | **1952** | **1953** | **1954** | **1955** | **Total** |
| Born in London | 31 | 56 | 52 | 39 | 38 | 34 | 38 | 15 | 42 | 37 | 36 | 418 |
| Born Elsewhere | 194 | 246 | 256 | 267 | 211 | 229 | 228 | 129 | 221 | 268 | 249 | 2,498 |
| Total | 225 | 302 | 308 | 306 | 249 | 263 | 266 | 144 | 263 | 305 | 285 | 2,916 |



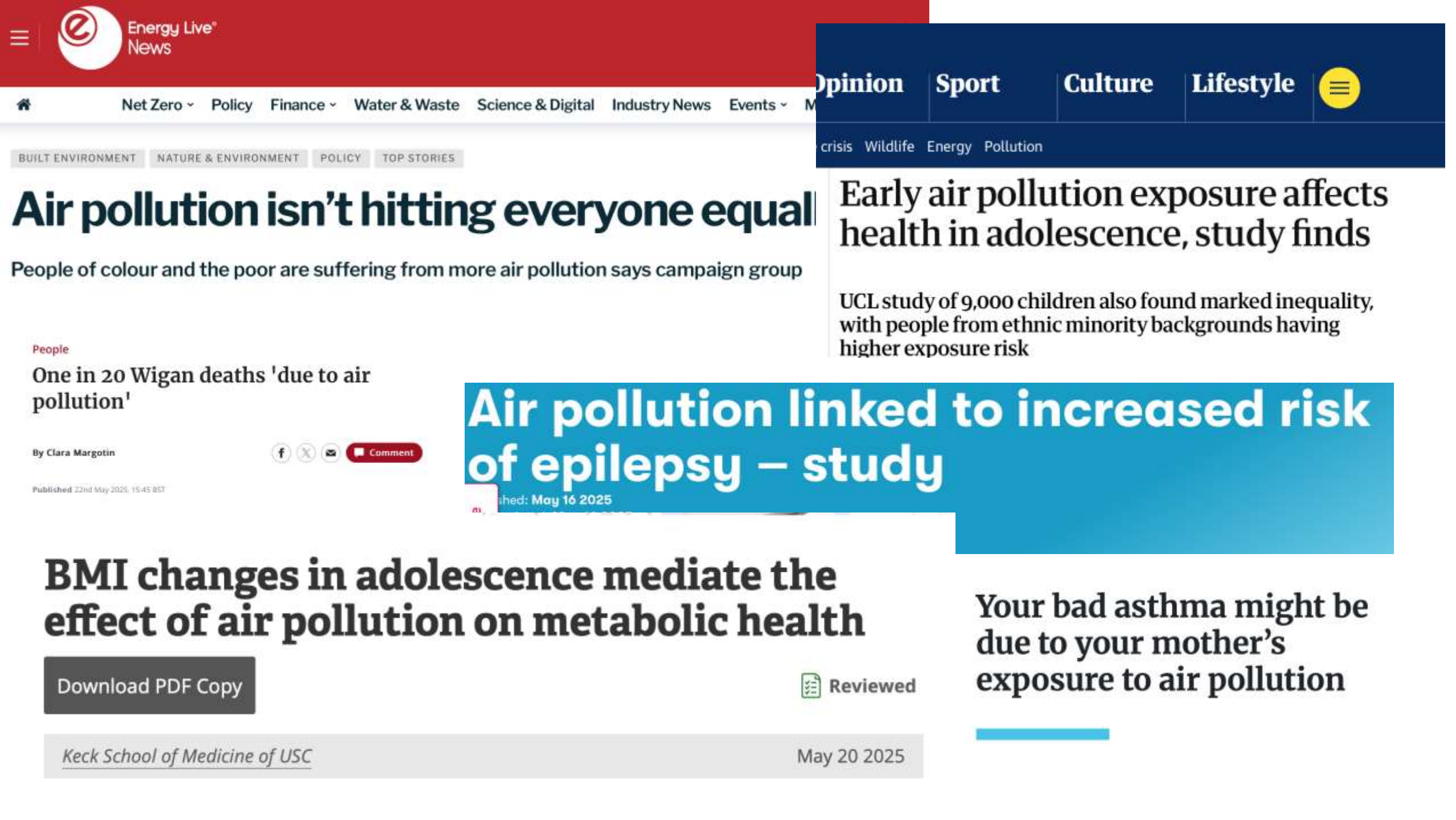

Devereux *et al.* 2006




Note: The figure shows trends in annual emissions of particulate matter ($PM_{10}$ and $PM_{2.5}$), nitrogen oxides, ammonia, non-methane volatile organic compounds, and sulphur dioxide, 1970 to 2020, expressed as a percentage change from the base year of 1970 (for ammonia the base year is 1980).

Source: Ricardo Energy & Environment. Defra (2022)

**Figure 2: Trends in UK emissions of air pollutants 1970 to 2020**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TOP STORIES
Air pollution isn't hitting everyone equall
People of colour and the poor are suffering from more air pollution says campaign group
Opinion
Sport
Culture
Lifestyle
crisis
Wildlife
Energy
Pollution
Early air pollution exposure affects health in adolescence, study finds
UCL study of 9,000 children also found marked inequality, with people from ethnic minority backgrounds having higher exposure risk
People
One in 20 Wigan deaths 'due to air pollution'
By Clara Margotin
Comment
Published 22nd May 2025, 15:45 BST
Air pollution linked to increased risk of epilepsy – study
shed: May 16 2025
BMI changes in adolescence mediate the effect of air pollution on metabolic health
Download PDF Copy
Reviewed
Keck School of Medicine of USC
May 20 2025
Your bad asthma might be due to your mother's exposure to air pollution

*“Our homes provide the living environment that dictates our future health”*

Sir Michael Marmot

Director, Institute of Health Equity

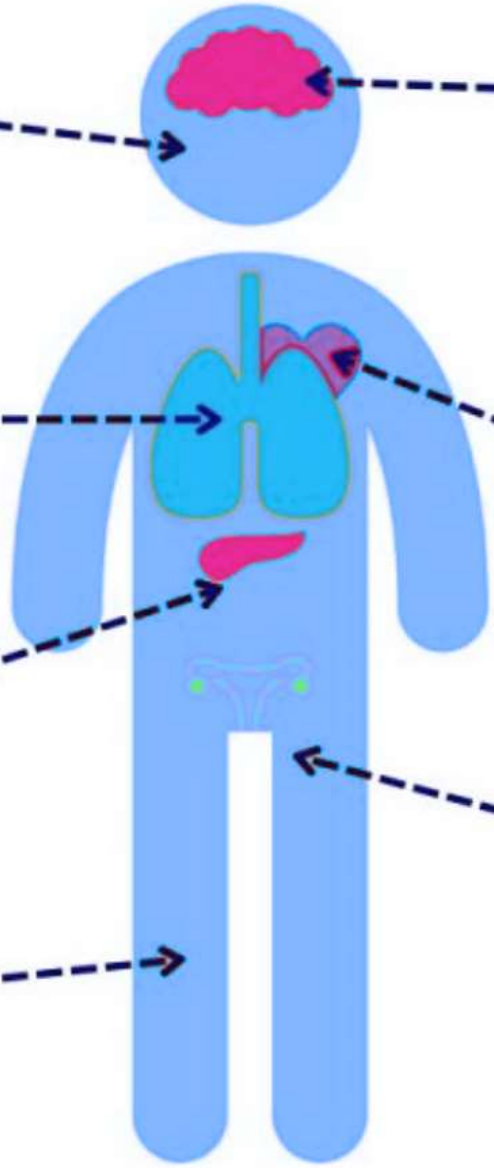
# The health harms of air pollution

Skin ageing

Lung diseases
Asthma
Lung cancer
Lung development
Pneumonia

Insulin resistance
and diabetes

Blood clots



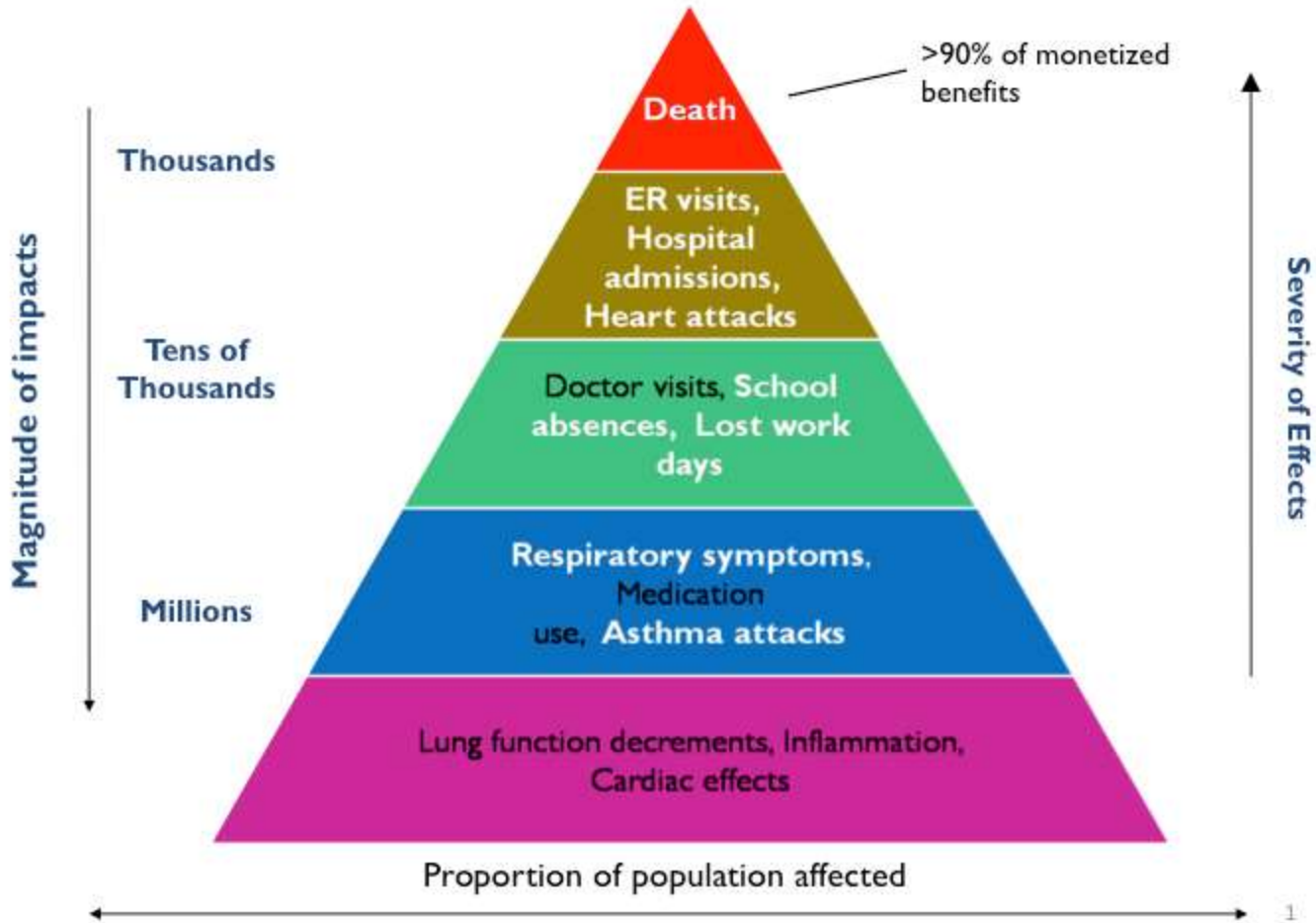
Stroke
Brain development
Mental health
Dementia

Heart disease
High blood pressure

Premature birth
Low birthweight
Decreased sperm quality
Illness during pregnancy

global action plan

# A "Pyramid of Effects" from Air Pollution




BenMAP-CE

# Can we improve an individuals exposure to air pollution?

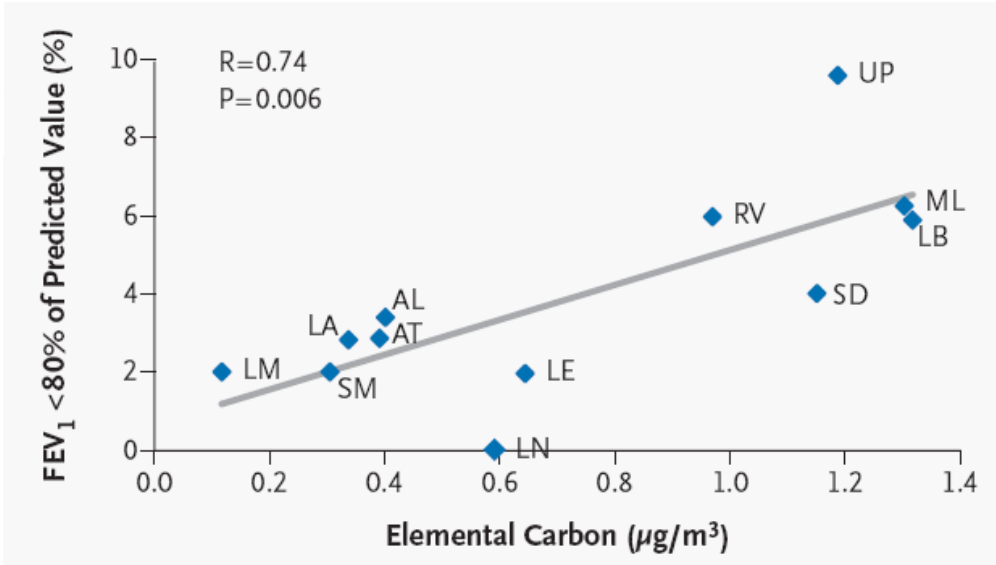
# Childrens Health Study - California

The NEW ENGLAND JOURNAL of MEDICINE

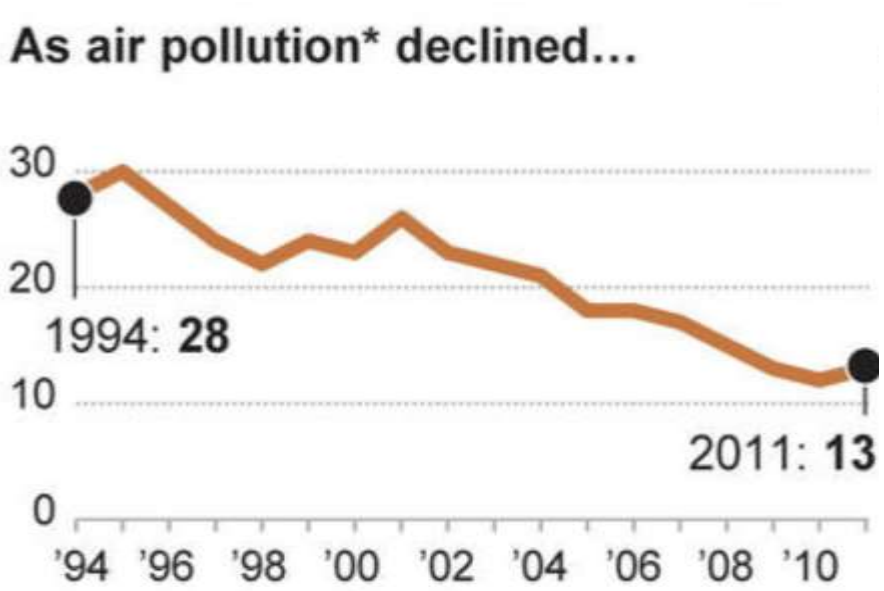
ESTABLISHED IN 1812 MARCH 5, 2015 VOL. 372 NO. 10

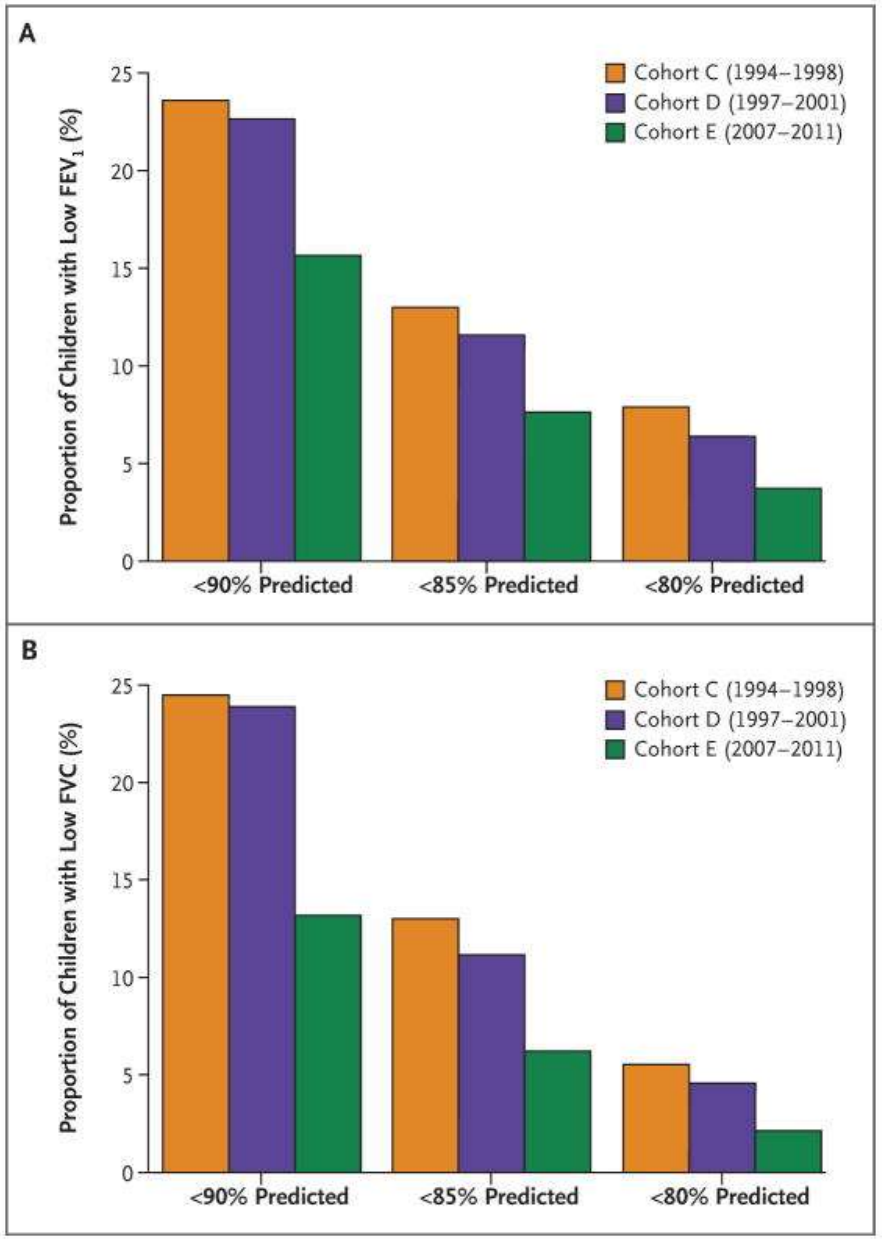
## Association of Improved Air Quality with Lung Development in Children

W. James Gauderman, Ph.D., Robert Urman, M.S., Edward Avol, M.S., Kiros Berhane, Ph.D., Rob McConnell, M.D., Edward Rappaport, M.S., Roger Chang, Ph.D., Fred Lurmann, M.S., and Frank Gilliland, M.D., Ph.D.




Gauderman *NEJM* 2004




Gauderman *New England Journal of Medicine* 2015

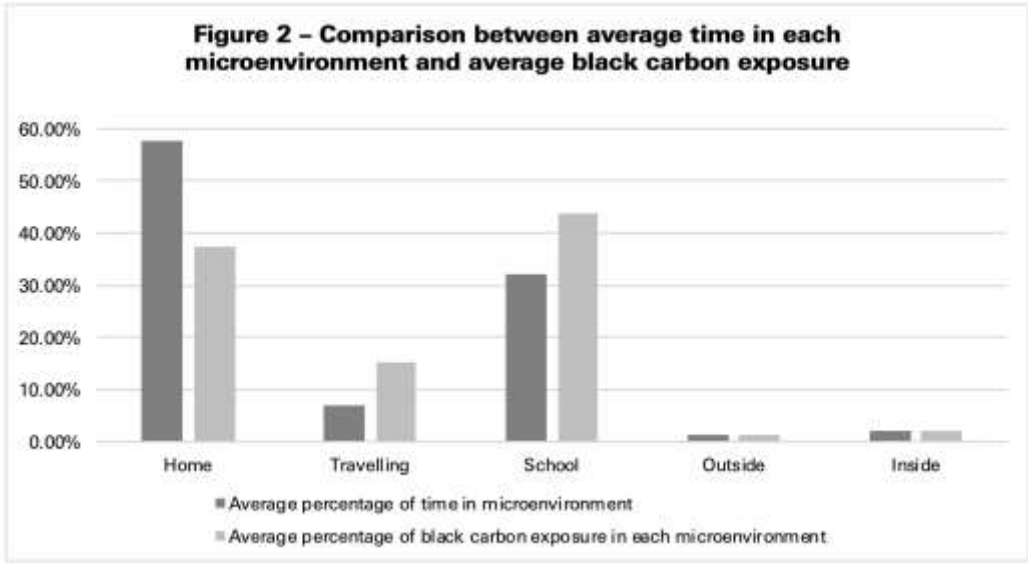
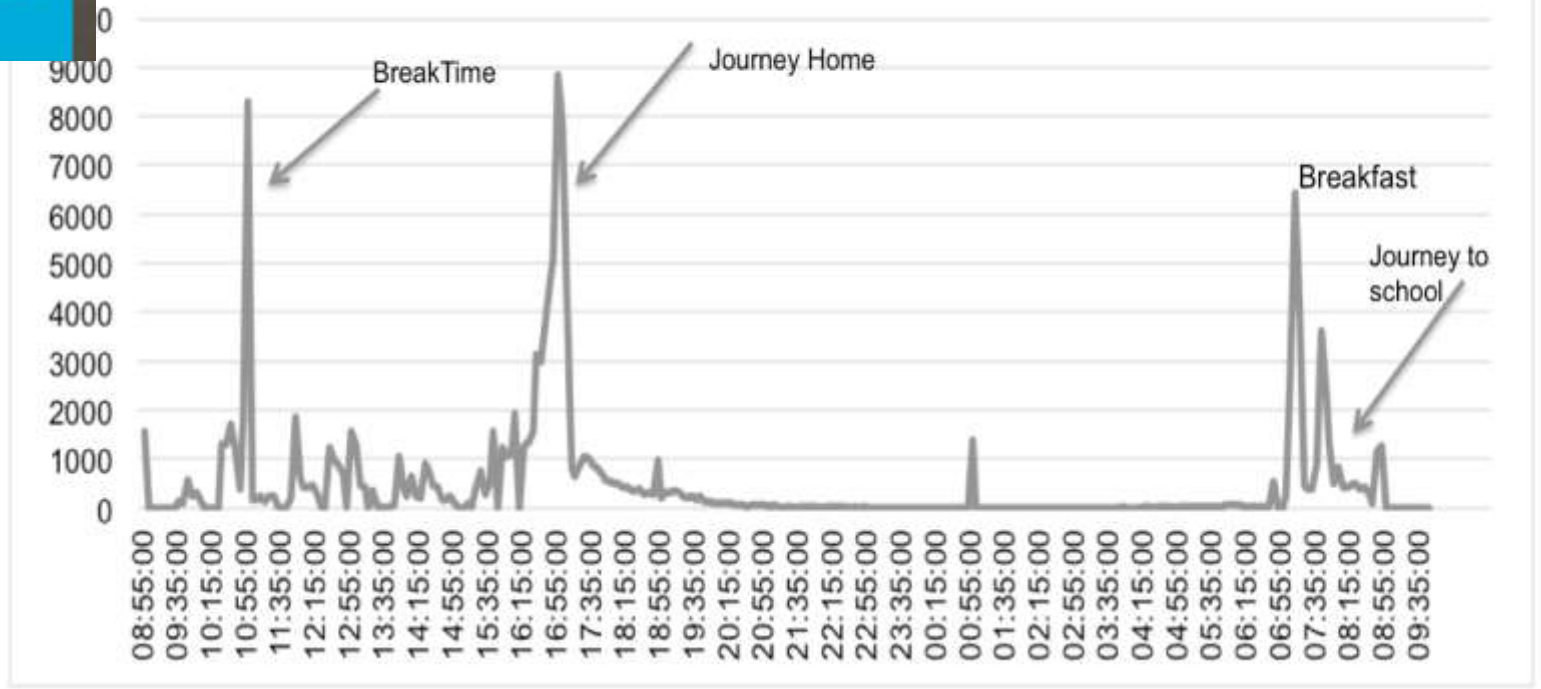
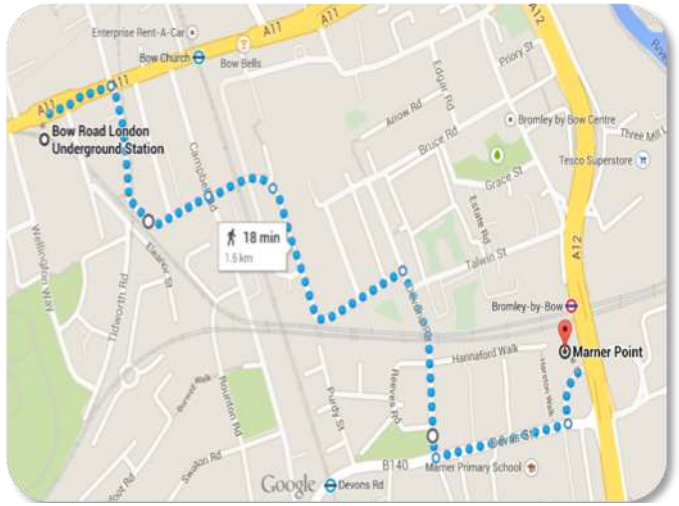
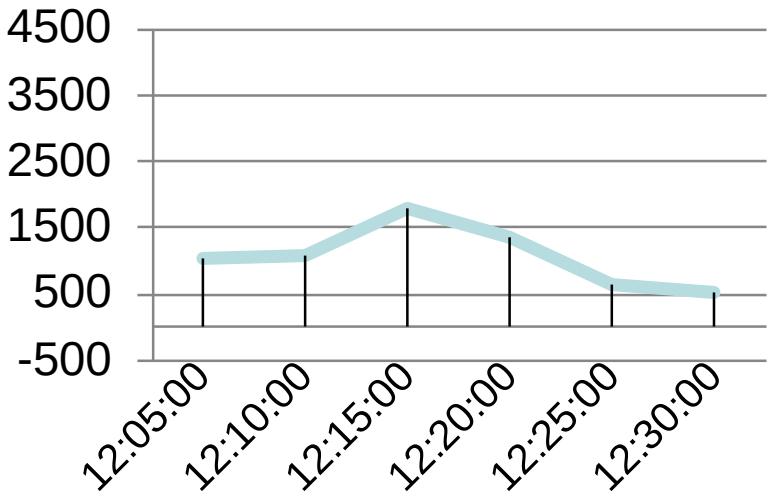



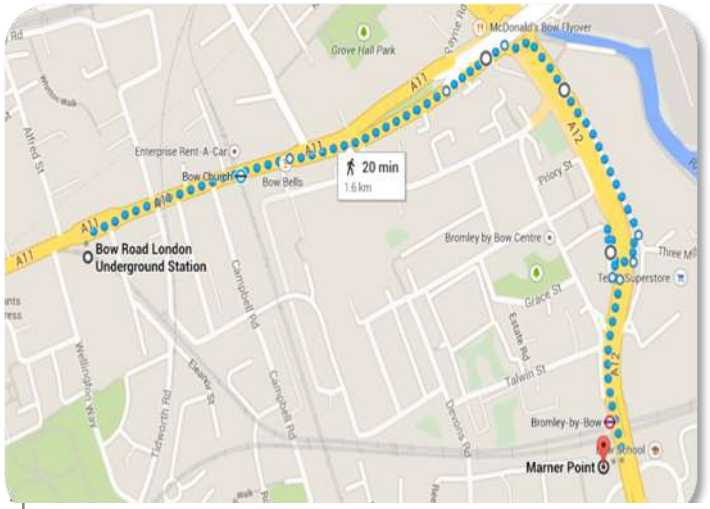

**Figure 1 - An example of a child's exposure to air pollution over 24 hours**

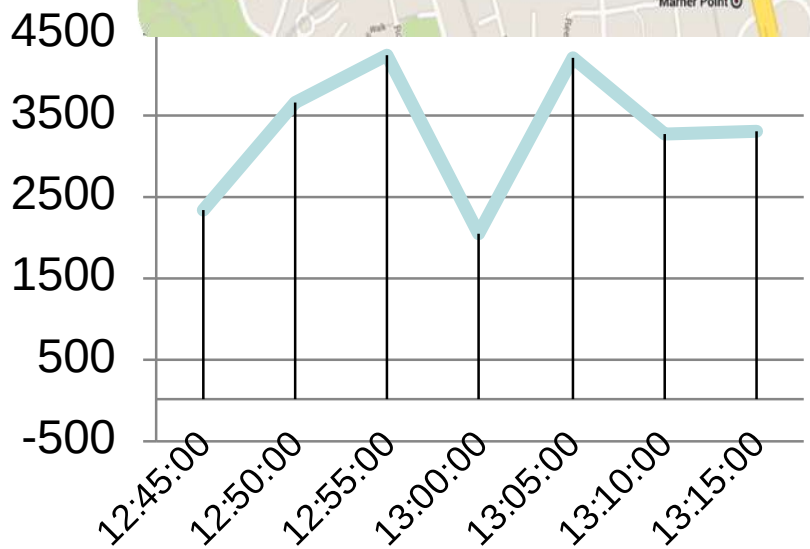


# low pollution routes

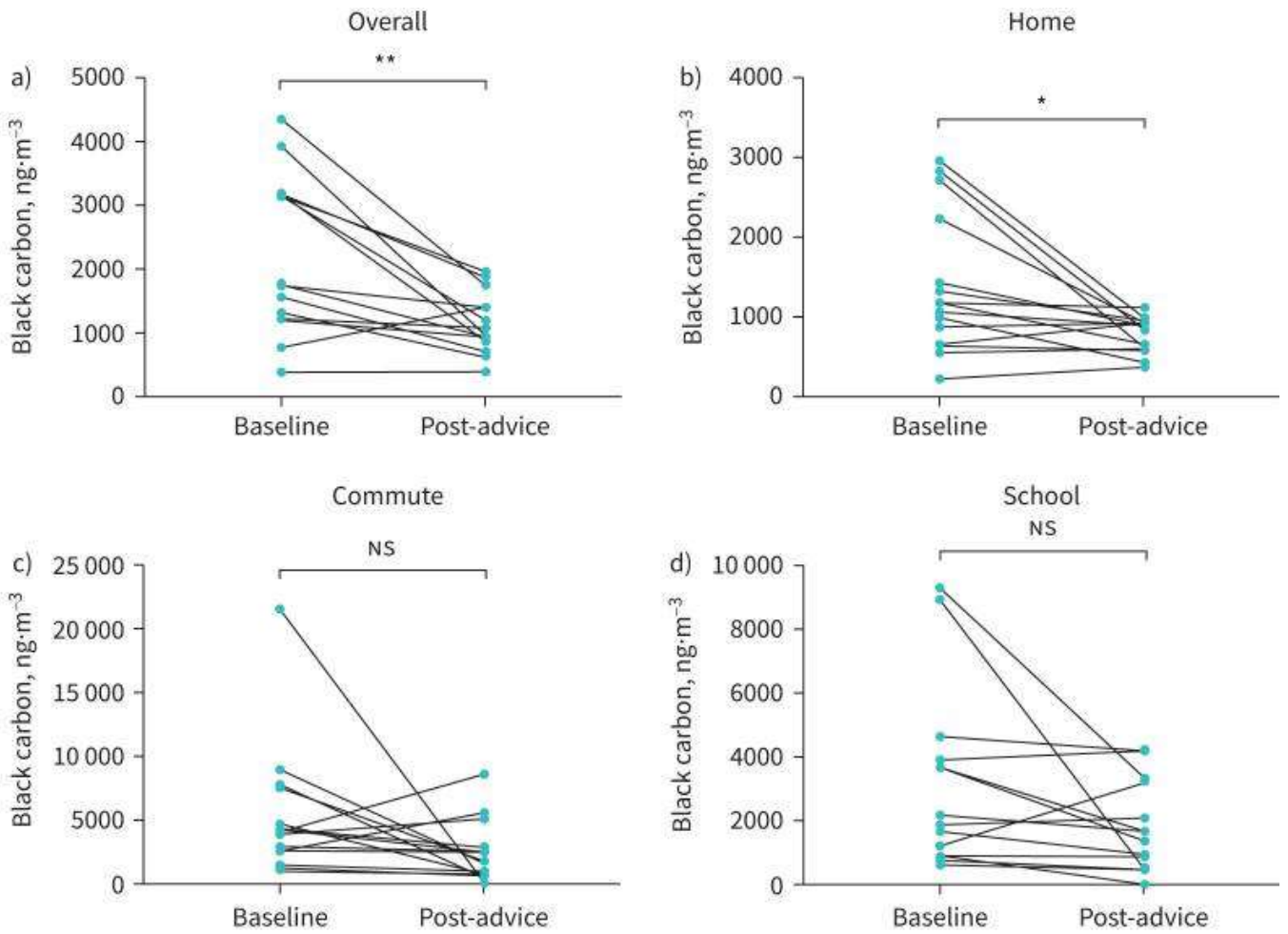


# Altering Exposure




Koh et al 2021, ERJ Open

# Interventions

## Technological Innovations

- Artificial intelligence models for $NO_2$ forecasting.

- Development of indoor air quality monitoring apps for asthma management.

## Educational Interventions

focus on increasing awareness and promoting behavioral changes

## Climate Change Policies

- Electric vehicle sales and Zero Emission Vehicle (ZEV) mandates.
- Health benefits of reduced air pollution from climate policies in the UK.
- London's Ultra Low Emission Zone and its effects on active travel to school.

## Green Spaces and Urban Planning

- Long-term effects of urban forests on PM10 reduction and asthma outcomes.

- Associations between greenspace exposure and childhood asthma (e.g., school surroundings, intra-city studies).

## Personal Air Quality Improvement

- Use of HEPA filters

- Residential air quality monitoring and filtration systems.

- Air quality warning systems for vulnerable populations.

- Cleaner air during desert dust storms and wildfire smoke protection strategies.

- Teaching parents about cooking ventilation and its impact on indoor air quality.

## School Environment

- Ventilation improvements in schools post-COVID-19.

- Polluted playgrounds and school building impacts on respiratory health.

- Meeting particle-level guidelines inside schools with enhanced ventilation conditions.

BARTS CHARITY

Barts Health NHS
NHS Trust

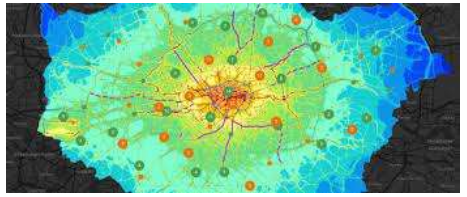
# Children's Environmental Health Service

Asthma

Education

Monitoring

Mitigation report



Environmental health questionnaire

Home assessment

Personalised triggers

School Environment

# What can we easily add in to clinic?

# London Air

## Annual Pollution by Location

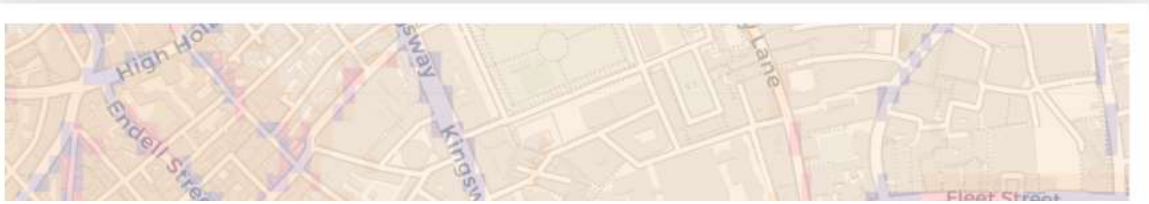
London Air

### INTRODUCTION

This map shows the annual mean pollution for NO2, PM10 and PM2.5 across London, the data is based on most recent year for which an accurate model is available, 2016.

You may explore the air pollution in London by clicking on an area of the map or entering a postcode below.

### PREVIEW





This map was used with permission from The Greater London Authority and Transport for London, who fund, develop and maintain the London Atmospheric Emissions Inventory. For more information please visit data.londongov.uk

**EU ANNUAL MEAN LIMIT VALUES**

- NO2 is **49** µg/m³ **exceeding** the EU limit of **40** µg/m³
- PM10 is **27** µg/m³ **passing** the EU limit of **40** µg/m³

**WHO ANNUAL MEAN LIMIT VALUES**

- NO2 is **49** µg/m³ **exceeding** the WHO limit of **40** µg/m³
- PM10 is **27** µg/m³ **exceeding** the WHO limit of **20** µg/m³

# Mould

Queen Mary University of London

North East London Health & Care Partnership

NHS North East London

Dear housing officer / housing association / landlord/ whom it may concern

I have asked 's family to this pass this letter on to you as I have concerns that their current housing situation is having a negative impact on their health.

has a diagnosis of asthma/wheeze. They also have severe allergic rhinitis and eczema. It is my belief that the family's current housing situation is significantly contributing to their health condition(s) and the amount of medication they are requiring to control them.

# My air pollution plan:

| *Plan out the actions that you and your family can take to reduce the impact of air pollution on your health* | On all days | On high pollution days |
|---|---|---|
| I will use my inhaler as recommended by my GP or asthma nurse | ❑ | ❑ |
| I will treat air pollution the same way I treat other asthma triggers | ❑ | ❑ |
| We will walk, cycle or scoot to school | ❑ | ❑ |
| We will look up quieter routes to avoid roads with heavy traffic | ❑ | ❑ |
| We will turn on the extractor fan when cooking | ❑ | ❑ |
| We will swap our cleaning products to low chemical options | ❑ | ❑ |
| We will open the window when cooking | ❑ | ❑ |
| We will open the windows when cleaning | ❑ | ❑ |
| We will always turn the engine off when our car is stationary | ❑ | ❑ |
| If we paint, we will check it is labelled "low VOC" | ❑ | ❑ |
| We will leave the car at home when we can | ❑ | ❑ |
| We will ask people not to smoke in our home | ❑ | ❑ |

This leaflet was designed in collaboration with:
children with asthma, their families, GPs and clinicians.
Thank you to Tower Hamlets Together and Global Action Plan as the original creators.

East London Health & Care Partnership

NHS

# Air Pollution & You

Air pollution can worsen asthma symptoms including coughing, wheezing and breathlessness. The actions below can help:


**Use quieter roads and paths to keep away from heavy polluting traffic.**


**Encourage your whole family to walk, cycle and scoot more - air pollution can be higher inside a car than outside.**


**Sign up at AirText.info to get air pollution alerts sent to your phone.**


**If you do need to use a car, ask the driver to turn the engine off when the car isn't moving.**


**Use fragrance free and low-chemical cleaning products. Stop air pollution collecting in your home by using extractor fans and opening windows away from busy roads.**

For more information on how air pollution can affect your health, and how to reduce your exposure, visit www.cleanairhub.org.uk/tower-hamlets

global action plan

| Parental Concern | Sex | | |
|---|---|---|---|
| | Male | Female | Total |
| Total | 36 | 24 | 60 |
| Mould Exposure | 29 | 20 | 49 |
| Mould Exposure % | 80.56% | 83.33% | 81.67% |
| Air Pollution Exposure | 36 | 24 | 60 |
| Air Pollution % | 100% | 100% | 100% |

| Behaviours | Sex | | |
|---|---|---|---|
| | Male | Female | Total |
| Total | 36 | 24 | 60 |
| Gas | 25 | 18 | 43 |
| Smoking | 15 | 6 | 21 |
| Bathroom Extractor Fan | 27 | 18 | 45 |
| Kitchen Extractor Fan | 22 | 14 | 36 |
| Bathroom Window | 31 | 14 | 45 |
| Kitchen Window | 36 | 23 | 59 |
| Dehumidifier | 3 | 4 | 7 |
| Purifier | 1 | 3 | 4 |
| Humidifier | 1 | 1 | 2 |
| Cleaning Sprays/Deodorant | 28 | 23 | 51 |
| Misters / Air fresheners | 2 | 1 | 3 |
| Candles / wax melts/oils | 5 | 1 | 6 |
| Incense | 2 | 0 | 2 |

| | Sex | | |
|---|---|---|---|
| | Male | Female | Total |
| Total | 36 | 24 | 60 |
| **Home to Busy Road** | | | |
| Less than 5 mins | 26 | 19 | 45 |
| 5 to 10 mins | 10 | 4 | 14 |
| More than 10 mins | 0 | 1 | 1 |

| **Property Type** | | | |
|---|---|---|---|
| Flat | 19 | 17 | 36 |
| House | 13 | 4 | 17 |
| Maisonette | 3 | 3 | 6 |
| Room | 1 | 0 | 1 |
| **Housing Provider** | | | |
| Council | 26 | 17 | 43 |
| Rented | 7 | 6 | 13 |
| Owned | 3 | 1 | 4 |

# Other projects

Housing referral pathway

- ICB
- Council
- Housing Providers

Public Education and Engagement

- Co-design of mitigation strategies
- PPI groups
- Community events

Newham Pharmacy Project

- DEFRA funded
- AP education with inhaler prescription collection

Clinician Education

- Paediatrics
- Respiratory

Research

- CHERISH – Playground exposures
- NESTED – nursery exposures

Aspirations……

- Air quality and health fellowship
- Roll out of environment clinic

# RCPCH Air Pollution Companion

## Knowledge hub

For anyone interested in learning more about air pollution and its impact on child health.

**Knowledge hub**

## Communication toolkit

For child health professionals who want to make talking about air pollution 'business as usual'.

**Communication toolkit**

## Advocacy toolkit

For health professionals who want to advocate for broader systemic change to improve air quality.

**Advocacy toolkit**

## Case studies

Explore our library of case studies highlighting projects and professionals working to improve air quality.

**Case studies**

## Clean air community

Discover more about our national and international networks focused on air pollution and child health.

**Clean air community**

## Clean air clinics

For policy makers, NHS leaders and child health professionals. Read more about these innovative clinics.

**Clean air clinics**

RCPCH

# Exploring air pollution with CYP and families in clinic

RCPCH
Royal College of Paediatrics and Child Health
*Leading the way in Children's Health*

## 1. Pre-consultation

### At home

Hospital website
Hospital phone systems
Text messaging
Appointment reminders
Invitation letter to routine regular reviews

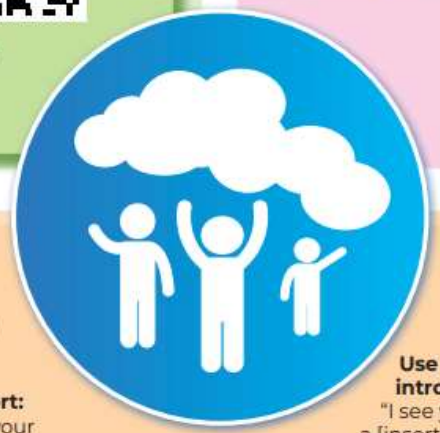
### Travel to hospital

Car park: messaging on idling

### Waiting room

Posters/screens/noticeboards
Patient registration forms

**Daily Air Quality Index**



## 3. Post-consultation

### Pharmacy

Posters/screens/noticeboards
Labels on medication

### Travel home

### At home

Send the patient information via email or text

Include a section on air pollution advice in the clinic letter

**Global Action Plan 'Actions on air pollution' checklist**

## 2. Consultation

### Setting the scene

**Show curiosity: Understanding the context and the patient experience**

**One size does not fit all:** Make it developmentally appropriate, relatable and individual.

**Keep an open mind:** Your patients may know more than you.

**Prepare:** Look at the patient's address. Some hospitals have linked patient postcodes to air quality levels, or you could look on Google Maps to see if they live on a main road, near industry or next to a park.

**Model behaviours:** Have plants in clinic or leave your bike helmet visible.

### History and examination

**Tease out symptoms and signs that may be caused/exacerbated by air pollution**

**Start a conversation about transport:**
For example "How did you travel to your appointment this morning?"

**Be specific about potential triggers:**
"Do you notice a change in your chest symptoms when you're around traffic or fires?"
"Do you find your allergies/eczema change when you're inside your home/when you go away?"

**Show you understand where they live and delve deeper:**
"I can see you live on [insert name] road. That looks like it might be a bit busy at rush hour. Does that affect your breathing at all?"

**Make asking about housing matter of fact:**
"Who lives together at home? Can you tell me more about your house – is it rented/privately owned? Do you have any concerns about mould/damp/ventilation?"

**Use visual cues to introduce activity:**
"I see you're wearing a [insert team] football shirt! Do you play at school/college? It's great for your physical and mental health! Do you do any other activity?"

**RCPCH Air Pollution Companion**

### Management plan

**Incorporate achievable goals in the plan**

Acknowledge that air pollution might be contributing to their health problem and **talk through some potential solutions together** – you could use a checklist to help guide this conversation.

**Use specific details from the history to tailor the plan:** "You mentioned that [child]'s breathing is worse in the house. This leaflet lists lots of potential triggers; could you try keeping a diary to see whether anything seems to set off [his/her] symptoms?"

**Give advice that is within their sphere of influence:**
"It's great that you already walk to school. Did you know that even by walking on the side of the pavement away from the cars, it reduces your exposure to air pollution?"

**Signpost to resources:**
"Did you know there's an air quality index – a bit like a weather forecast?" Show the young person the Daily Air Quality Index (DAQI) on their phone.

**This resource is not comprehensive but aims to start conversations.**

**Made by the RCPCH Clean Air Fund partnership team in collaboration with RCPCH &Us Climate Changers and the RCPCH Clean Air Network**

# Thank you

Any Questions?

Professor Jonathan Grigg
Dr Lisa Miyashita
Dr Norrice Liu
Dr Gioia Mosler
Dr Charlie Moorcroft

# Summary of West Midlands Air Quality Framework and Defra project

Jackie Homan

Head of Environment,
WMCA

West Midlands Combined Authority

Greener Together

# WMCA air quality priorities: delivering the Framework

***The West Midlands will have cleaner air that is safe for all people, no matter where you live in the region, resulting in significantly improved public health and environmental outcomes***

There are **143 actions** in our air quality framework – these are the initial priorities:

- Monitoring and data, including a stretch target
- Behaviour change and providing consistent information
- Working with vulnerable groups, including an alert system
- Schools programme
- Supporting decision makers
- Renewal of planning guidance

# West Midlands AQ Framework Delivery Group

- Aim: to help strategically and collaboratively align air quality work in the region, including prioritised Framework actions.
- Meets quarterly and chaired by UKHSA
- Task and Finish groups have been set up with key representatives from regional stakeholders

# What next…

- Working with Defra to understand how our work can be supported
- Additional funding to the West Midlands to support air quality projects
- Rolling out air quality literacy to increase awareness amongst policymakers
- Identifying ways to scale behaviour change projects
- Launching the alert system
- Ensuring the data is reliable and remains at the highest quality
- Building air quality into community projects
- ……and more!

# Break

11:00 – 11:15

West Midlands Combined Authority

Greener Together

# Partner Delivery

## Working in partnership for cleaner air in the West Midlands

West Midlands Combined Authority | Greener Together

# Panel

## Elizabeth Stephens

Air Quality Manager, Sandwell Metropolitan Borough Council

## Dr Suzanne Bartington

Clinical Associate Professor in Environmental Health, University of Birmingham

## Dr Prasad Nagakumar

Paediatric Respiratory Consultant, Birmingham Children's Hospital

## Dr Mubasshir Ajaz

Head of Health and Communities at West Midlands Combined Authority

West Midlands Combined Authority | Greener Together


Sandwell
Metropolitan Borough Council

**Elizabeth Stephens**
**Air Quality Team Manager**

# Why we need partnerships to address the air quality challenge

Local -> Global

Ownership of the ‘problem’


Communication barriers

Public understanding

Acceptability of interventions

Complex (and evolving) science…

**Global/Local Influences**

- Weather forecast
- Multi year weather analysis
- Nested finer scale local weather models
- Climate change

**Emissions**

- Anthropogenic and biogenic
- Temporal and spatial variation
- Street, local, national, regional, global
- Observations

**Air Quality**

- Street to global
- Hourly to climatic variation
- Gas and aerosol chemistry, deposition, etc
- Weather and climate feedbacks
- Observations

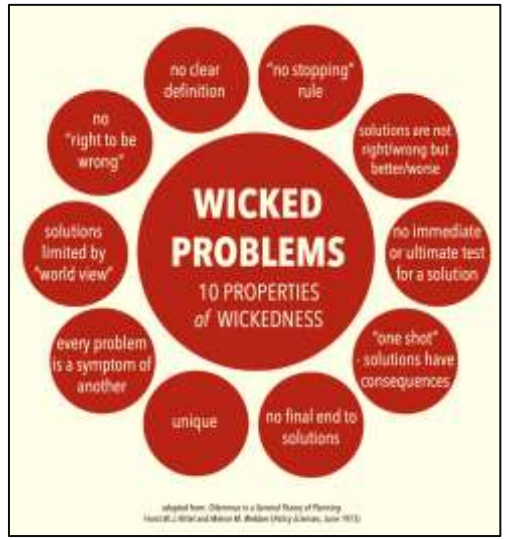
**Health Impacts**

- Hazard x Vulnerability x Exposure
- Economic cost/benefit
- Health and Environmental
- Measurement of impact/mitigated impact

**Action**

- Long term policy e.g. energy mix, vehicle, clean air zones, international
- Tactical e.g. health advice, industrial and traffic management, individual choice

Lack of coordinated action




PUSH BACK!

Competing priorities – need for ‘win-wins’

Clean Air Programme

UNIVERSITY OF BIRMINGHAM

# Community delivery and capacity building

**Working in partnership for cleaner air in the West Midlands**

West Midlands Combined Authority | Greener Together

# Panel

## Waseem Zaffar

Councillor Waseem Zaffar MBE,
Chair - Birmingham Healthy Air Coalition

## Catherine Kenyon

Head of Programmes, Clean Air, Global Action Plan

## Kirsten de Vos

Campaigner and volunteer for Mums for Lungs

West Midlands Combined Authority | Greener Together

# Breakout rooms: post-lunch

Air quality behaviour change
*Explore*

Air quality policy and targets
*Inspire*

Transport interventions for cleaner air
*Think*

Improving indoor air quality
*Smile*

West Midlands Combined Authority

Greener Together

# Lunch

12:30 – 13:30

West Midlands Combined Authority

Greener Together

# Breakout room sessions

West Midlands Combined Authority

Greener Together

# Air quality behaviour change


James Knoll-Pollard

Behaviour Change Lead, WSP

Ellis Garvey

Assistant PM & Trial Lead, WSP


West Midlands Combined Authority

Greener Together

# AIR QUALITY BEHAVIOUR CHANGE TRIALS: LEARNINGS

# Introduction


## James Knoll-Pollard

Behavioural Design Lead, Communities and Mobility, WSP



## Eilis Garvey

Principal Consultant, Communities and Mobility, WSP

# Background

- In 2023, funding was awarded from Defra, to the WMCA to commission an Air Quality Behavioural Change Programme (August 2023 - March 2025).
- Aims to drive behavioural change within the local community, implementing interventions to reduce pollution and exposure to it.
- Involves the design, implementation and evaluation of 7 air quality behaviour change campaigns within each constituent authority, with fine particulate matter (PM2.5) being the pollutant of primary focus due to its ill health effects.

# Objectives

1. Identify what type of behavioural change campaigns have a scalable and demonstrable impact

2. Identify what interventions are likely to result in the largest impact to public health

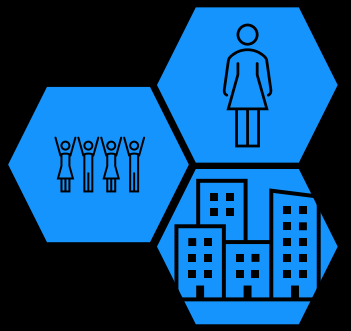
# Methodology

Each of the 7 trials was designed with input from the local authority. Each trial had a specified air quality focus, behaviour change mechanism, and target group.

- Air Quality Focus

- Behavioural mechanism


- Target group

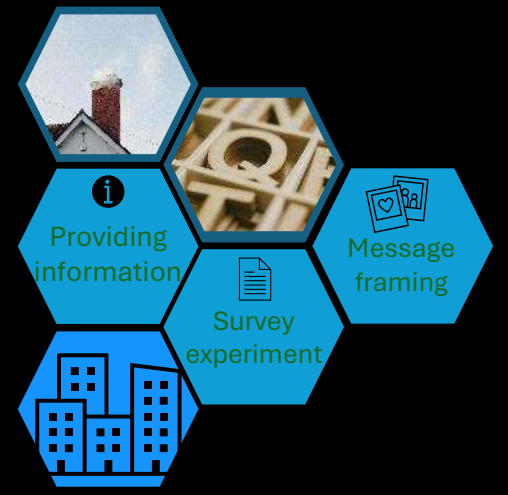


# Sandwell and Birmingham

**Air Quality Focus**

**Behavioural mechanism**

**Target group**




- A survey experiment to test the effect of framing information on the Smoke Control Area.

- A survey experiment to understand what kind of messaging is most effective at debunking common air quality myths.

## Question:

**Which message framing technique was most effective at changing AQ attitudes in Sandwell?**

**Health** or **Compliance**

# Answer: Compliance messaging was more effective.

**Compliance framing** was most effective at changing people's **attitudes**.

People in the **compliance framing** were more likely to **perceive** the Smoke Control Area as **positive**.

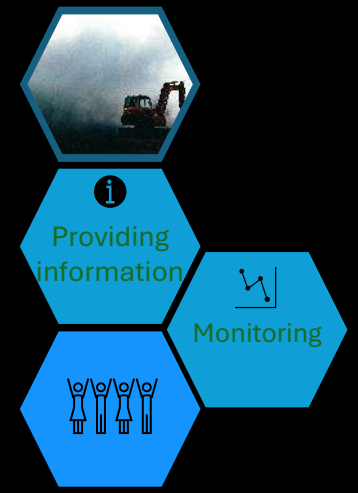
Both **compliance and health framing** were effective at improving people's **knowledge**.

# Wolverhampton

**Air Quality Focus**

**Behavioural mechanism**

**Target group**




- Using an information campaign and vehicle telematics to reduce idling at a construction site

## Question

Which engagement technique did participants say made them rethink idling activities the most?

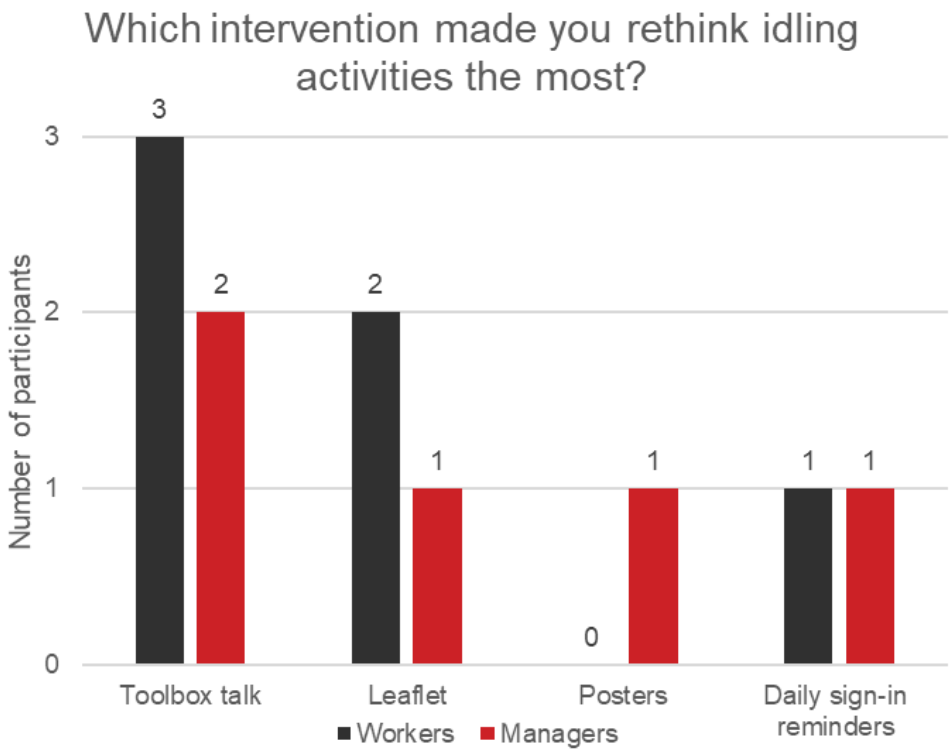
Toolbox talks, anti-idling posters, information leaflets, or daily sign-in reminders?

# Answer: Toolbox talks were the most effective.

A **20% reduction in idling** was recorded during the trial period

**Myth-first messaging** was effective at debunking idling myths

The most effective intervention message for **management** was about **cost-savings**. The most effective intervention message for **workers** was about **health impacts**.



# Dudley

Air Quality Focus

Behavioural mechanism

Target group



- Testing which behavioural mechanism is most effective at getting sports club attendees to reduce car use

## Question:

**Which incentive was most effective at reducing car use in Dudley?**

**Financial incentive, team competition or personal goal setting?**

# Answer: the team competition was most effective.

**Social norming** (working as a team) was the most effective mechanism at encouraging **behaviour change.**

Participants were motivated by not wanting to let down their team and by encouragement from team members.

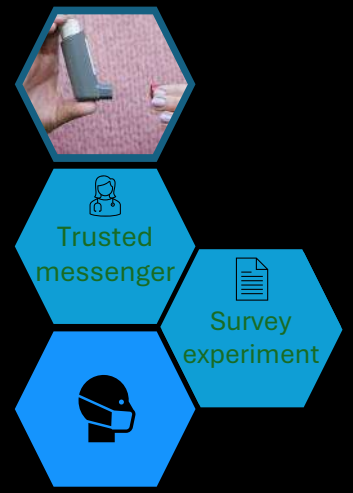
Most participants stated they were likely/very likely to continue using active travel modes.

# Solihull

**Air Quality Focus**

**Behavioural mechanism**

**Target group**




Using pharmacists as a trusted messenger, people with respiratory conditions were provided with an information on the impacts of air quality when visiting local pharmacies.

## Question

Out of 300 flyers shared with the public, how many people scanned the QR code for more information on air quality?

# Answer: One.

We added **Friction.** The feedback from the pharmacists was that while the information was interesting and well received, people were in a rush, didn't want to hang around, and generally didn't end up in a position to sit and read a flyer, then scan a QR code.

# Walsall and Coventry

Air Quality Focus

Behavioural mechanism

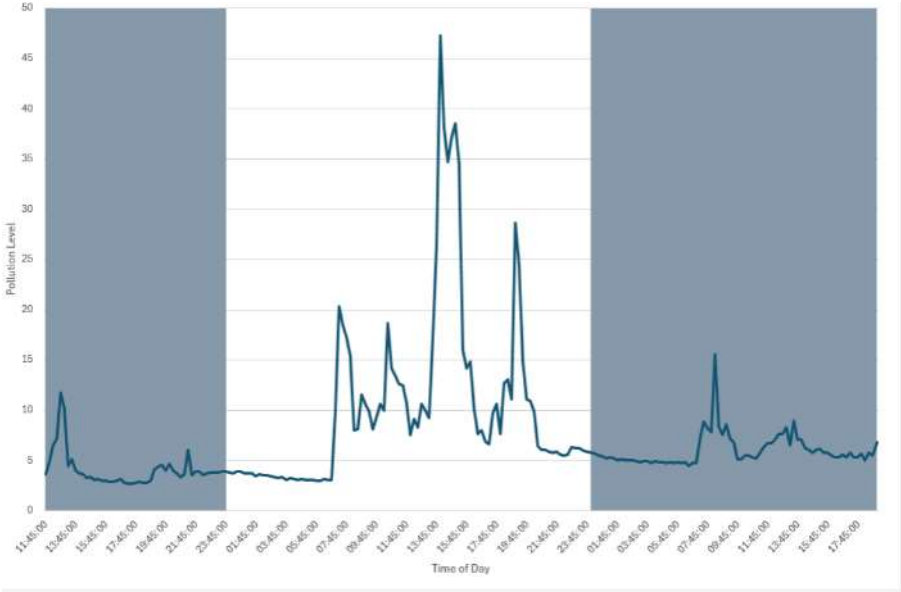
Target group


- Volunteers carried air quality monitors to measure their exposure to PM2.5 while carrying out normal daily activities, both inside and outside of the house.

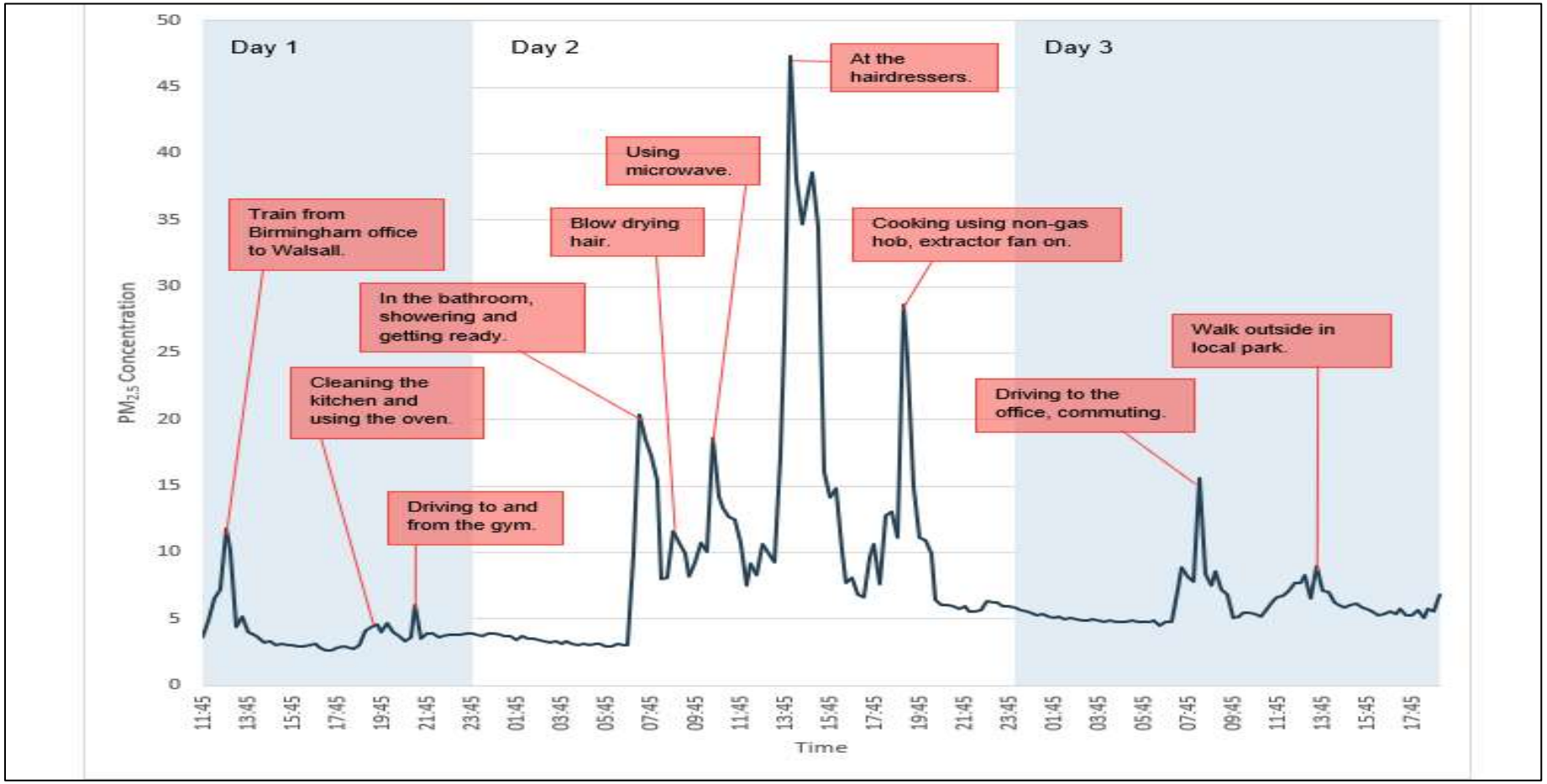
- Indoor air quality monitors in households with a wood burning stove to monitor the impact on air quality when the stove was in use.

## Question:

**What activity might have caused this peak in PM2.5 exposure in Walsall?**

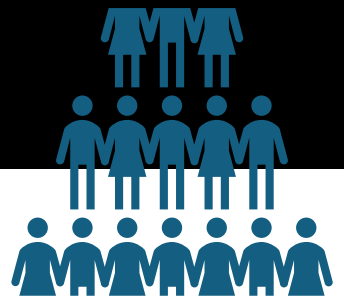


# Answer: visiting the hairdresser.

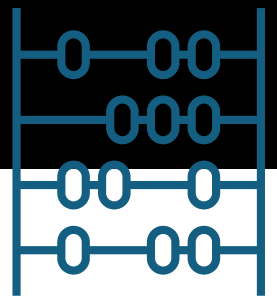


# What worked?

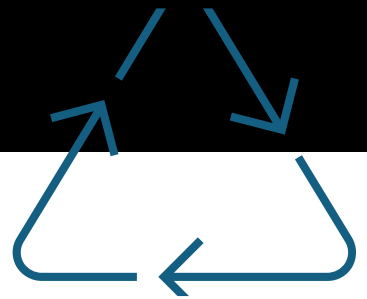
- Shared ownership of trials by engaging with local authorities to direct the trials



- Community engagement – we exceeded our engagement target



- Replicable trials that had a clear air quality and behaviour change focus

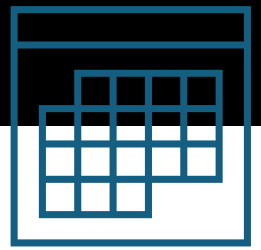


- Incorporating learnings throughout by staggering the delivery of trials and designing based on what we learned

# What caused challenges?

- Relying on volunteers to support delivery

- Sharing information via QR codes

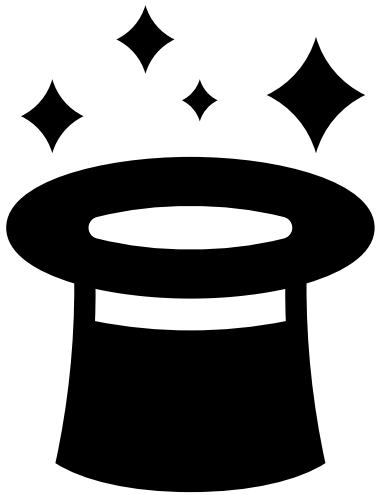


- Timescales

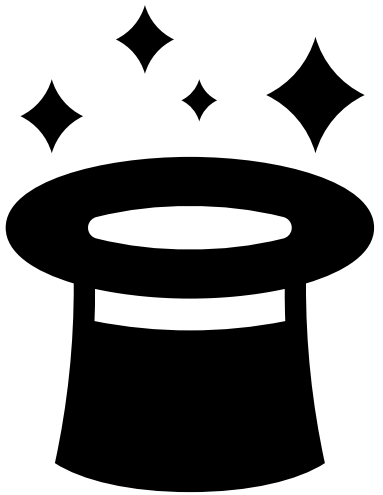
# THE POLLUTION SOLUTION SHOWDOWN

# Your turn to be a researcher!

- What is your challenge?



- What is your cohort?



# Task 1

- What emissions/ behaviours could you address with your cohort?

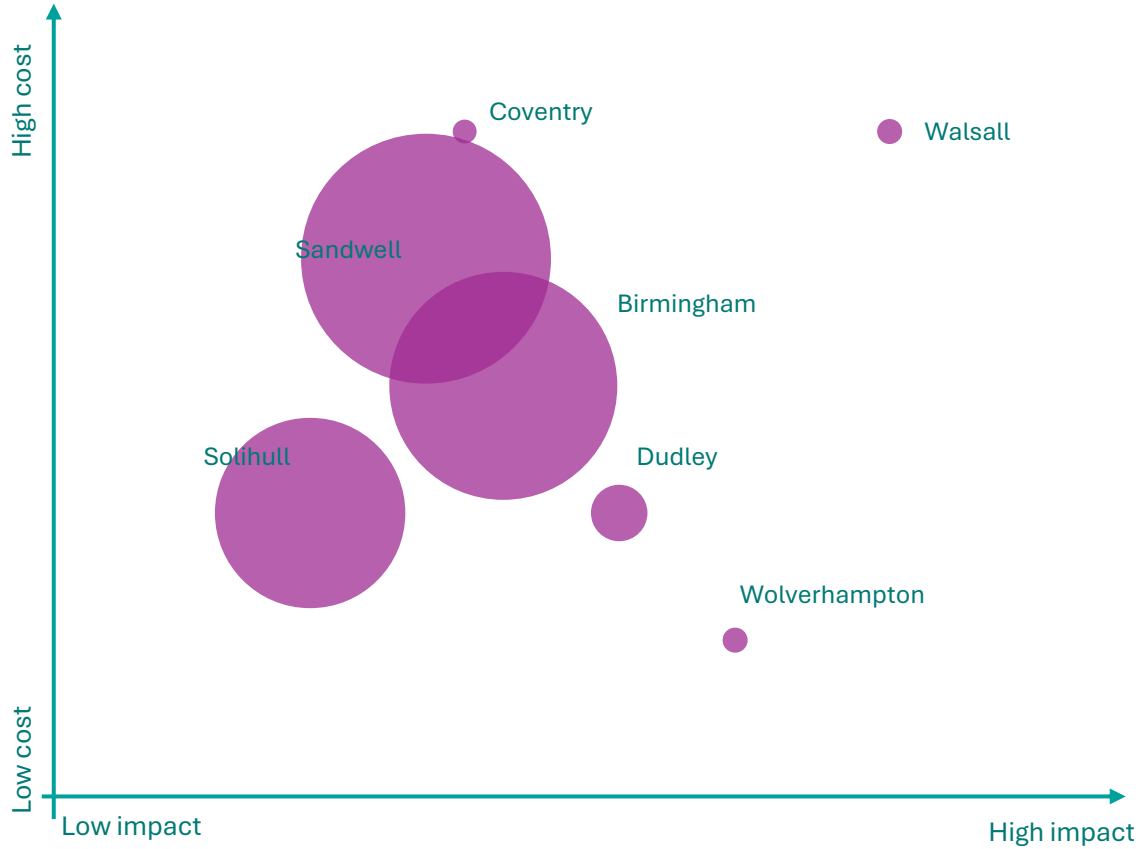

# Task 2

- Design an intervention to address this challenge, with your cohort and topic.

# Task 3

- Pre-mortem:
- Why will it work?

# What is your intervention and where does it land on the chart?



# Thank you!

**James Knoll-Pollard**

**Behavioural Design Lead, Communities and Mobility, WSP**

**James.knoll-pollard@wsp.com**

**Eilis Garvey**

**Principal Consultant, Communities and Mobility, WSP**

**Eilis.garvey@wsp.com**

# Air quality behaviour change


## Siobhan Sadlier

Engagement Executive, WMCA

## Lauren Hoyle

Engagement Officer, WMCA


West Midlands Combined Authority

Greener Together

# Engagement – One Conversation at a time

7 Data Visualisation workshops across region engaging 82 individuals.

7 Pop Up Exhibitions with general public in footfall hot spots engaging 200+ individuals

Community based pop up exhibitions in partnership with community based organisations engaging 50+ individuals (delivery ongoing)


West Midlands Combined Authority

# Role of Art in Engagement

- Process of making art collectively
- Attention grabbing stimulus for conversations in public
- Strengthening relationships with community organisations and members in displaying their art work
- Sense of being part of a regional effort

# Art Competition

- Only 2 entries.
- Feedback – fostering competition rather than collaboration amongst artists.
- Featured artist in exhibition prominently.

# Community Researchers

- Introduction to community research skills workshop
- Co create questions
- Vox pops – audio recordings and flip charts.
- Next steps – co produce analysis and dissemination.

West Midlands Combined Authority

# Engagement – Discovering Community's 'Touch Point' to Air Quality

- Small Sparks – small grants for community groups and organisations to experiment.
  - Applications incoming
  - Opening up interpretations of air quality awareness and activity that brings people together
- Community Researchers – local citizens keen to explore their interests around air quality.
  - Opening up conversations of how air quality is perceived, understood and acted upon.

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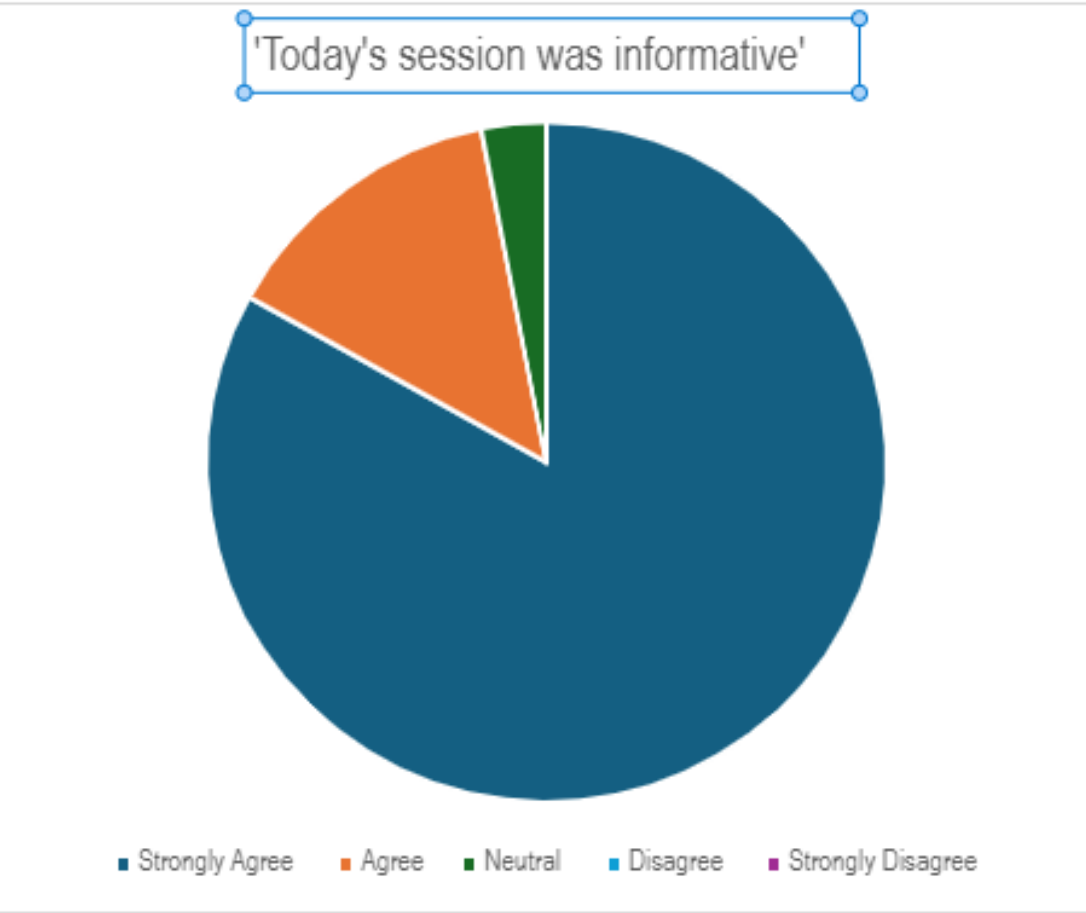
# Evidence of creative approach's efficacy





# Key quotes from data visualisation workshops – focusing on process *and* outputs

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*"This is like school  but a really cool school"*

*"I don't learn by school or YouTube – I learn by doing"*

*"When you're gluing the lungs down, it makes you think, it really sinks in"*

*"Making the ink  is a great way to learn about this"*

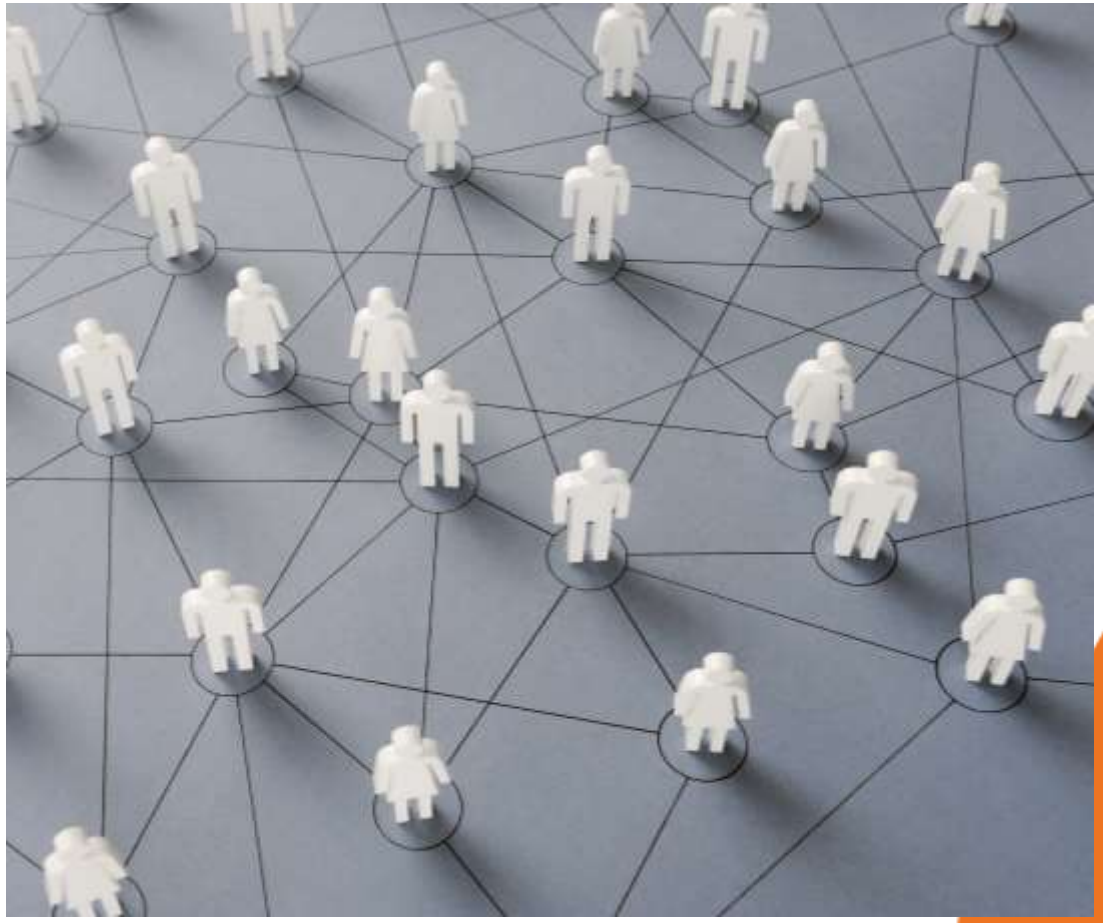
West Midlands Combined Authority


# Key Principles of Practice (½)

1. Two way conversations - not an announcement understanding how air quality is interpreted, what is prioritised will help future messaging.

# Key Principles of Practice (2/2)

1. Art – process *and* outcomes. the workshops didn't just produce stimulating assets for exhibitions, they helped people learn about issues.



# ‘Living’ questions

| | |
|---|---|
| Where am I discovering community perceptions and priorities around air quality? | • Evaluation questions<br>• Community Research<br>• Data visualisation workshop pre-engagement. |
| How am I discovering community based strengths in effort to improve air quality? | • Small sparks fund. |

# Air quality behaviour change & engagement

**How can we mainstream and scale up behavior change and engagement measures to support improvements to air quality?**

- What are the best practices for engaging communities most impacted by air pollution?

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# Air quality policy and targets


Joe Acton

Impact Fellow, University of Birmingham

Jackie Homan

Head of Environment, WMCA


West Midlands Combined Authority

Greener Together

# Air Quality Stretch Targets for the West Midlands

June 2025

Dr Joe Acton, Prof William (Bill) Bloss &
the WM-Air team

**WM-AIR**
CLEAN AIR SCIENCE FOR
THE WEST MIDLANDS

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@WMAIR_UOB
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# Stretch Targets for the West Midlands ?

**Motivation**

- Protection of health – mortality, illness, healthcare cost, productivity … childhood asthma
- Evidence for harm to health at levels below current “threshold” targets
- Reduce environmental inequality between different communities

- Scope for local and regional action (in some respects), delivering local and regional benefits
- UK / England targets are, arguably, not as stretching as they might be: London factor

# Stretch Targets for the West Midlands ?

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- UK / England targets are, arguably, not as stretching as they might be: London factor

**Approach**

- Review of air quality “target” approaches in the UK and elsewhere
- Assessment of current air quality levels vs present-day and future targets
- Exploration of future air quality anticipated (e.g. under “business as usual” activity) and possible policies / scenarios

- Identification of options for stretch targets for the West Midlands
- Estimate of benefits – health, and environmental inequality / equity

# Air Quality “Targets”

- Air quality targets, limits and objectives have been set by supranational, national, regional and local governments and organisations

- These targets typically focus on particulates ($PM_{10}$ and **$PM_{2.5}$**) and nitrogen oxides (**$NO_2$** and $NO_x$)

- In addition to these species UK limits are in place for: ozone, sulphur dioxide, polycyclic aromatic hydrocarbons (PAHs), benzene, 1,3-butadiene, carbon monoxide and lead

- Targets can be focused on:
  - Emission controls – a maximum rate of pollutant emission from a specific source (e.g. an industrial site)
  - **Concentration limits – a set concentration that should not be exceeded (often an annual average)**
  - **Exposure reduction – reducing the concentration to which a percentage of the population are exposed**

# Which Pollutants?

- **Nitrogen dioxide** ($NO_2$)
  - Current exceedances of national standards within the region
  - Small health impact relative to particulates
  - Concentration mainly driven by local road traffic
- **Fine particles** ($PM_{2.5}$)
  - No exceedances of current national standards within the region (although much of the region is above the 10 µg $m^{-3}$ to be achieved by 2040 set by the Environment Act)
  - Large impact on health
  - Concentration driven by a broad range of local and regional sources
- **Ozone** ($O_3$)
  - No exceedances of current targets, but levels expected to rise (as NO emissions fall: less NO + O3 titration)
  - Potential future health impact
  - Long-lived: Concentration driven by regional and wider emissions, transport
- **Ultrafine Particles** (UFP)
  - Health impact (as per WHO) but no clear guidelines or standards; no established measurement capability (beyond BAQS)

# WHO guidelines, 2021

- WHO issues health based air quality guidelines in the form of limit values
- The published guidelines are the level below which there is less certainty (no evidence) for an impact on health
- **Interim target levels** are provided alongside **guideline levels**

| | Nitrogen dioxide, $NO_2$ | $PM_{2.5}$ |
|---|---|---|
| **2021 WHO guidelines** | 40/30/20 **10** | 35/25/15/10 **5** |

# UK (England) Policy

**Concentration Limits**

- DEFRA set binding annual mean concentration targets (in force now) for **$NO_2$ (40 µg $m^{-3}$)** and **$PM_{2.5}$ (20 µg $m^{-3}$)**
- The Environment Act, 2021 updated the **$PM_{2.5}$** target to **10 µg $m^{-3}$** to be achieved by **2040**
- The Environmental Improvement Plan 2023 sets an interim $PM_{2.5}$ target of 12 µg $m^{-3}$ to be achieved by 2028

(Limits also in place for ozone, sulphur dioxide, polycyclic aromatic hydrocarbons (PAHs), benzene, 1,3-butadiene, carbon monoxide and lead)

**Exposure reduction**

- UK **Clean Air Strategy (2019) aimed to achieve a 50% reduction** in the number of people living in locations above the 2005 WHO $PM_{2.5}$ guideline level (10 µg $m^{-3}$) by 2025
- The Environment Act, 2021 set a legally binding target for a **35% reduction in population $PM_{2.5}$ exposure by 2040** (compared to a base year of 2018)
- The Environmental Improvement Plan 2023 sets an interim $PM_{2.5}$ exposure reduction target of 22% to be achieved by **2028**

# European Union (EU)

**Concentration limits**

- The EU sets air quality targets for member states and member states are required to monitor air quality and report exceedances to the European Environment Agency (EEA)

- A new EU Directive 2024-2881 (October 2024) set more ambitious binding targets for **$NO_2$ (20 µg $m^{-3}$** annual mean) and **$PM_{2.5}$ (10 µg $m^{-3}$** annual mean) to be achieved by 2030, bringing them in line with WHO interim target levels

Official Journal of the European Union

EN
L series

2024/2881

20.11.2024

DIRECTIVE (EU) 2024/2881 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 23 October 2024

on ambient air quality and cleaner air for Europe

(recast)

# Regional and local authorities

- In places regional and local authorities have enacted more ambitious air quality targets than required by national legislation, either through **lower concentration targets** or **reducing the timeframe** for delivery

- The GLA have set a target of reaching an annual average **$PM_{2.5}$ of 10 µg $m^{-3}$ by 2030**, 10 years ahead of the national target

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**Oxford:** In January 2021 Oxford City Council set a new **30 µg $m^{-3}$ target for $NO_2$** annual mean concentration to be achieved by 2025 in their AQAP

- A Zero Emissions Zone will be introduced in two phases to support local air quality objectives

- The first, trial, phase was introduced in 2022. All petrol and diesel vehicles, including hybrids, incur a daily charge when driven into the trial area between 7am and 7pm

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**Richmond:** London Borough of Richmond upon Thames have a objective to reduce annual average **$NO_2$ concentrations to below 20 µg $m^{-3}$** at all measurement sites in the borough by 2029

- This is a draft Action Plan is currently undergoing an consultation

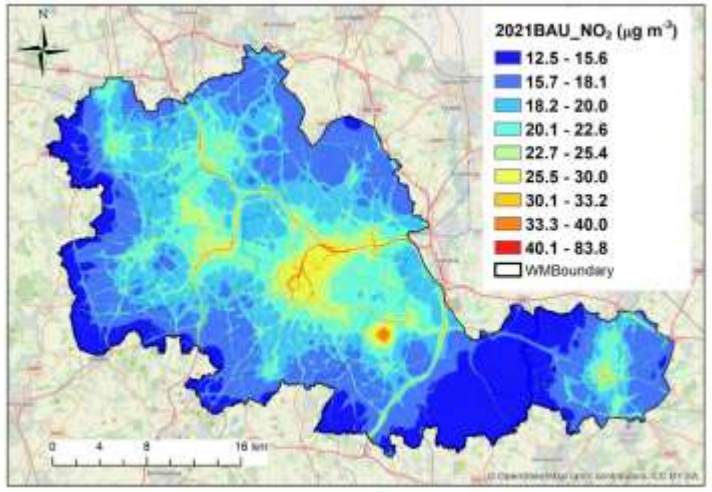
- This is in addition to the London wide target to reduce $PM_{2.5}$ annual averages in London to below 10 µg $m^{-3}$.
- Action plan proposes action on road traffic, wood burning and also commercial kitchens and restaurants

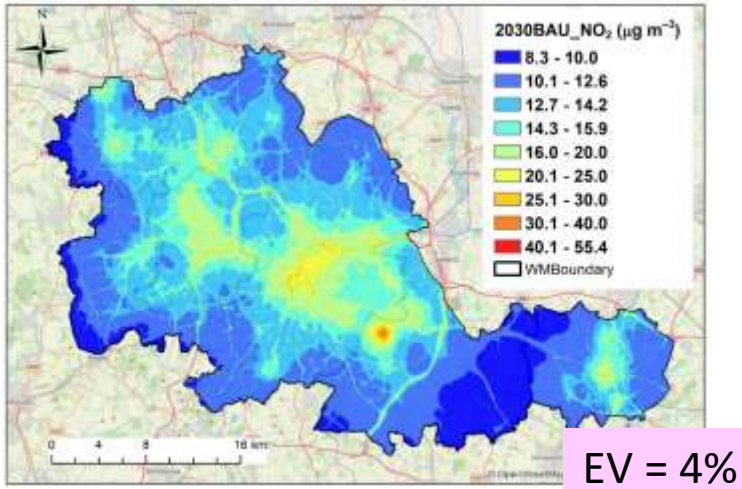
# Summary of annual average concentration targets/limits

| Organisation | $NO_2$ (µg $m^{-3}$) | $PM_{2.5}$ (µg $m^{-3}$) |
|---|---|---|
| WHO | 10 | 5 |
| EU | 20 (by 2030) | 10 (by 2030) |
| UK | 40 | 20 (10 by 2040) |
| Scotland | 40 | 10 |
| Wales/Northern Ireland | 40 | 25 |
| Greater London Authority | NA | 10 |
| London Borough of Camden | 10 (by 2034) | 5 (by 2034) |
| Richmond Borough Council | 20 (by 2029) | 10 (by 2029) |
| Oxford City Council | 30 (by 2025) | NA |
| Greater Cambridge | 20 (by 2029) | 10 (by 2029) |

# Present Day vs Business-As-Usual (BAU) 2030

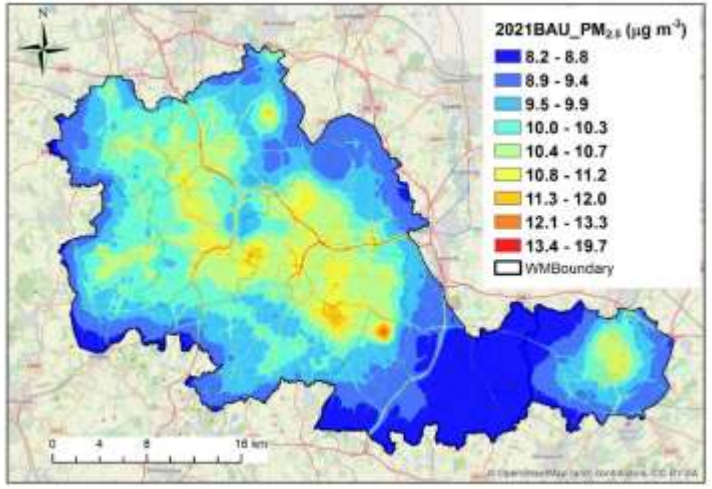
$NO_2$

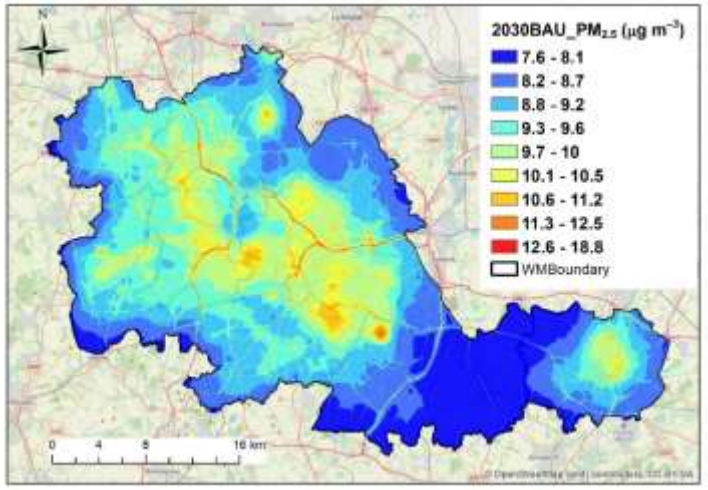



EV = 4% cars, 0.0015% HGVs)

$PM_{2.5}$




Now (2021)

2030

# Towards a regional target: $NO_2$

**Current targets**

| Target/Objective/Guideline | $NO_2$ (µg $m^{-3}$ annual mean) |
|---|---|
| Current binding DEFRA air quality limit (England) | 40 |
| WHO 2021 air quality guideline | 10 |
| WHO 2021 air quality interim targets | 40/30/20 |

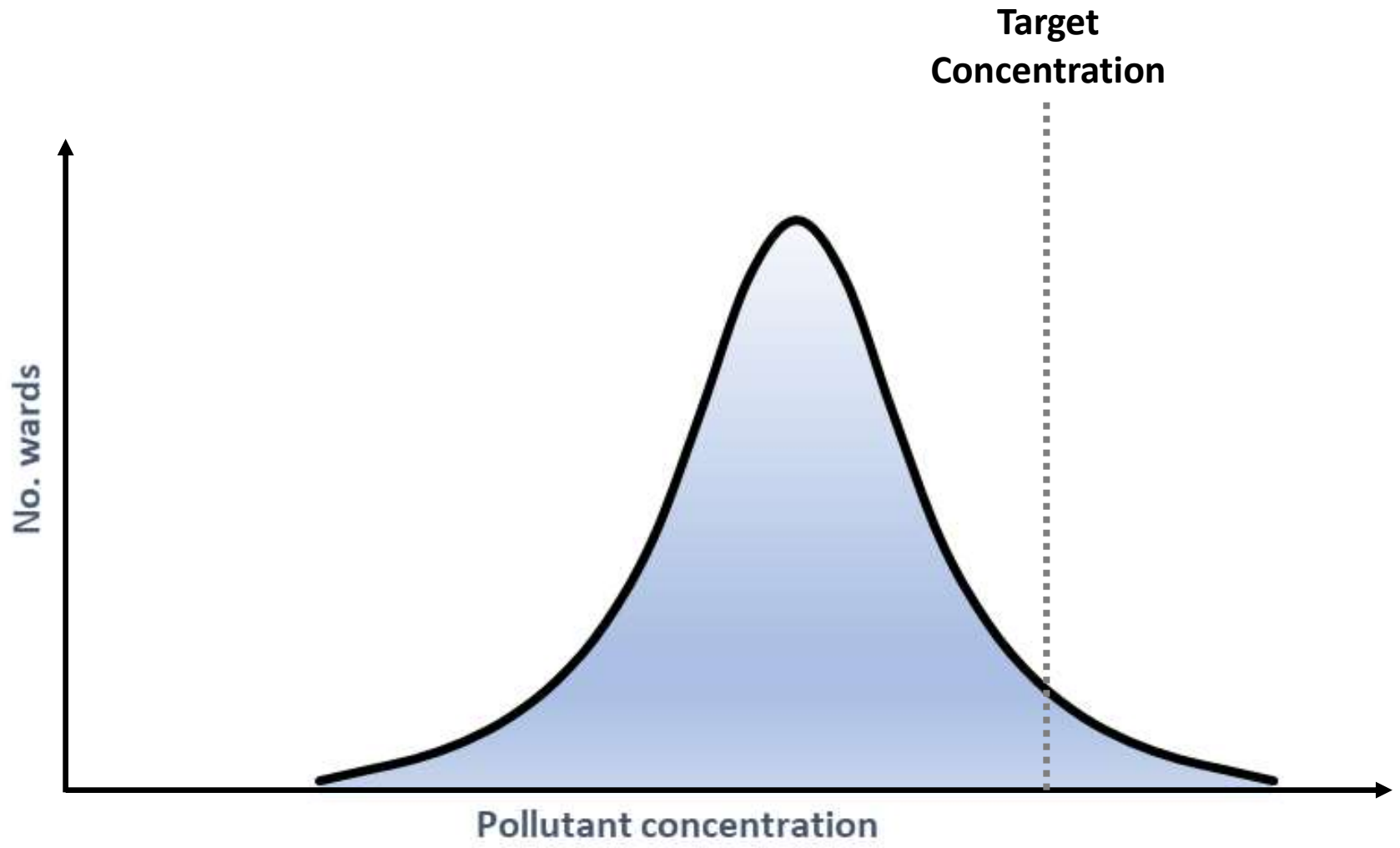
# Towards a regional target: $NO_2$

- **Concentration limits**:
  - WHO interim targets are 40, 30 and 20 μg $m^{-3}$
  - 30, 20 and 10 μg $m^{-3}$ adopted by different local/regional authorities in England (non-binding)
  - Modelling suggests 20 μg $m^{-3}$ annual average background concentration may be attainable by 2030

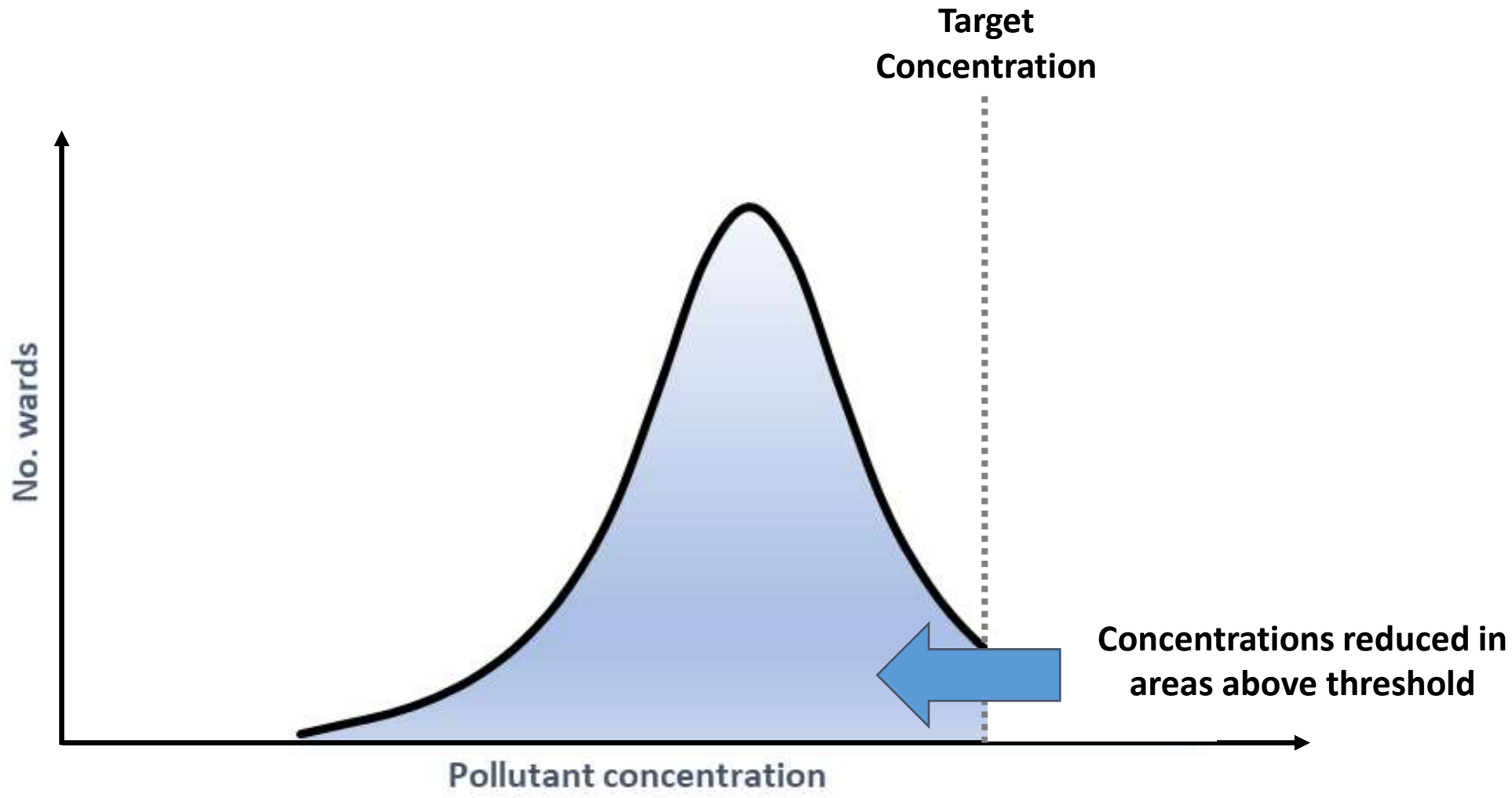
- **Disparity reduction:**
  - Disparity between wards could be addressed through a target e.g. an annual 5% reduction in the difference in ward average concentration between the least and most polluted wards

- **Timescale**:
  - Where LA's have set regional air quality objectives the time scale has been driven by local priorities (generally in the range 2025-3035)
  - EU are working towards a date of 2030
  - Environment Act targets ($PM_{2.5}$) 2040 (2028 interim)

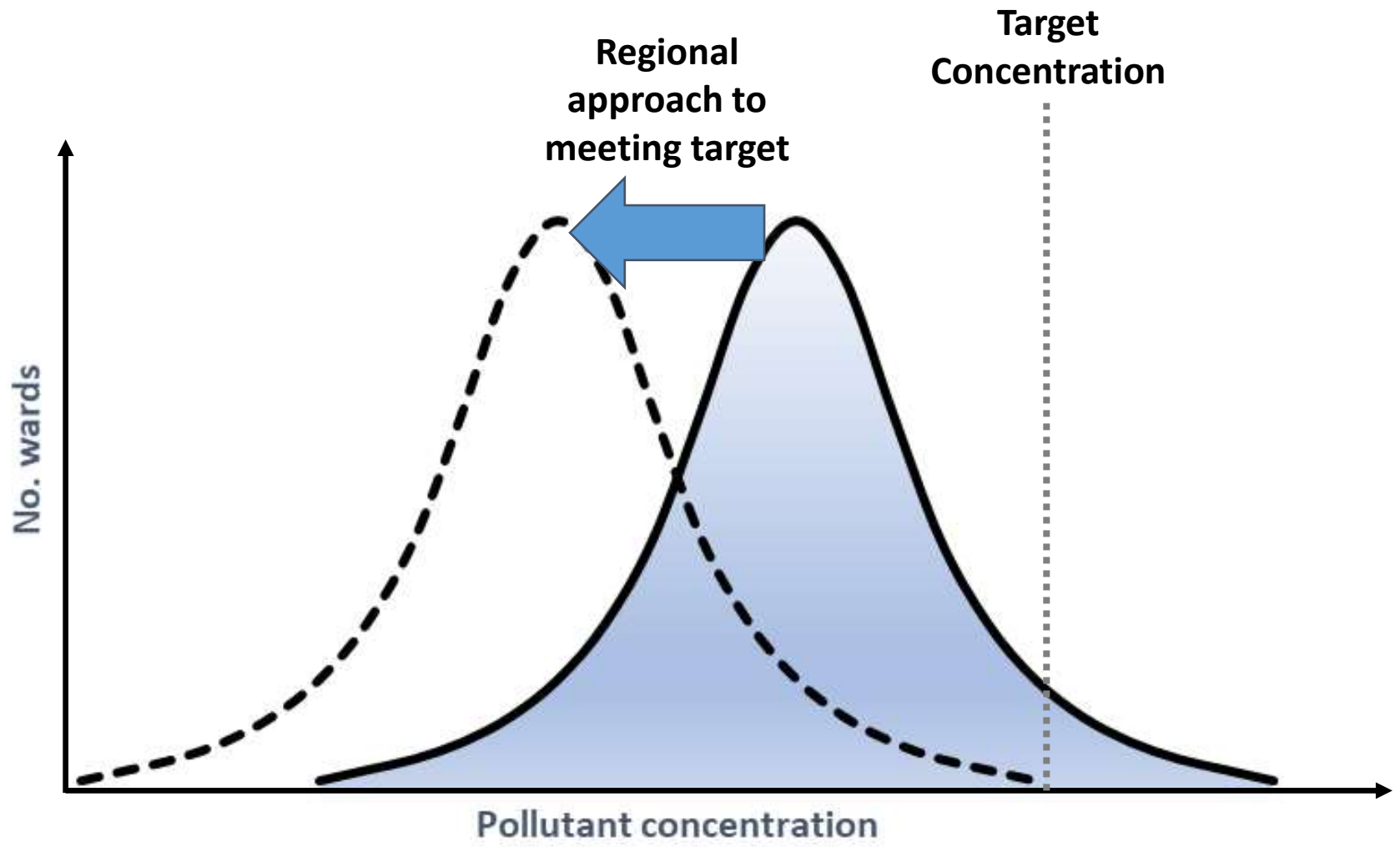
# Routes to achieving target concentrations



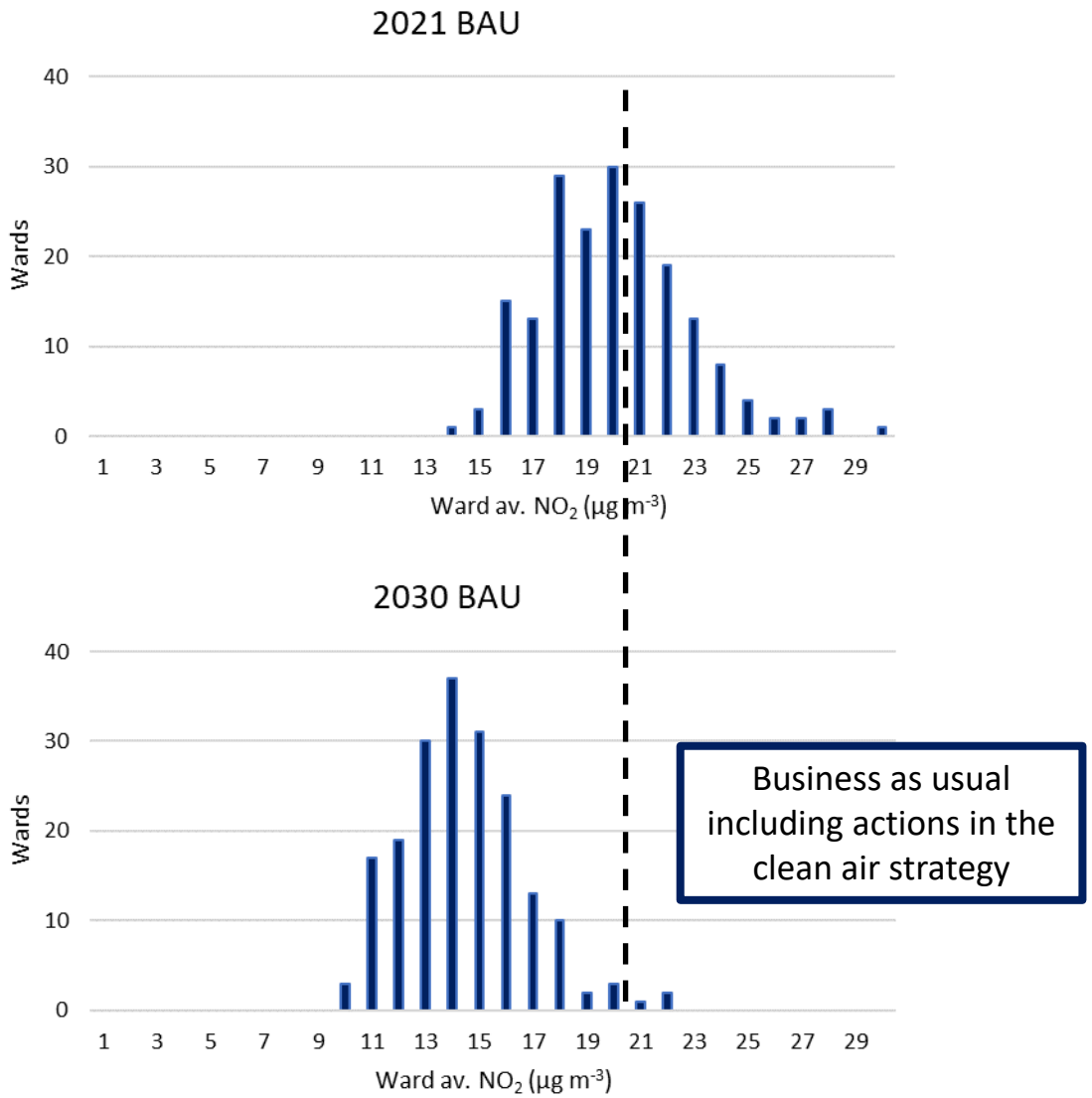
# Routes to achieving target concentrations: **1 target only areas above threshold**



# Routes to achieving target concentrations: **2 concentration reduced across the region**



# 20 µg $m^{-3}$ ward average $NO_2$



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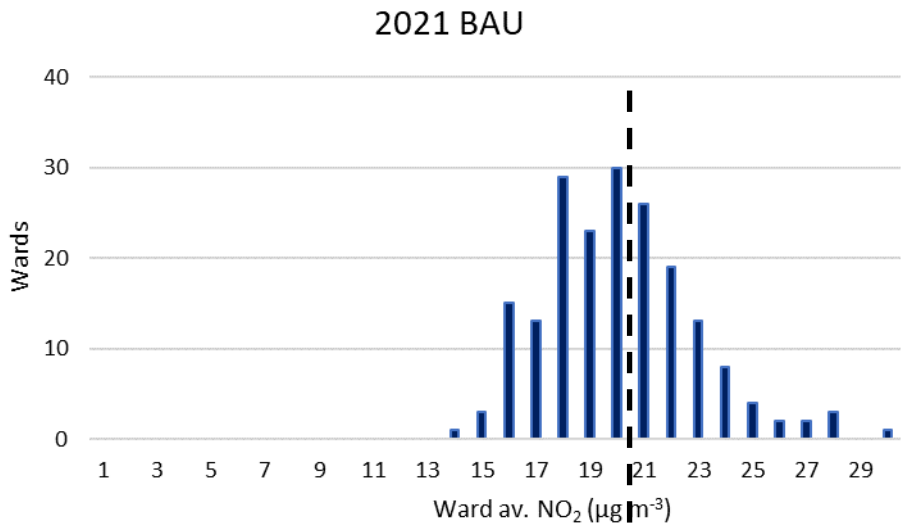
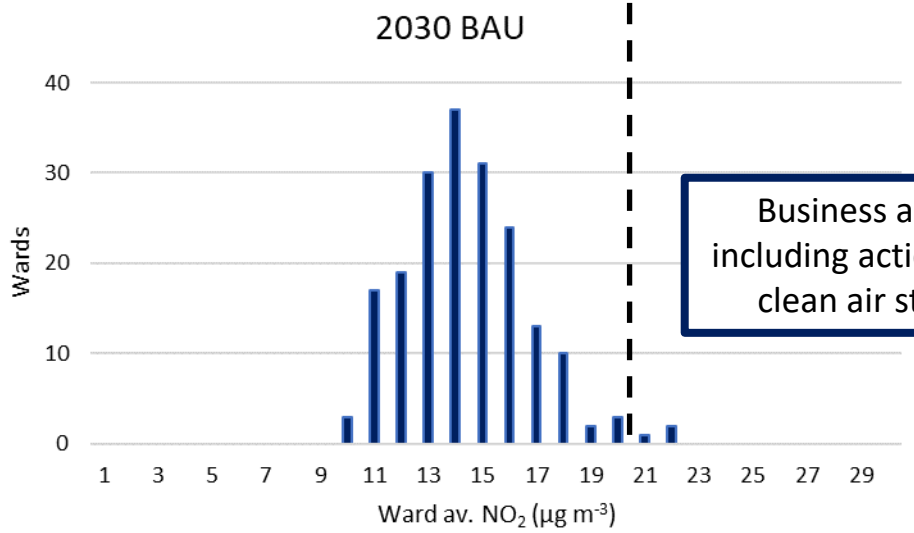
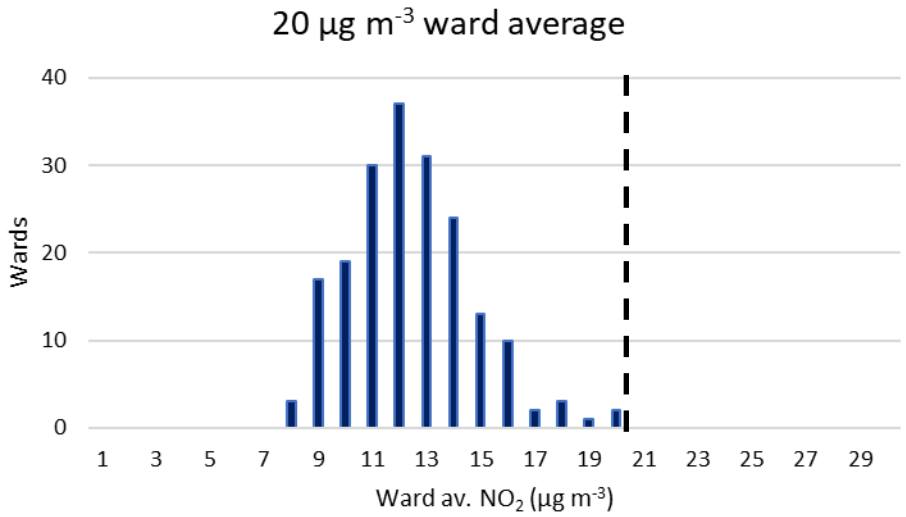



Business as usual including actions in the clean air strategy

Assuming action across region




**Health impacts**

Reduction in disease and mortality associated with $NO_2$ exposure relative to BAU:

- 10% reduction in deaths
- 9% reduction in asthma
- 10% reduction in lung cancer

# Towards a regional target: $PM_{2.5}$

**Current targets**

| Target/Objective/Guideline | $PM_{2.5}$ (µg $m^{-3}$ annual mean) |
|---|---|
| Current binding DEFRA air quality limit (England) | 20 |
| WHO 2021 air quality guideline | 5 |
| WHO 2021 air quality interim targets | 35/25/15/10 |
| Environment Act, to be achieved by 2040 (2028) | 10(12) |
| 35% reduction in exposure by 2040 relative to 2018 | |

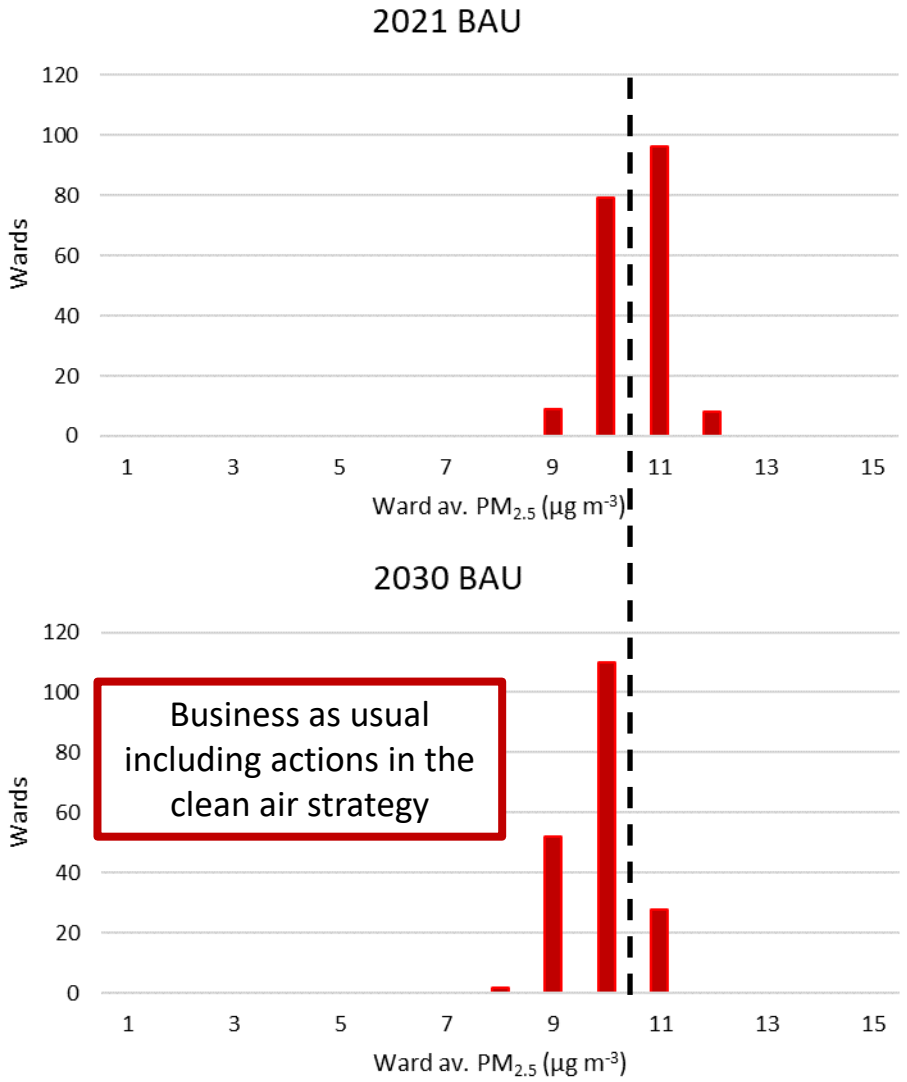
# Towards a regional target: $PM_{2.5}$

- **Concentration limits**:
  - 20, 10 and 5 μg $m^{-3}$ adopted by different local/regional authorities in England (non-binding)
  - 5 μg $m^{-3}$ WHO guideline will not be met but modelling suggested that **10 μg $m^{-3}$** England target (and WHO interim target) ) likely attainable well before 2040 (current DEFRA target date)
  - Modelling suggests a stretch target of an annual average concentration of 10 μg $m^{-3}$ could be achieved by 2030

- **Disparity reduction:**
  - Disparity between wards could be addressed through a target e.g. an annual 5% reduction in the difference in ward average concentration between the least and most polluted wards

- **Timescale**:
  - Where LA's have set regional air quality objectives the time scale has been driven by local priorities (generally in the range 2029-3035)
  - EU are working towards a date of 2030
  - Environment Act targets 2040 (2028 interim)

# 10 µg $m^{-3}$ ward average $PM_{2.5}$



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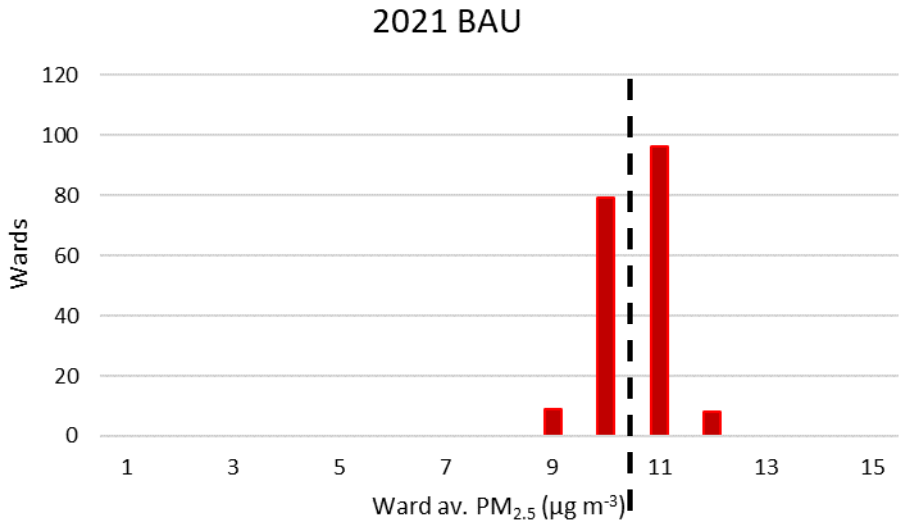
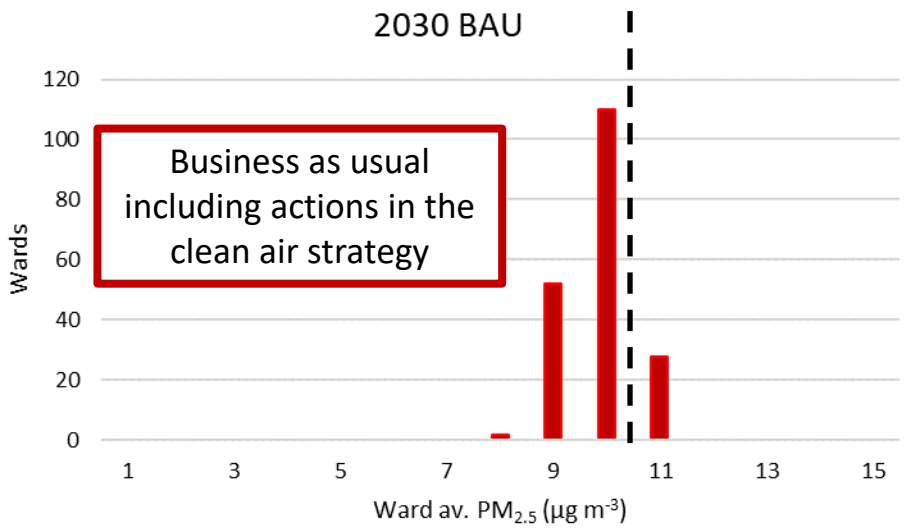
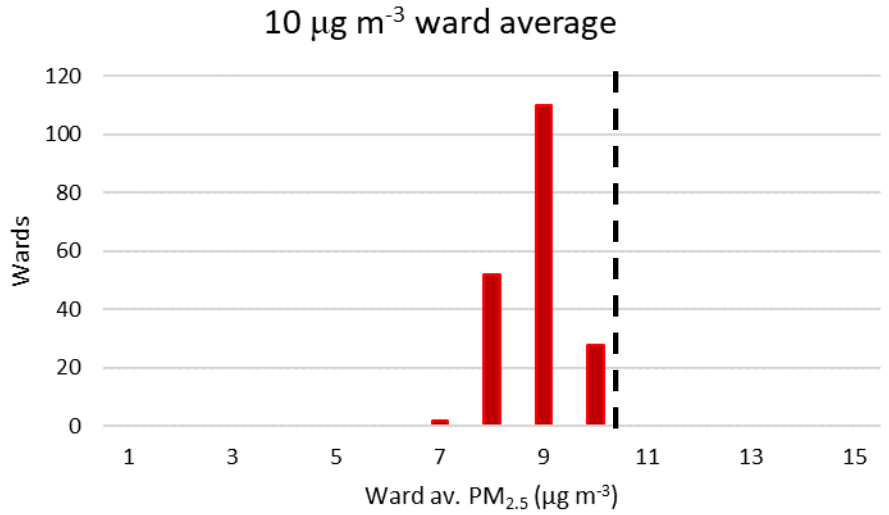



Assuming action across region




**Health impacts**

Reduction in disease and mortality associated with $PM_{2.5}$ exposure relative to BAU:

- 4% reduction in deaths
- 3% reduction in asthma
- 3% reduction in coronary heart disease
- 4% reduction in lung cancer and strokes

# Towards regional Air Quality targets for health

**$NO_2$**

Stretch Target: background concentration < 20 μg $m^{-3}$ by 2030

Progress Measure: 5% annual reduction in the difference between the most and least polluted wards

**$PM_{2.5}$**

Stretch Target: concentration < 10 μg $m^{-3}$ by 2030

Progress Measure: 5% annual reduction in the difference between the most and least polluted wards

- Progress evaluated against DEFRA modelling

# Thank you

# Air quality policy and targets

**How could regional stretch targets accelerate air quality action across the West Midlands?**

- What are your views on adopting the stretch targets?
- What are the implications of the stretch targets for your work?
- What support would be required to communicate and deliver the stretch targets?

West Midlands Combined Authority | Greener Together

# Transport interventions for cleaner air


## Jake Thrush

Associate Policy Advisor, Transport for West Midlands


West Midlands Combined Authority

Greener Together

# Transport for West Midlands

# Transport Strategy to Improve West Midlands Air Quality, and the role of an integrated public transport system

Jake Thrush

WMCA Air Quality Conference

5 June 2025

# Transport Strategy to improve air quality

Overall air quality strategy in the West Midlands is aimed at reducing NO2 levels and fine particulate levels (PM2.5s).

It is based on:

-public transport, walking and cycling capital scheme improvements

-behaviour change awareness and promotion campaigns, especially with schools

-Birmingham's Clean Air Zone

-Improved monitoring

-Bus vehicle fleet improvements

-Electric charging points roll out

-Improved signalised junctions with dynamic traffic management

-Land use planning policies and development control

-Smoke Control Areas and campaigns to reduce domestic burning

The transport  themes are part of the overall Local Transport Plan sustainable urban transport strategy for the West Midlands

# West Midlands Local Transport Plan 5

West Midlands Local Transport Plan 5 has five overarching aims (“motives for change”):

-Sustaining economic success

-Creating a fairer society

-Supporting local communities and places

-Becoming more active

-Tackling the climate emergency


**We need to create an “anywhere to anywhere”, integrated public transport system to help us deliver these five, overarching aims, which include improving air quality. We also need improved conditions for walking and cycling and demand management measures to help reduce some car use**

# Walking and Cycling Improvements

Transport for West Midlands

Walking and cycling excel for trips:

0 – 1 km walking

1 – 3 km cycling

Plus key role for cycling for 3 – 8 km (as well as bus for these trips)

Local residential area improvements and strategic cycle network (segregated cycle tracks)

# Demand Management

Need to reduce car vehicle kilometres whilst improving ability of people to reach desired destinations

Politically difficult to implement demand management, but can be done, eg roadspace allocation for bus priority, parking policies

Birmingham's Clean Air Zone has been successfully delivered by Birmingham City Council

# Public transport improvements

**TfWM seeking to create an integrated public transport system of three joined up network tiers:**

-Regional Rail and Metro Network

-Core Network (high frequency, main bus network, with higher capacity tramway or Bus Rapid Transit lines for a limited number of high volume/major growth corridors)

-Secondary Bus Network (lower frequency, network coverage bus services)

All underpinned by integrated ticketing, branding, information, promotion and high quality interchanges: small/medium on-street and larger strategic centre interchanges

Bus Franchising will support, alongside work with new rail industry structures

# Regional Rail and Metro Network

All Ten Strategic Centres Served: the “structural, backbone network”

(Birmingham, Brierley Hill, Coventry, Dudley, Solihull, Sutton Coldfield, UKCentral Hub (Airport/NEC), Walsall, West Bromwich, Wolverhampton)

# Core Network

Transport for West Midlands

Town and main district centres served by the Core Turn and Go Frequency Bus Network, includes some cross-city routes. Main urban flows served. Other key destinations served: hospitals, university and further education college campuses

**Core**



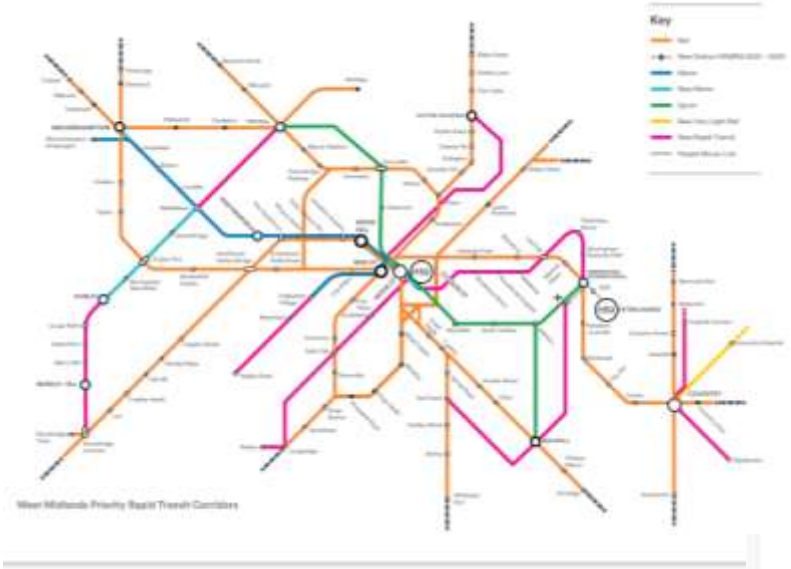
Plus a limited number of priority rapid transit corridors:

# Rapid Transit Priority Corridors

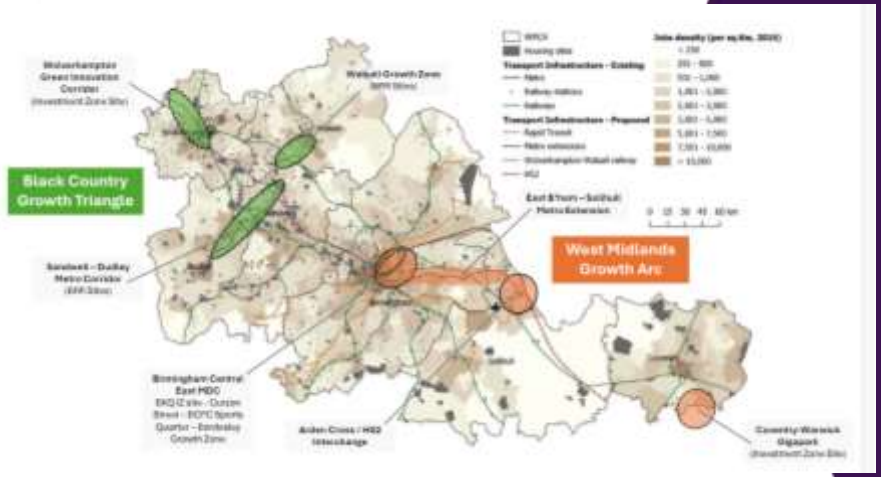
Transport for West Midlands

Eight rapid transit priority corridors: high volume/major development corridors ( either Metro tramway, Sprint Bus Rapid Transit or, potentially, Very Light Rail)

West Midlands Metro



**Sprint**

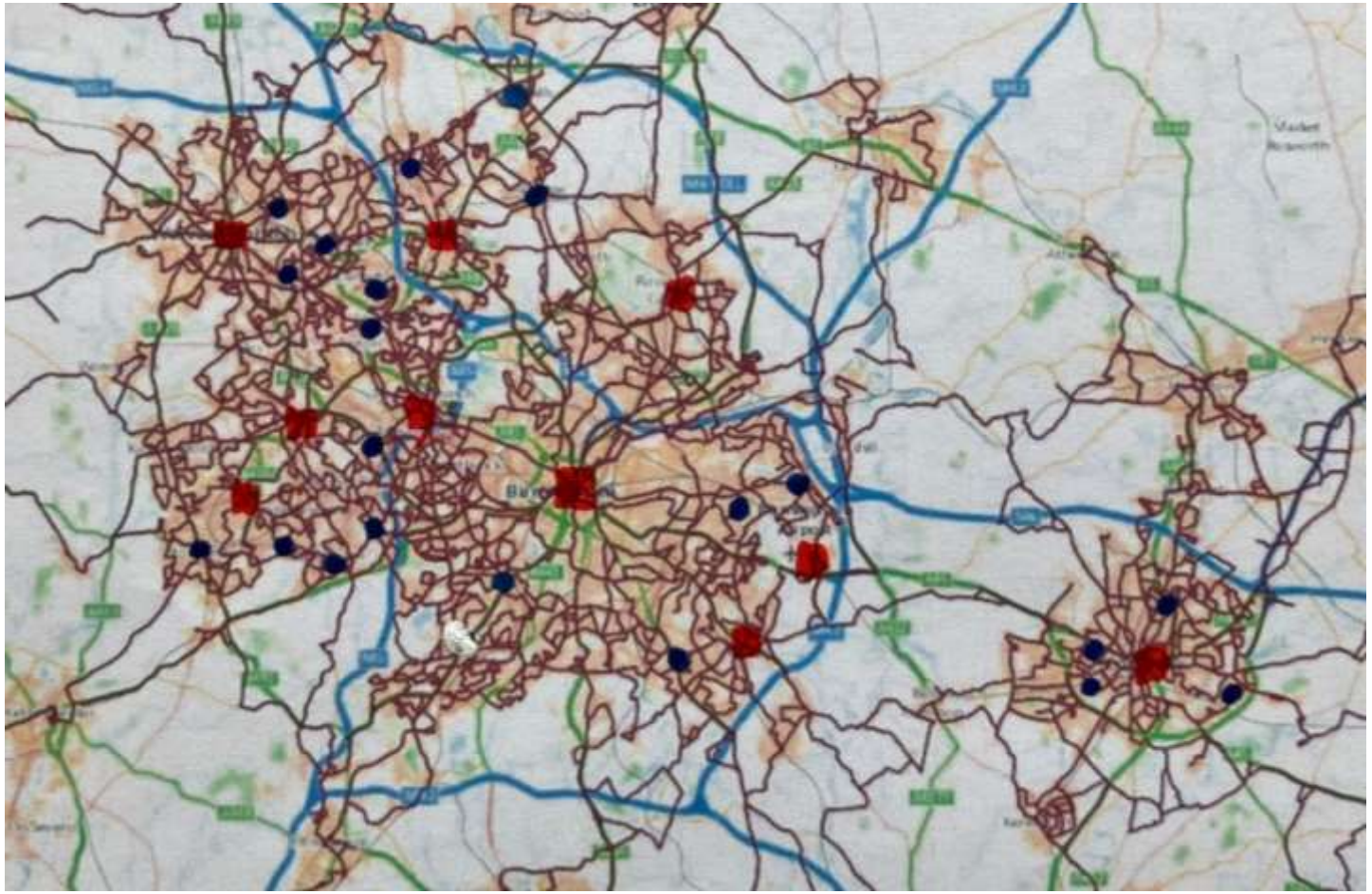


# Secondary Bus Network

Network coverage, lower frequency local bus network.

Includes a role for demand responsive transport

**Local**



# Three Network Tiers of an Integrated Public Transport System

Transport for West Midlands

**All underpinned by integrated ticketing, branding, information, promotion and high quality interchanges: small/medium on-street and larger strategic centre interchanges**




# West Midlands Air Quality Successes

Transport for West Midlands

In the four years between 2018 and 2022, there has been a two thirds reduction in the number of monitoring sites in the West Midlands with exceedance levels of annual average NO2 (greater than 40 µg/m3): from 77 sites down to 26. There will have been further reductions since 2022

Whilst monitoring is more limited, there has also been a reduction in the small number of monitoring sites with exceedance annual average levels for fine particulates: PM2.5. This is against the 2040 UK target for fine particulates (10 µg/m3)

Key measures:

Improved environmental performance of the fleet of 2000 buses (Euro VI and electric)

ULEV charging points to support private car, taxi and van transition to electric vehicles

Localised traffic signal junction improvements

Birmingham's Clean Air Zone

Localised cycling and walking improvements and use

Major programme of public transport improvements starting to come on-stream

University of Birmingham's WM-Air 6 Year Project  has fostered greater co-operation of local authorities and WMCA/TfWM

# Transport interventions for cleaner air


## Rachel Johnson

Senior Behaviour Change Officer,
Transport for West Midlands


West Midlands Combined Authority | Greener Together

# Demand Responsive Transport in the West Midlands

*5th June 2025*

# West Midlands on Demand

Transport for West Midlands


# Impact on use of sustainable modes

| | Net % change (% more-% less) |
|---|---|
| Passenger | -8% |
| Taxi | -7% |
| Bicycle | -5% |
| Driver | -3% |
| Train | +3% |
| Walk | +6% |
| Bus | +2% |

| Net % change (% more - % less) | Previous WMoD | Previous Ring and Ride |
|---|---|---|
| Taxi | -19% | +1% |
| Passenger | -17% | -2% |
| Bicycle | -9% | -1% |
| Driver | -8% | +1% |
| Train | +7% | +1% |
| Walk | +12% | +1% |
| Bus | +7% | -1% |

# Challenges

- Costs
- Demonstrating wider value
- Managing competing needs
- Increasing utilisation

# Extending the reach of WMoD

Physical Capability (involving a person's physical and musculoskeletal functioning): As a service that incorporates the ring and ride customers, it is an important factor in overcoming physical capability barriers.

Psychological Capability (a person's mental functions, e.g., understanding, memory and knowledge): Our research has shown that psychological Capability is a key aspect of the potential for uptake in the DRT service. It has revealed that we need to consider not just knowledge of the service but also their understanding of how it works and confidence that the service can meet their needs.

Reflective motivation (conscious through process, e.g., plans, evaluations): People expressed that trialling or testing the service might be helpful; they were keen to understand the process of booking and using the service and its practicalities.

Social opportunity (people and organisations, e.g., social norms and culture): Understanding who the service is for and believing that people like them can use the service are important elements to encourage more users. Examples of positive information from current users proved to be a popular way to communicate the service.

# How can we enable a greater adoption of demand responsive transport services?

Researching user behaviour and attitudes

Influencing Transport Lab

January 2024

# Transport interventions for cleaner air


## Eliot Wilde

Zero emission bus programme manager,
Transport for West Midlands


West Midlands Combined Authority

Greener Together

Transport for West Midlands

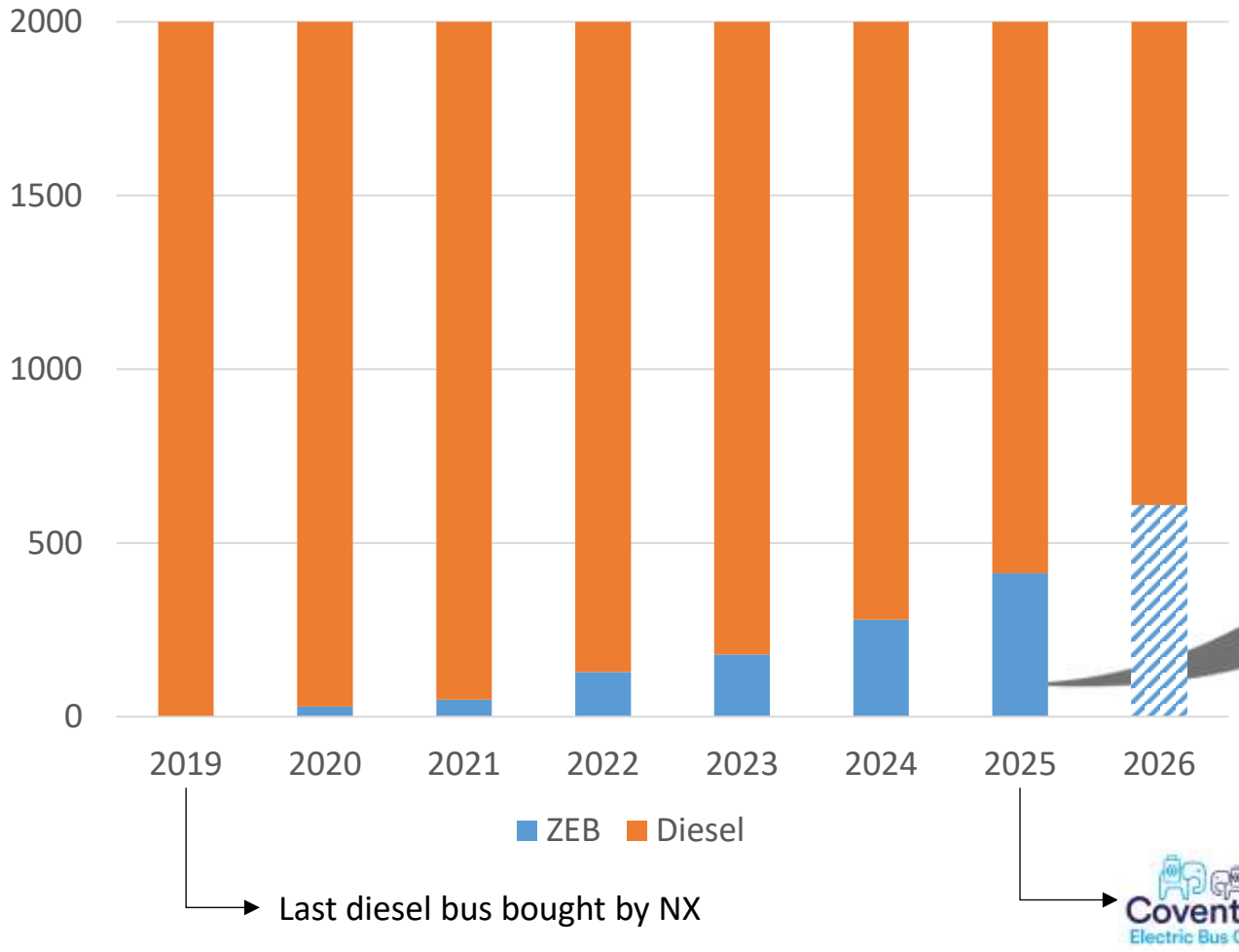
# Greasing the wheels of ZE buses in the West Midlands

Eliot Wilde – Bus Fleet Programme Manager

Transport for West Midlands

# Watt's Occurring?

# Powering Up




Carbon Abatement

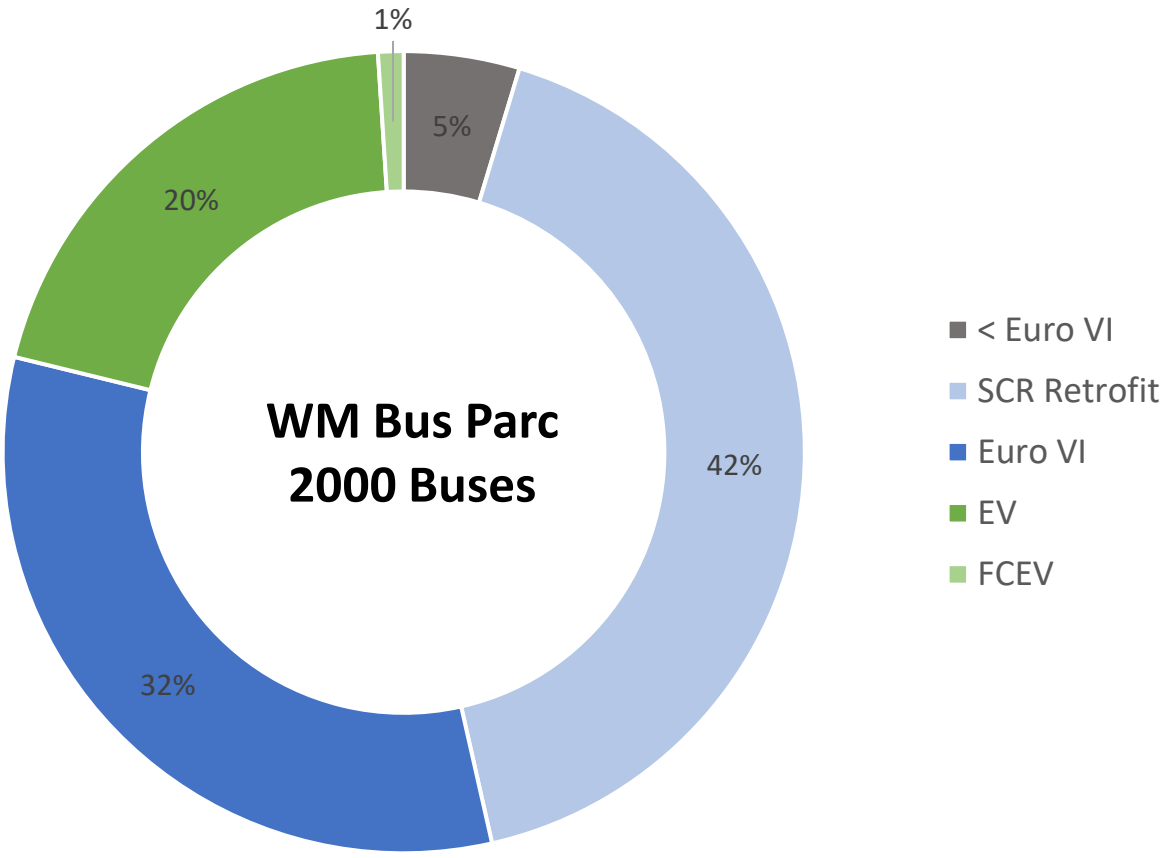
Air Quality

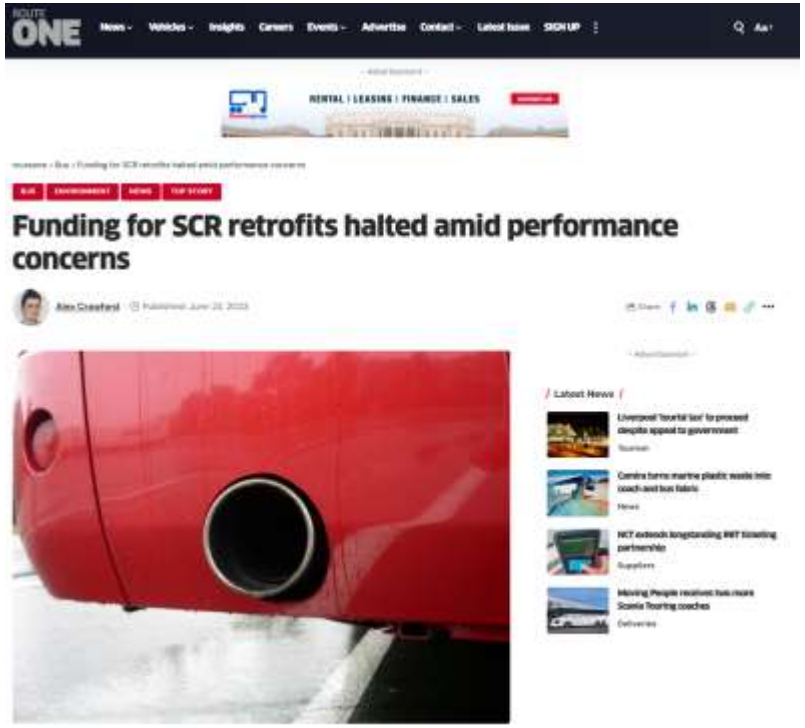
Accessibility

Safety

Better Buses

# Retrofit Regret?



# Hydro-gone?


## Millions spent on hydrogen buses left stuck in depots due to lack of fuel

Liverpool and Aberdeen are amongst the cities that have seen dozens of vehicles off the road since last summer due to fueling problems and high maintenance costs

Dozens of hydrogen buses have been left off the road for months on end (Photo: Getty)

**Lucie Heath**
Environment Correspondent

May 18, 2025 6:00 am (Updated 6:01 am)

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Councils have spent millions on hydrogen buses so plagued with faults that many vehicles have been left trapped in depots for months at a time.

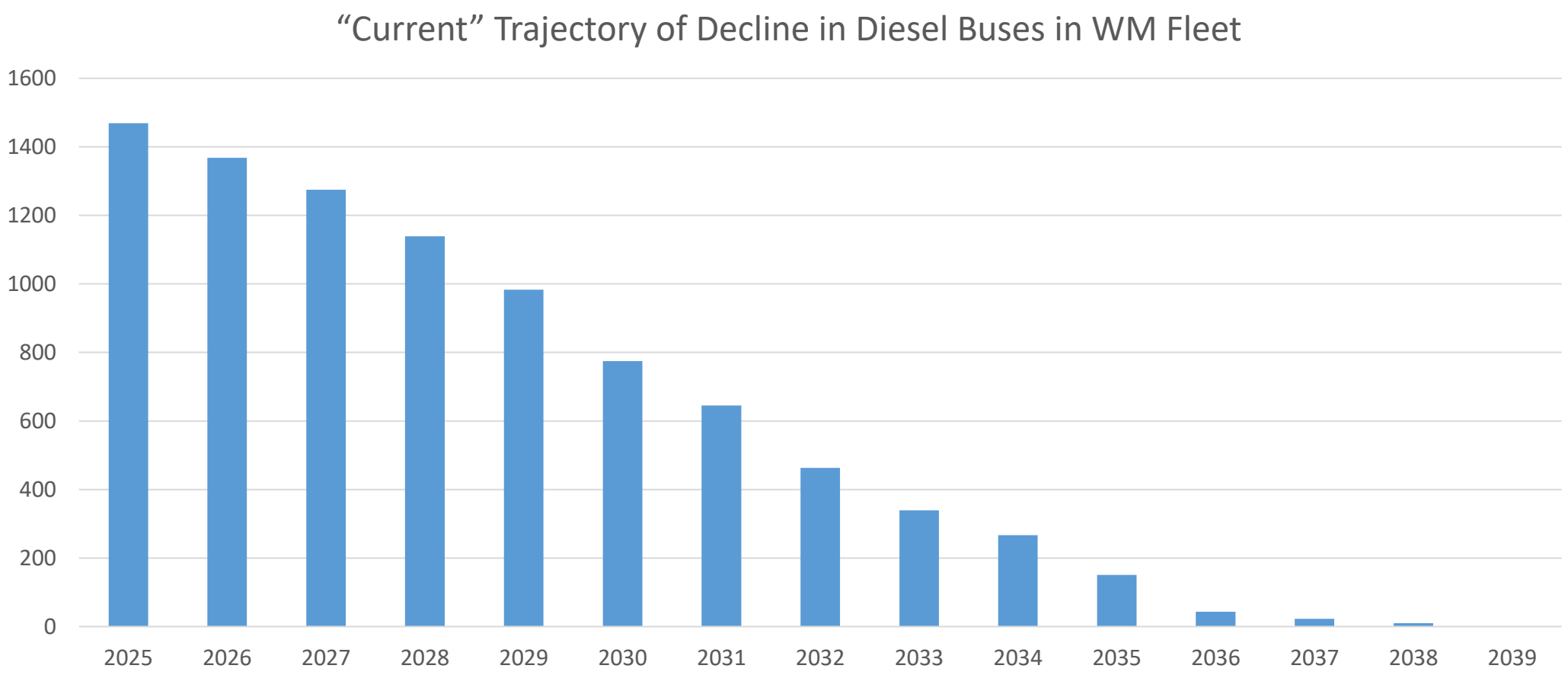
Liverpool, Birmingham and Aberdeen Councils are among those that have faced challenges with their hydrogen bus fleets, including high maintenance costs and a lack of fuel supply.

At least 139 hydrogen buses have been purchased by local authorities for around £500,000 each, as part of trials of the new technology in recent years.

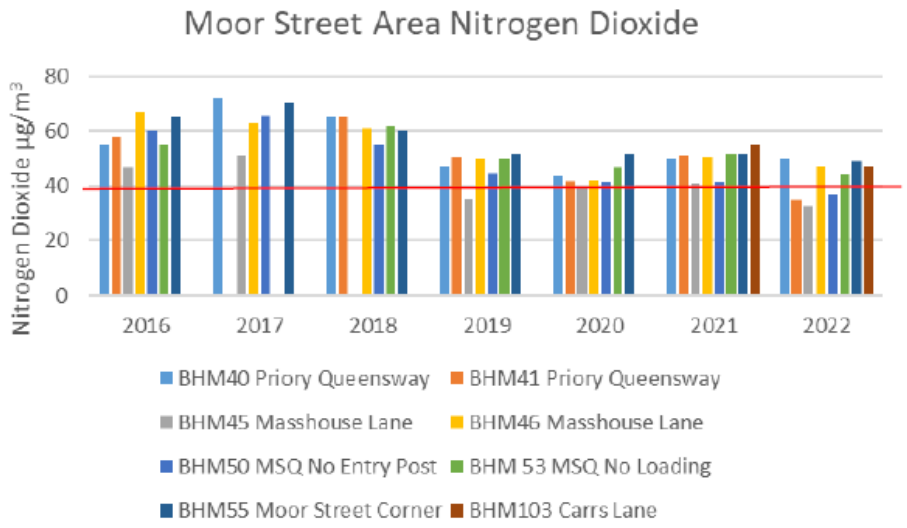
Transport for West Midlands

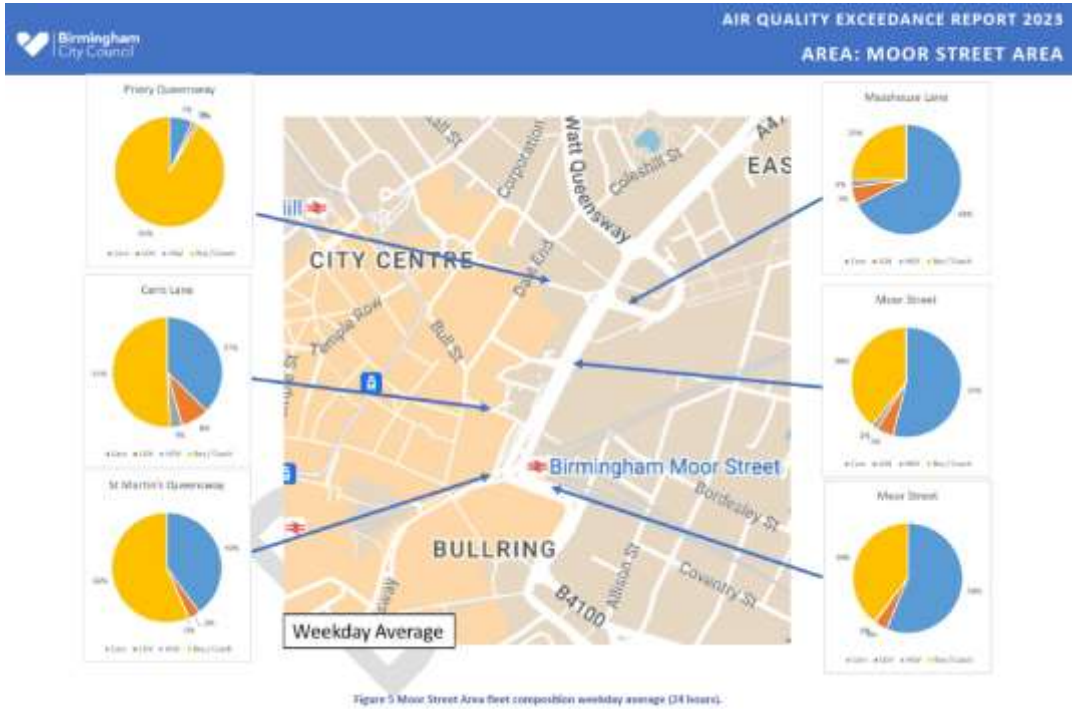
# Watt's Next?

# Hero to zero (at tailpipe)

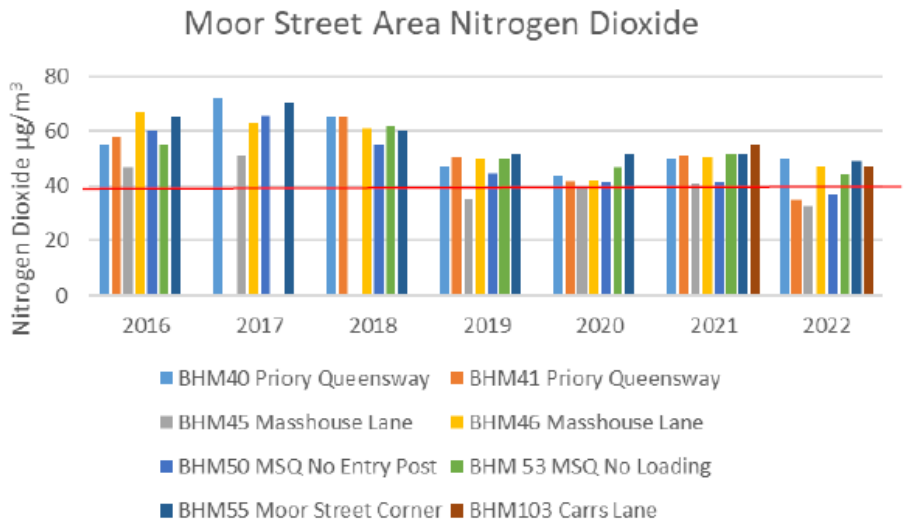


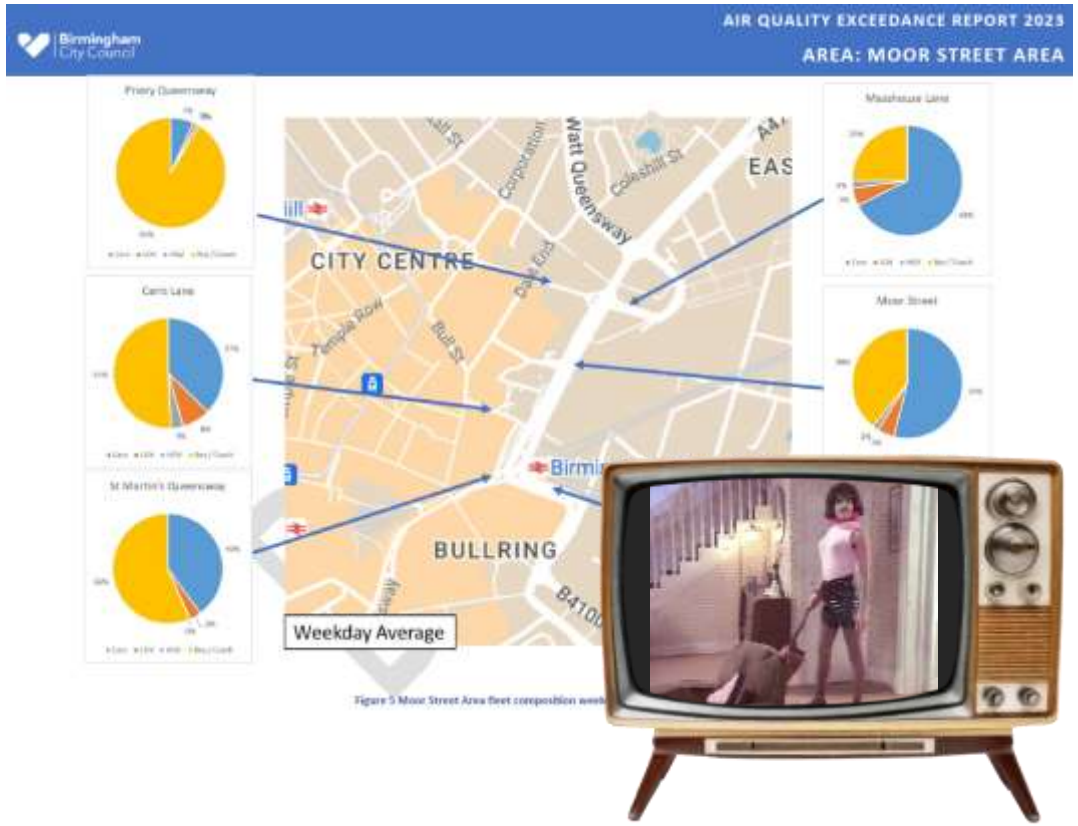
# Cleaning up the Queensway



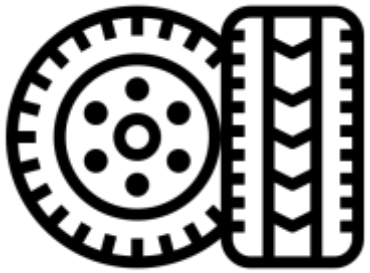



# Cleaning up the Queensway



# Getting into the particulates



$PM_{2.5}$

Transport for West Midlands

# Watt Can Go Wrong?

# Electrical Resistance?

Cost of vehicles

Grid Connections

Just Transition

# Ohm Grown?

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NEWS

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Alba

## Bus manufacturer Alexander Dennis warns of 160 jobs at risk


The company's biggest UK plant is based in Larbert

12 September 2024

**Falkirk-based bus manufacturer Alexander Dennis said 160 Scottish jobs are at risk as the result of an "uneven playing field" in the sector.**

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## Rapid lift in zero-emission bus HVAC service contracts for Grayson

ROUTE ONE routeone Team

Grayson Thermal Systems has now secured heating, ventilation and air-conditioning (HVAC) service and maintenance contracts for over 700 battery-electric and hydrogen fuel cell-electric buses in the UK.

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Tourism


Camira turns marine plastic waste into coach and bus fabric

News


MCT extends longstanding INIT ticketing partnership

Suppliers

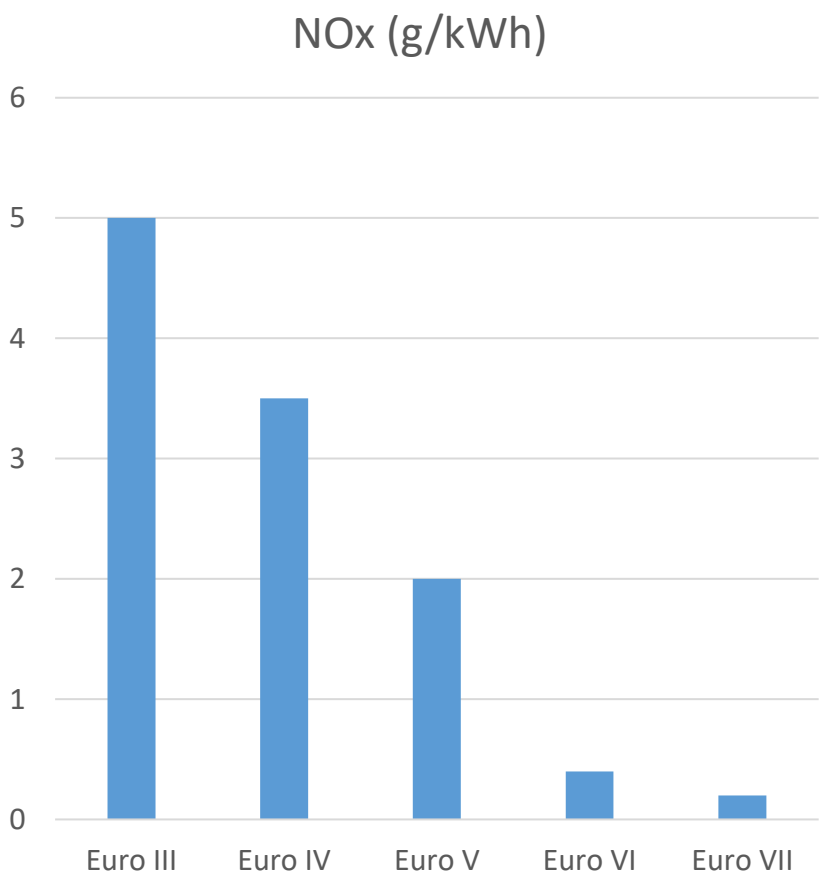

Moving People receives two more Scania Touring coaches

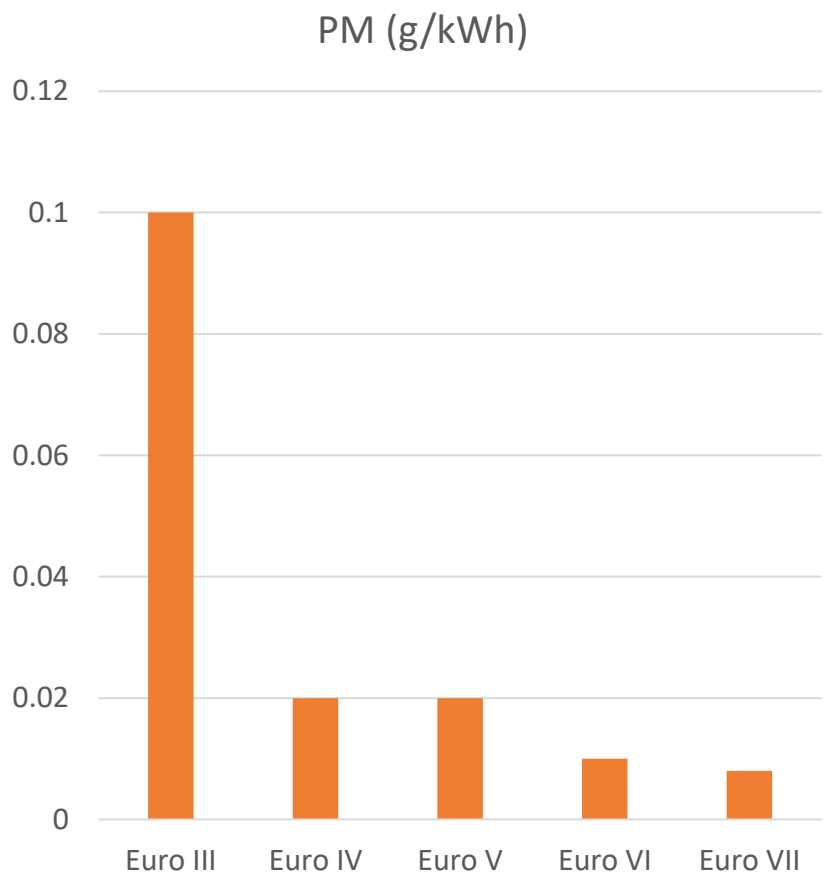
Deliveries

Transport for West Midlands

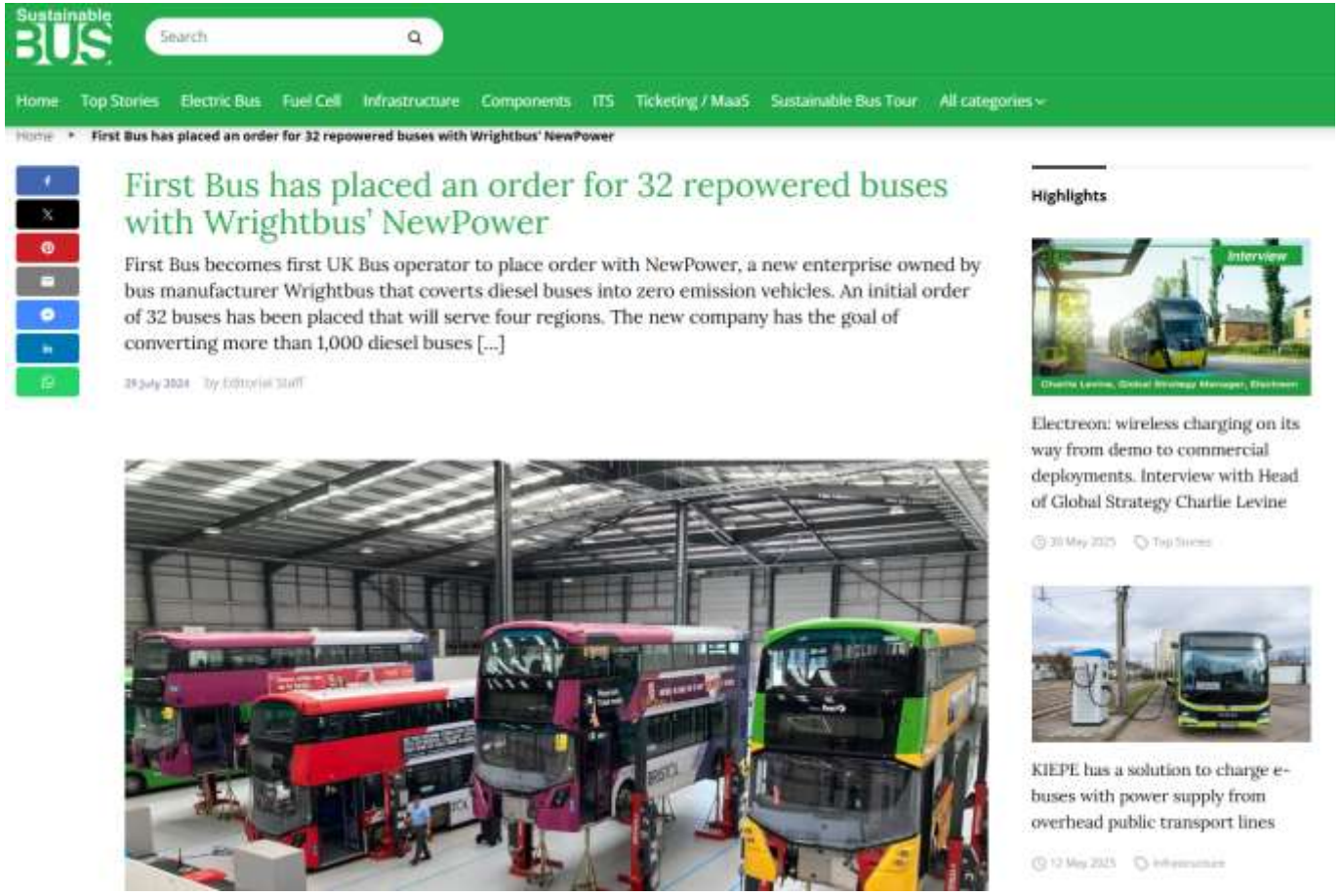
# Watt Else?

# Unplugged?


NOx (g/kWh)
6
5
4
3
2
1
0
Euro III
Euro IV
Euro V
Euro VI
Euro VII


PM (g/kWh)
0.12
0.1
0.08
0.06
0.04
0.02
0
Euro III
Euro IV
Euro V
Euro VI
Euro VII

# Repower to the people?



# The F Word

Franchising is not a silver bullet for delivering a zero-emission bus fleet……but it gives us more levers

# Transport interventions for cleaner air

**How can innovative transport solutions contribute to improving air quality?**

- How do we scale up and embed these approaches to be a part of the broader transport system?
- How do we sustainably transition to electrification of the transport system?
- How do we ensure air quality related transport improvements also promote economic regeneration?

West Midlands Combined Authority | Greener Together

# Improving indoor air quality

Zongbo Shi
Professor of Atmospheric Biogeochemistry,
University of Birmingham

Alex Gordon
Energy Projects Officer, WMCA

West Midlands Combined Authority

Greener Together

West Midlands Combined Authority

UNIVERSITY OF BIRMINGHAM

# Indoor Air Quality in a changing world


Professor Zongbo Shi
University of Birmingham
Alex Gordon
West Midlands Combined Authority



WM-NETZERO@CONTACTS.BHAM.AC.UK

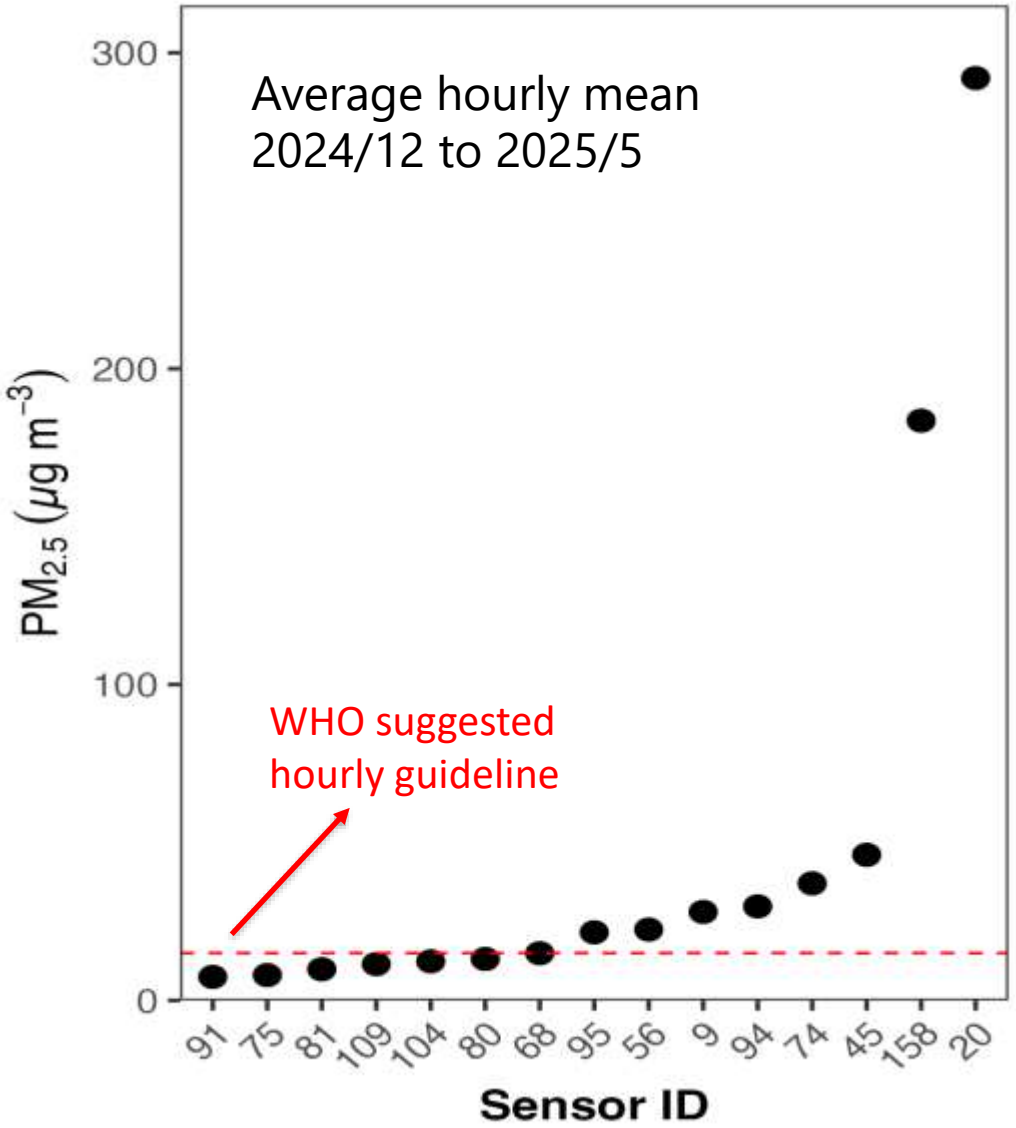
@WMNETZERO


WM-NET ZERO

"*Our homes provide the living environment that dictates our future health*." **Sir Michael Marmot**

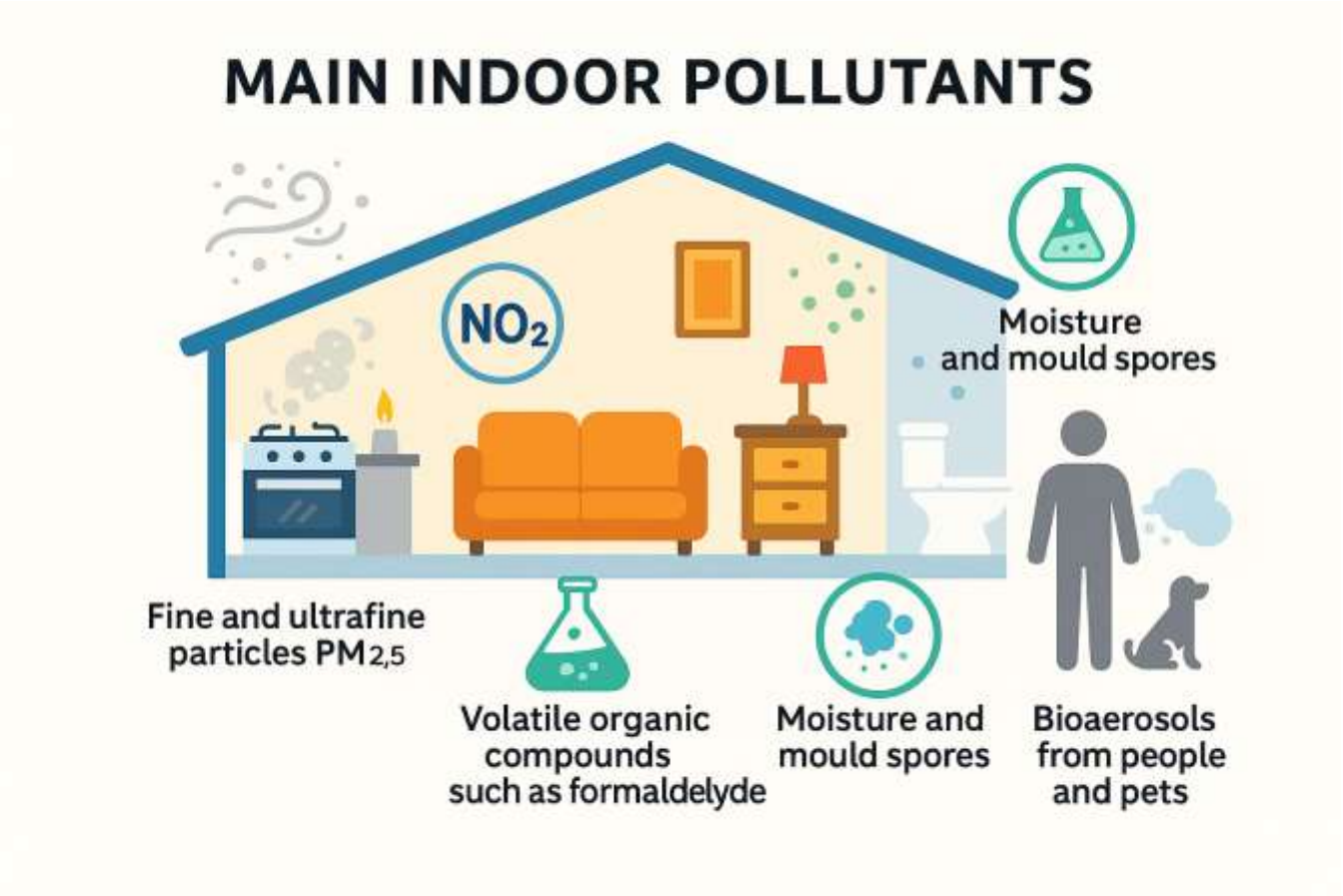
# Why indoor air quality matters

- People spend about 90% of their time indoors
- WHO 2021 annual guideline for $PM_{2.5}$ is 5 µg/m³, and hourly guideline is 15 µg/m³
- Many homes in the UK exceeded the WHO suggested hourly average $PM_{2.5}$ guidelines.



# Main indoor air pollutants

- Fine particles (such as $PM_{2.5}$)
- Nitrogen dioxide ($NO_2$)
- Volatile organic compounds such as formaldehyde
- Moisture and mold
- Bioaerosols from people and pets



# Indoor air pollutant sources

Combustion: smoking, gas hobs, candles, wood burners

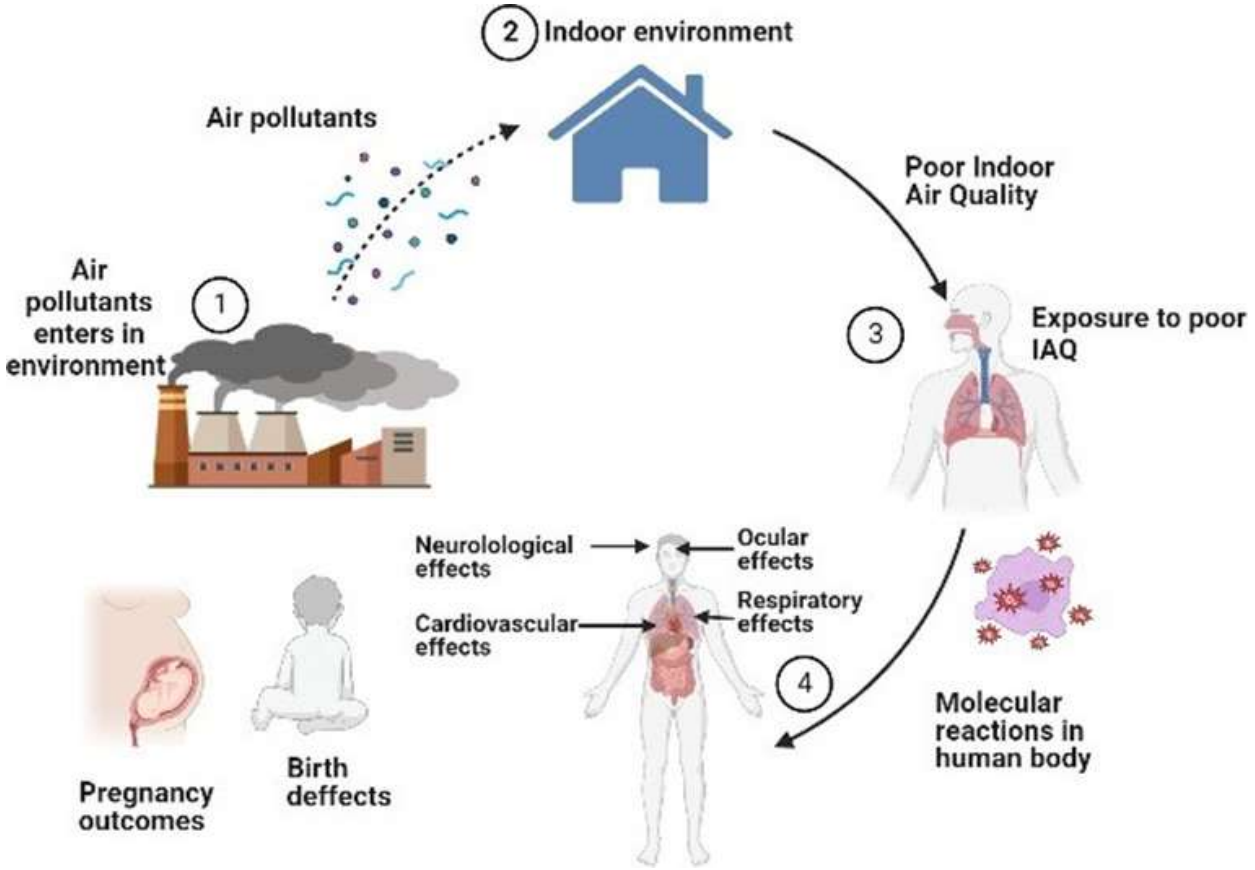
Outdoor pollution that infiltrates through windows and doors

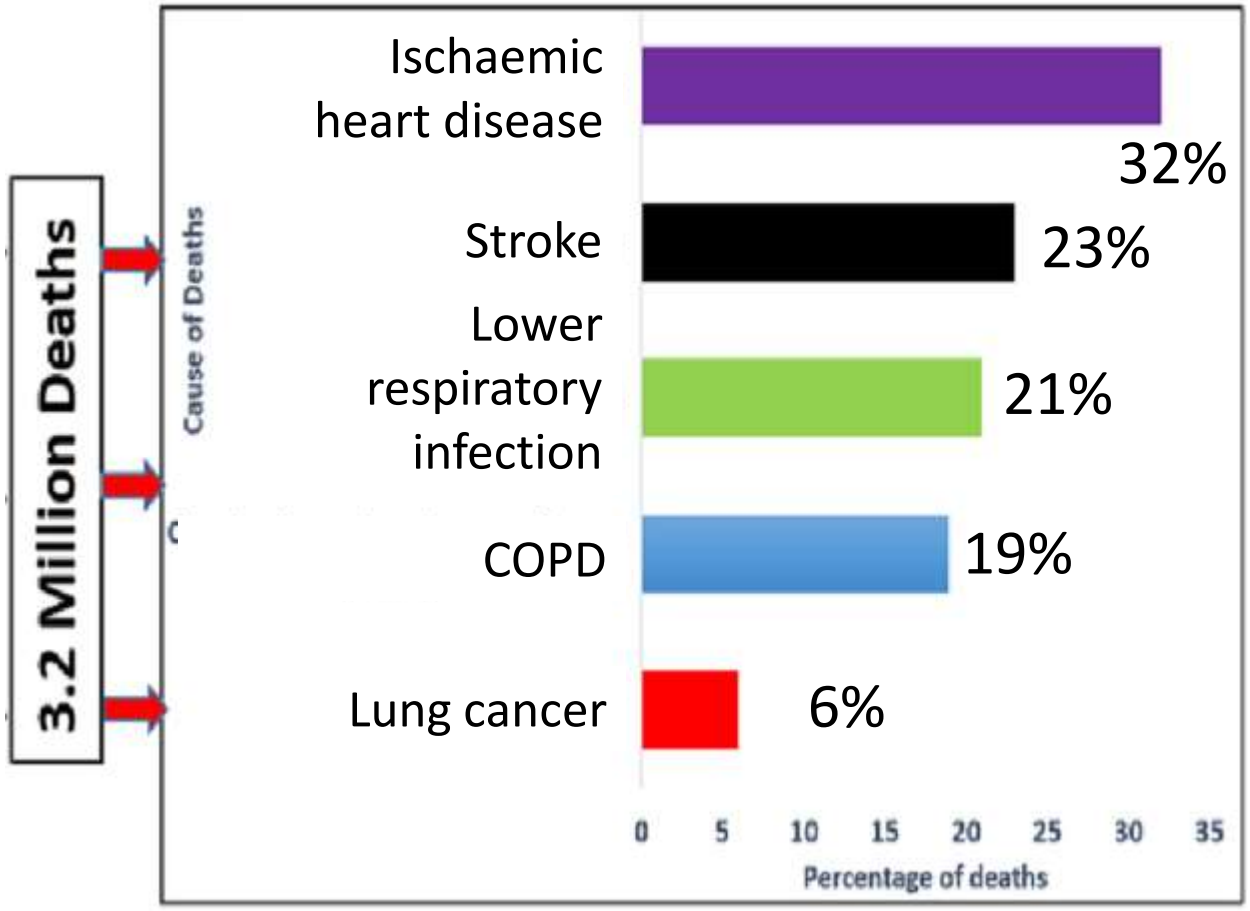
Off-gassing from furniture, paint, and building products

Occupants and pets breathing and shedding particles

# Health impacts

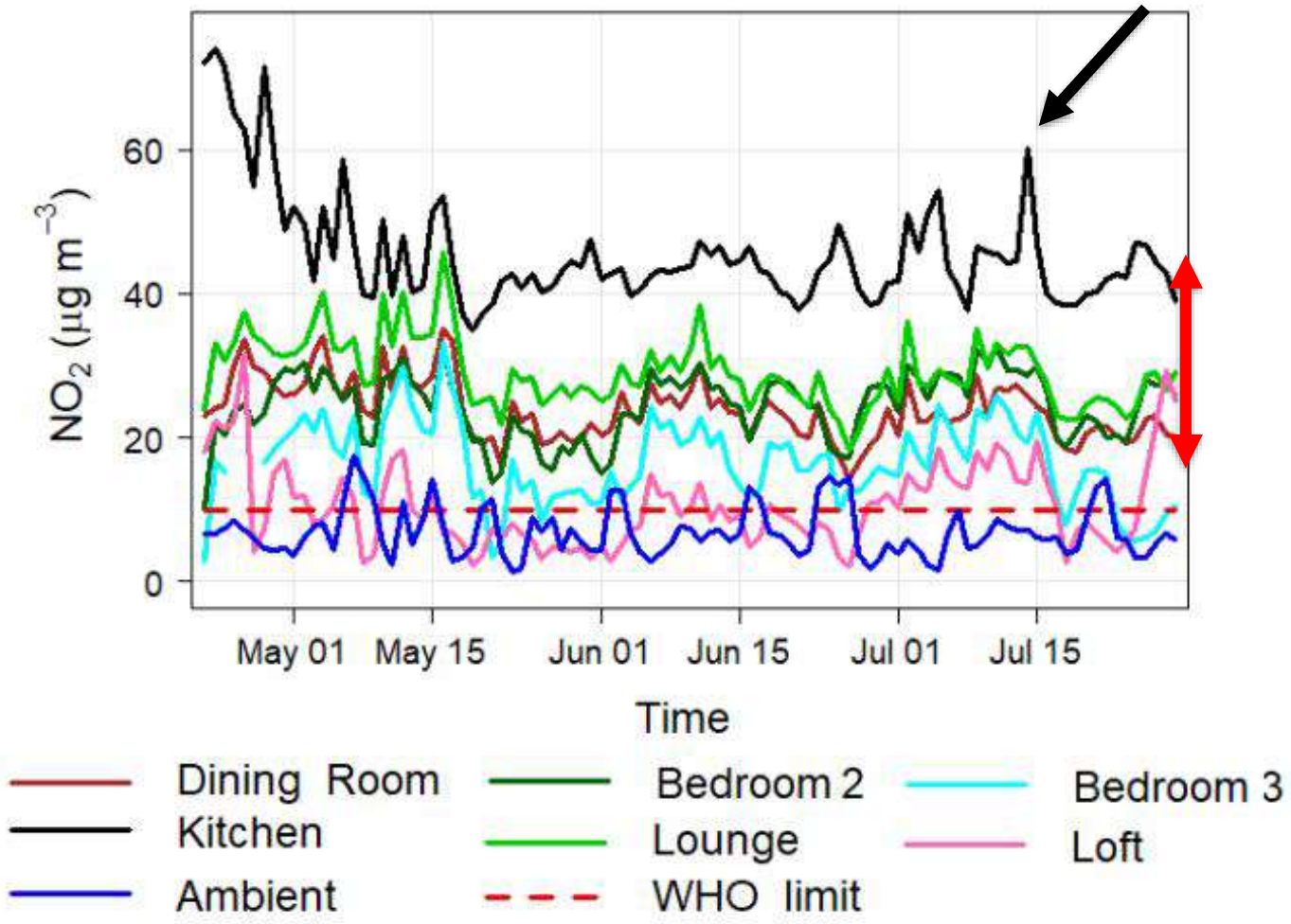
**3.2 million** people die prematurely each year caused by the incomplete combustion of solid fuels and kerosene used for cooking (WHO, 2021).




Kumar et al., 2023, STOTEN

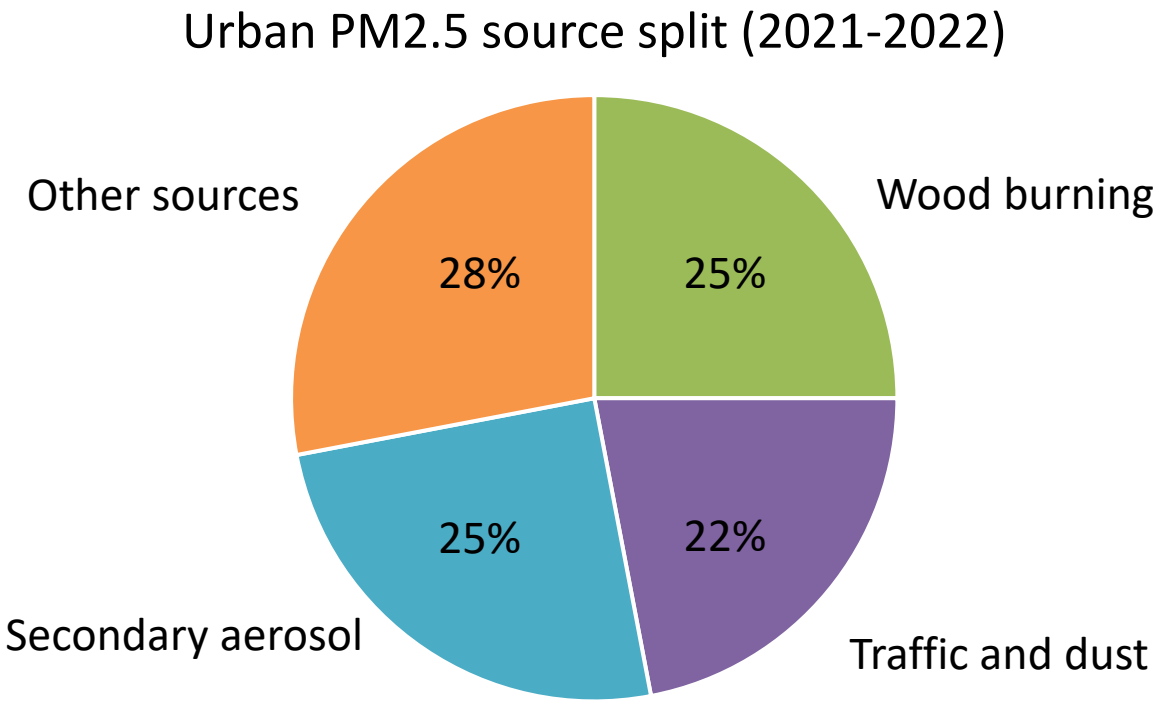
# Gas cooking – an important pollutant source

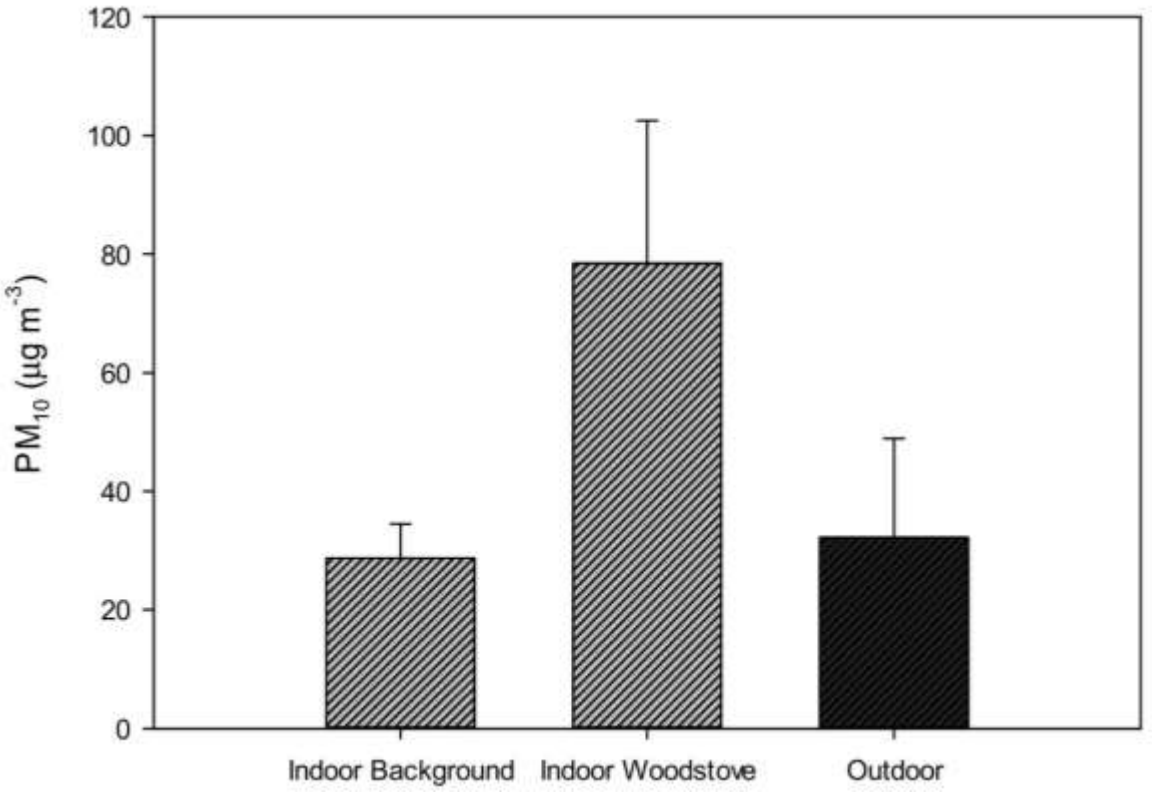



Daily average $NO_2$ concentrations over a 3-month period in multiple rooms in an urban home (Singh et al., 2024).

- **Gas hobs are the main indoor source of $NO_2$** and also emit CO, methane and $PM_{2.5}$.
- **80 %** of UK homes lack adequate kitchen extraction.
- **Switch to induction or electric hobs**
- Interim measures are powerful extraction fans & open windows.

# Wood burning and $PM_{2.5}$




- Wood-smoke concentrations in 2021–22 are **seven times higher** than those measured in 2008–10
- Modelling shows that **targeted cuts in wood-burning and traffic could halve $PM_{2.5}$ exposures** and save ~1 000+ lives region-wide (i.e., West Midlands)

$PM_{10}$ concentrations indoors (while using combustion appliances and room background air) and outdoors.

E.D. Vicente et al., 2020, STOTEN

# Indoor air quality inequality

**Low-income populations tend to**

- live in areas with higher levels of outdoor air pollution (e.g., closer to busy roads)
- smoke indoors, spend more time cooking, and may be less likely to open windows to ventilate due to security concerns
- have higher underlying rates of disease than the rest of the population.

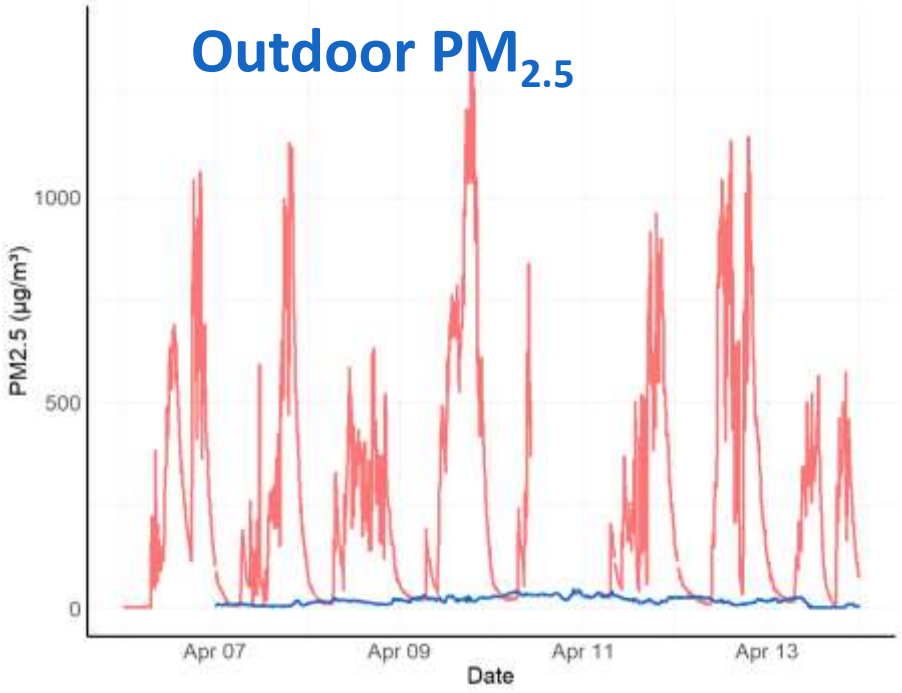
**But we don’t yet have sufficient data to quantify these impacts**

Ferguson et al., 2021, Buildings and Cities

# Impacts of house retrofitting on indoor environment

Indoor $PM_{2.5}$

Outdoor $PM_{2.5}$

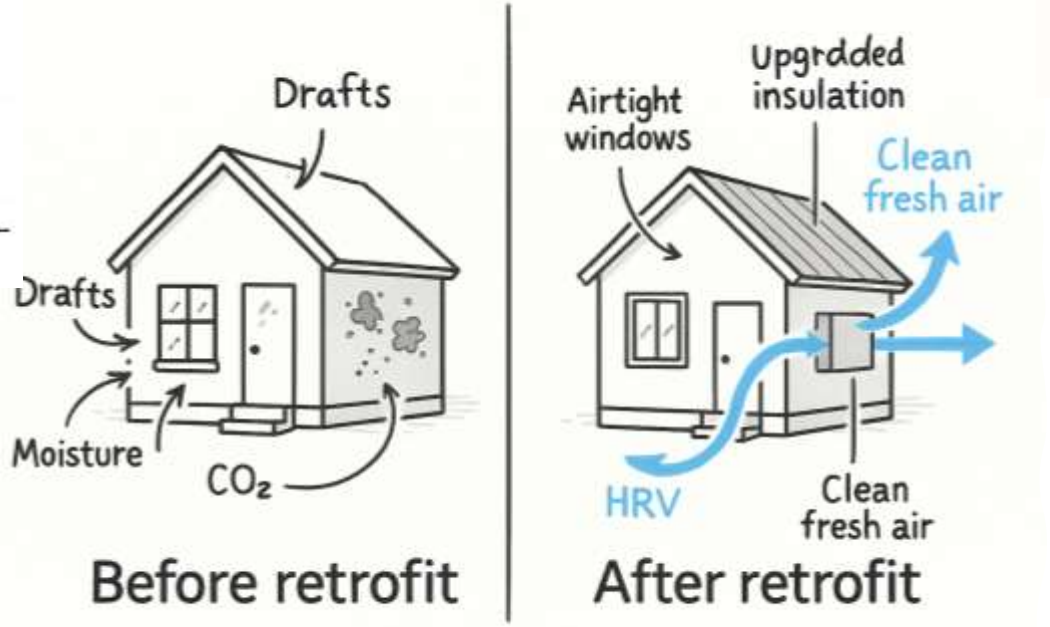




$PM_{2.5}$

$CO_2$

T/RH



West Midlands Combined Authority

# Net Zero Neighbourhoods

Place-based Decarbonisation and Air Quality

# Contents



ENERGY CAPITAL

West Midlands Combined Authority

# Programme Origin

**Decarbonise (or make Net Zero ready)**
**1.2m homes by 2041**

**18 years – 63,000 homes per year**

**50 working weeks per year – 1,263 homes per week**

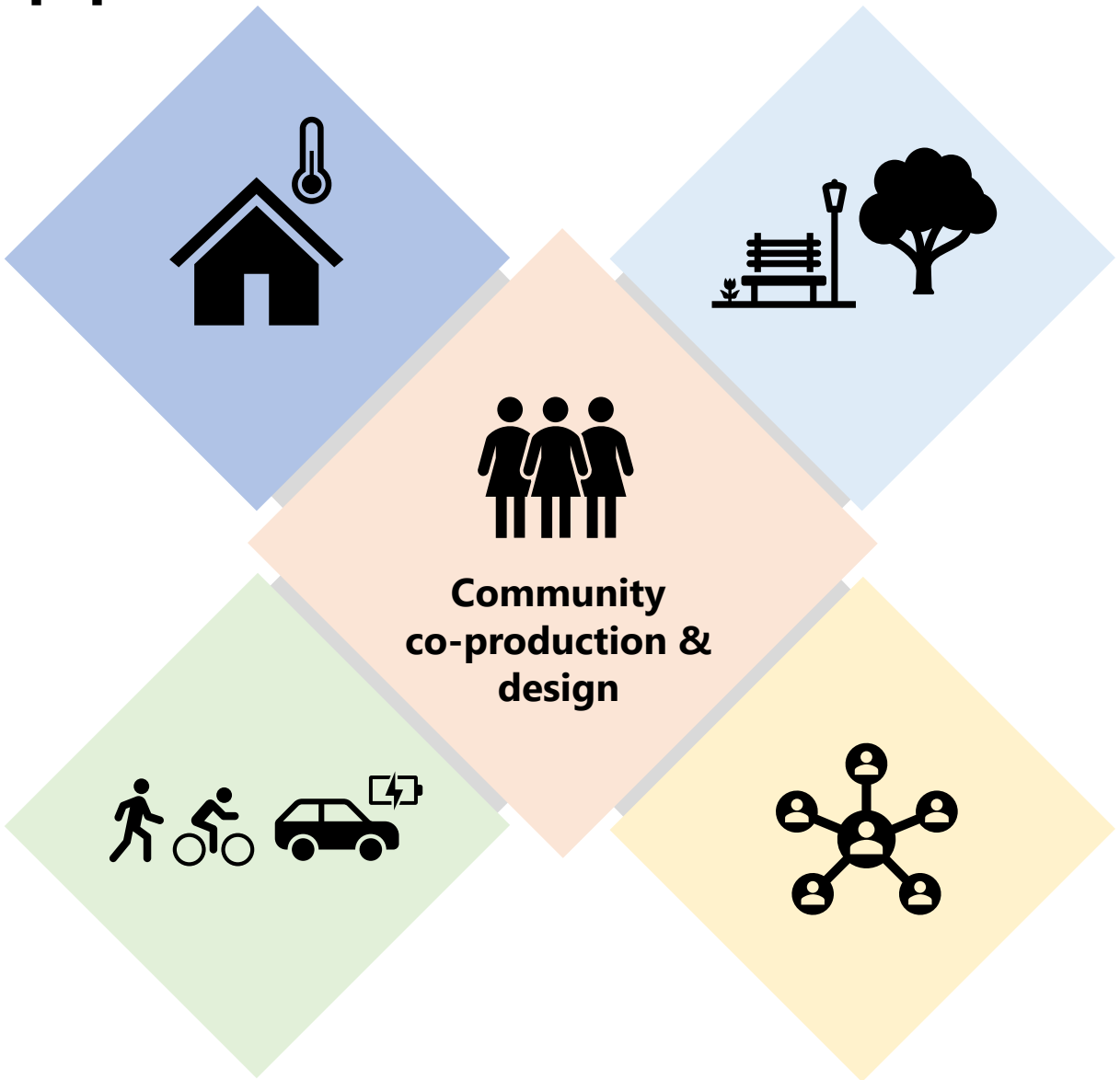
**40 hours per working week – 32 homes per hour**

**1 home every 2 minutes**

Can we develop a **replicable funding and delivery model** for creating **low carbon energy communities** on a **street-by-street or neighbourhood-by-neighbourhood** basis.

# The NZN Approach

Comfortable energy efficient **homes** with affordable low carbon heating




Neighbourhood regeneration and **green** spaces

Low carbon **mobility** and active travel infrastructure

Community **energy** and climate resilience opportunities

# Retrofit and Indoor Air Quality

Insulate

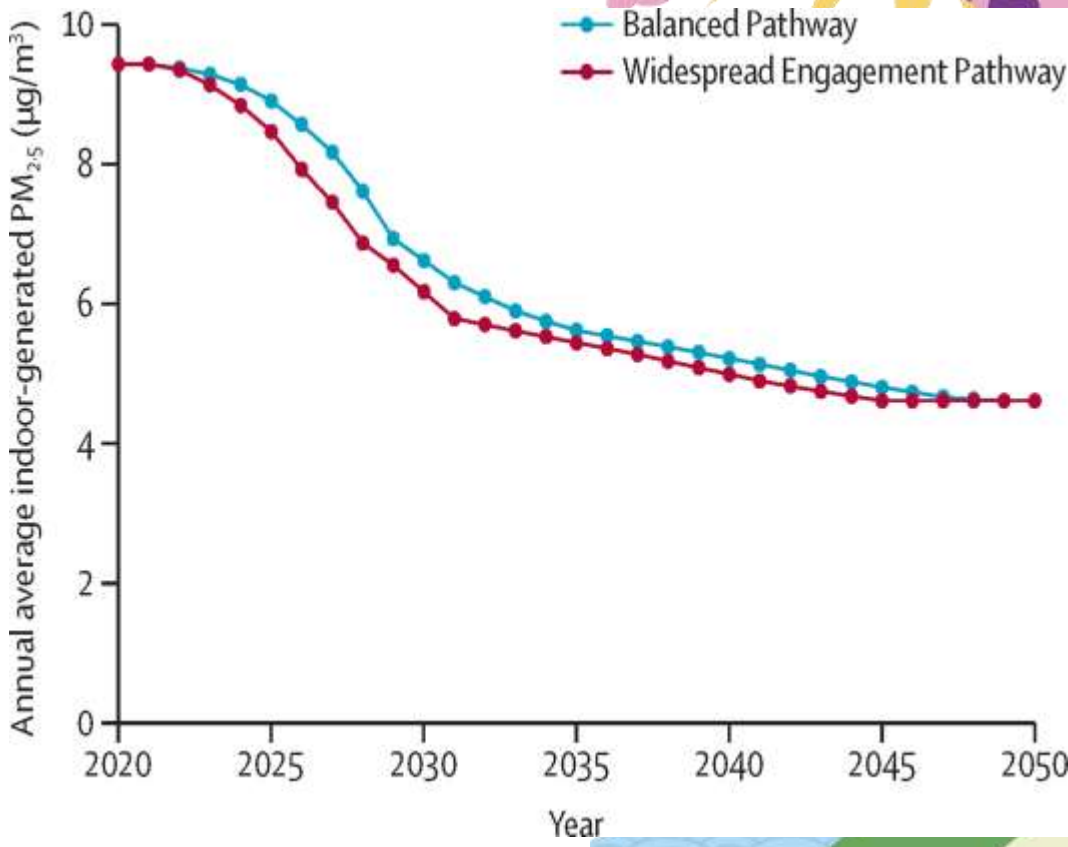
Ventilate

Generate

Complete Retrofit

# Indoor Air Quality in a NZ world

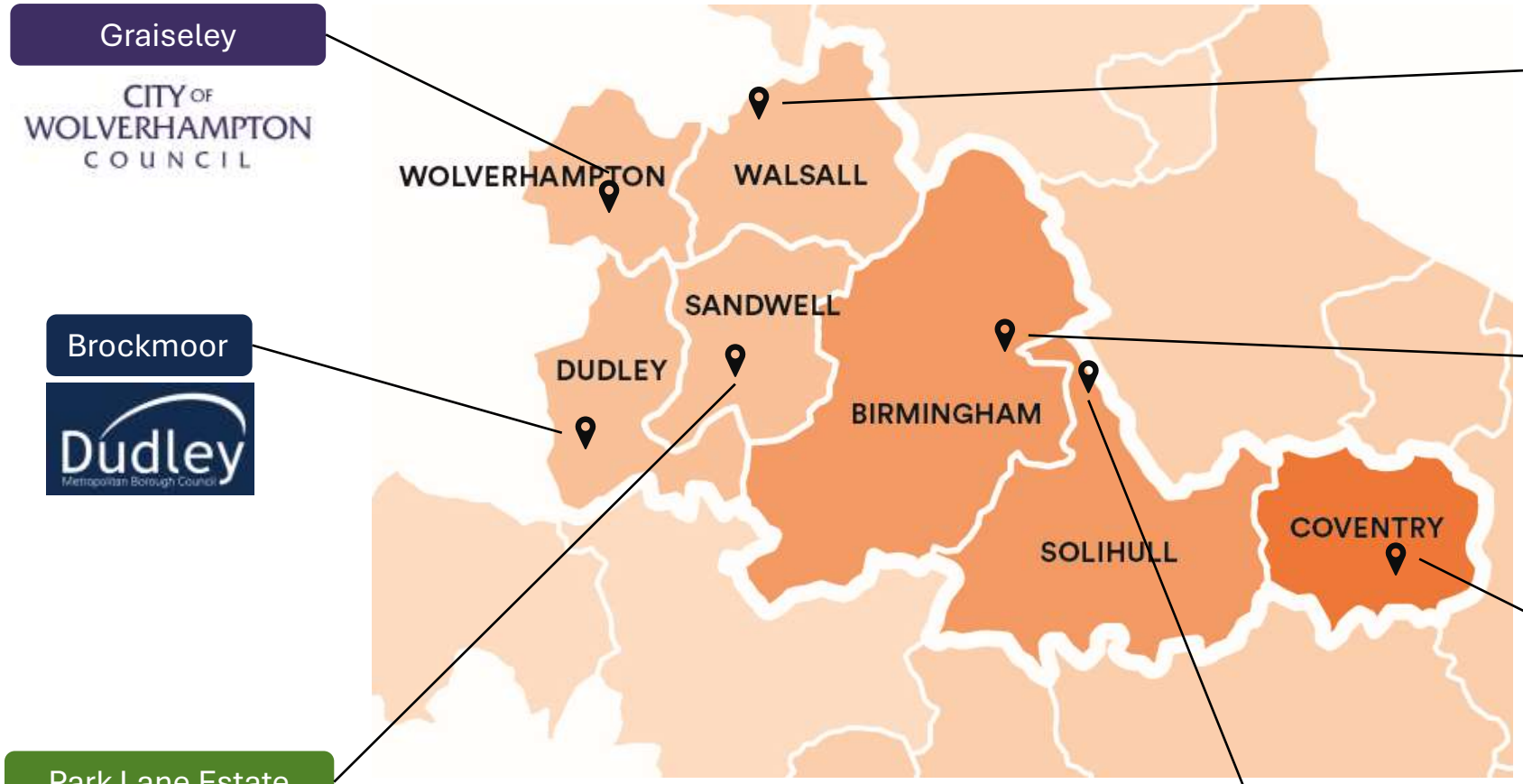
- Improved indoor environment
- Risk of worsening indoor air quality inequalities
  - Damp/Mould
  - Poorer IAQ
- UKRI/NIHR funded INHABIT hub: realising health co-benefits of NZ transition




Milner et al. Lancet planetary health,2023

Qian et al. 2025. In review

# Where are we now?




Graiseley

CITY OF WOLVERHAMPTON COUNCIL

Dudley Fields

Walsall Council

Brockmoor

Dudley Metropolitan Borough Council

Castle Vale

Birmingham City Council

Park Lane Estate

Sandwell Metropolitan Borough Council

Chelmsley Wood

Solihull Metropolitan Borough Council

Hillfields

Coventry City Council

# Thank you

Visit our website for templates, blogs and other updates!

Email us at:
NetZeroNeighbourhoods@wmca.org.uk

# Improving indoor air quality

**What is the most important focus in addressing indoor air quality issues?**

- Is there enough research to advise on how to tackle these issues and where do we need to focus further research?
- Where should we focus behaviour change and awareness raising?
- How do we create consistent messaging around indoor air quality regionally?
- As we build new homes or retrofit existing homes, how do we get this on the radar of decision makers?

West Midlands Combined Authority | Greener Together

# Break

14:45 – 15:00

West Midlands Combined Authority

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# Plenary and panel discussion

West Midlands Combined Authority

Greener Together

# Closing remarks

## Ed Cox

Executive Director of Strategy, Economy and Net Zero and Deputy Chief Executive, WMCA

West Midlands Combined Authority

Greener Together

# Thank you

## wmca.org.uk/air-quality

environment@wmca.org.uk

West Midlands Combined Authority

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