

Live and Breathe

Session 21 of the Sustainability Series



A session discussing Air Quality Monitoring in RBKC, how to visualise and engage with air quality data, and ways to improve your air quality and reduce your contribution to air pollution



LANCASTER WEST
NEIGHBOURHOOD TEAM

W11

Green Skills
ACADEMY

Agenda

- ▶ Improving air quality in Kensington and Chelsea - **Rebecca Brown**
- ▶ Outdoor Air Quality Monitoring and Breathe London - **Timothy Baker**
- ▶ Environmental Research Group at Imperial College London - **Kayla Schulte**
- ▶ The Social Innovation Partnership (TSIP) - **Georgina Hammerton**
- ▶ West London Healthy Home and Environment Study - **Esther Lie**

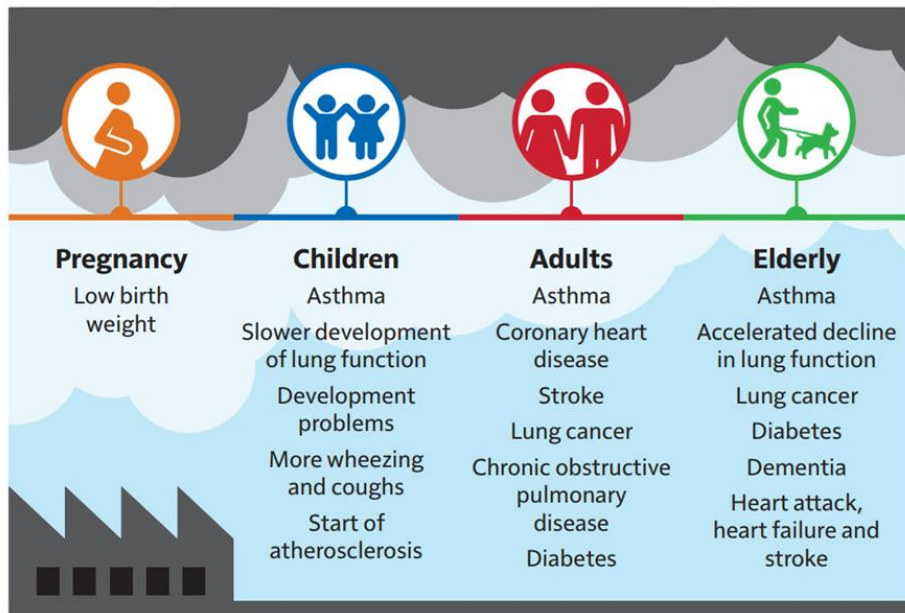
Improving air quality in Kensington and Chelsea

Rebecca Brown - Pollution Regulatory Team Manager (Environmental Health, RBKC)

Today...

- ▶ Overview of health impacts of air pollution
- ▶ Pollutants of concern
- ▶ Standards and guideline values
- ▶ Air quality monitoring in RBKC
- ▶ Air quality action plan

Impact of air pollution



Source: Adapted from Public Health England (2018)⁶

Figure 1: Health effects of air pollution throughout life

New research published Sept 2023:

[Long-term air pollution exposure link with SARS-CoV-2 infection \(publishing.service.gov.uk\)](https://publishing.service.gov.uk/long-term-air-pollution-exposure-link-with-sars-cov-2-infection)

Pollutants of concern

- ▶ **Nitrogen dioxide (NO_2)**
- ▶ **Particulate Matter (PM_{10} and $\text{PM}_{2.5}$)**
- ▶ **Ozone (O_3)**
- ▶ **Carbon monoxide (CO)**
- ▶ **Sulphur Dioxide (SO_2)**
- ▶ **Lead**
- ▶ **Benzene**
- ▶ **1,3-butadiene**

RBKC is an Air Quality Management Area

Nitrogen dioxide (NO₂)

- ▶ Gas - produced during the combustion of fossil fuels, along with nitric oxide (NO).
- ▶ Short-term exposure - inflammation of the airways and increase susceptibility to respiratory infections and allergens.
- ▶ Exacerbates symptoms of those already suffering from lung or heart conditions.
- ▶ Dry or wet deposition of nitrogen can change soil chemistry and affect biodiversity in sensitive habitats.
- ▶ NO_x are precursors for the formation of ozone (O₃). Ozone can trigger inflammation of the respiratory tract, eyes, nose and throat as well as asthma attacks. Can also affect the environment through oxidative damage to vegetation including crops.

Particulate matter (PM_{10} and $PM_{2.5}$)

- ▶ Solid or liquid small particles of dust, dirt soot, smoke, pollen etc, some of which can be toxic.
- ▶ Toxins may enter the bloodstream and be transported around the body, to the heart, brain and other organs.
- ▶ Particulates are classified according to size. The UK is focused on measuring the fractions of PM less than 10 micrometres in diameter (PM_{10}) and less than 2.5 micrometres in diameter ($PM_{2.5}$).
- ▶ PM can travel large distances. A small proportion comes from naturally occurring sources such as pollen and sea spray. Another third is transported to the UK from Europe. However, around half of UK concentrations comes from sources in the UK such as domestic wood burning and tyre and brake wear from vehicles.

Summary of National Air Quality Standards

Pollutant	Standard / Objective (UK)	Averaging Period	Date ⁽¹⁾
Nitrogen dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
Nitrogen dioxide (NO ₂)	40 µg/m ³	Annual mean	31 Dec 2005
Particles (PM ₁₀)	50 µg/m ³ not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
Particles (PM ₁₀)	40 µg/m ³	Annual mean	31 Dec 2004
Particles (PM _{2.5})	25 µg/m ³	Annual mean	31 Dec 2004
Particles (PM _{2.5})	10 µg/m ³	Annual mean	31 Dec 2040 ⁽²⁾

Note:

(1) Date by which to be achieved by and maintained thereafter.

(2) New Air Quality Target introduced by the Environment Act 2021 as set out in [The Environmental Targets \(Fine Particulate Matter\) \(England\) Regulations 2022](#)

Summary of WHO Guideline Values

Pollutant	Metric	Guideline Value (2005)	Guideline Value (2021)*
NO ₂	1-Hour Mean	200 µg/m ³	-
	Annual Mean	40 µg/m ³	10 µg/m ³
PM ₁₀	24-Hour Mean	50 µg/m ³	45 µg/m ³
	Annual Mean	20 µg/m ³	15 µg/m ³
PM _{2.5}	Annual Mean	10 µg/m ³	5 µg/m ³
	24-Hour Mean	25 µg/m ³	15 µg/m ³

Note:

*These represent the final AQG level recommended by the WHO for countries to achieve globally. There are four interim target values to reach before these concentrations. WHO Global Air Quality Guideline Report available online at <https://apps.who.int/iris/bitstream/handle/10665/345329/9789240034228-eng.pdf?sequence=1&isAllowed=y>

Air quality monitoring in RBKC

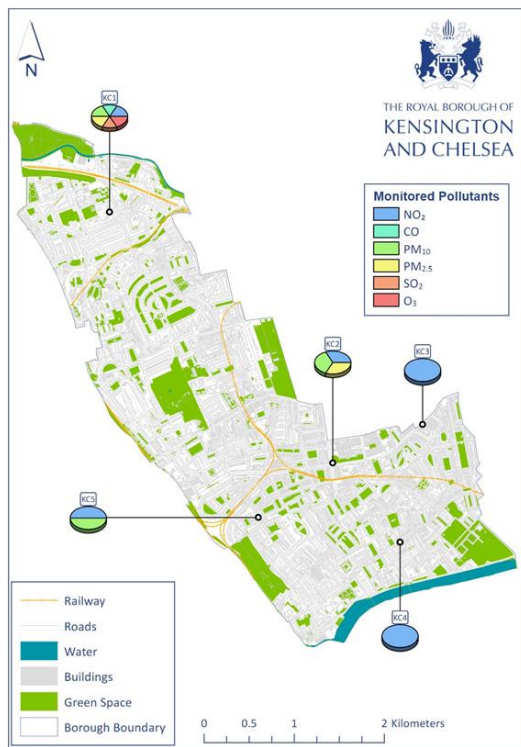
- Five fixed automatic monitoring stations

Site ID	Site name	Site type	Pollutants monitored
KC1	North Kensington	Urban background	NO ₂ , CO, PM ₁₀ , PM _{2.5} , SO ₂ , O ₃
KC2	Cromwell Road	Roadside	NO ₂ , PM ₁₀ , PM _{2.5}
KC3	Knightsbridge	Kerbside	NO ₂
KC4	Chelsea	Roadside	NO ₂
KC5	Earl's Court	Kerbside	NO ₂ , PM ₁₀

- 80 passive NO₂ tubes
- 23 mobile sensors

Locations of real time monitoring sites

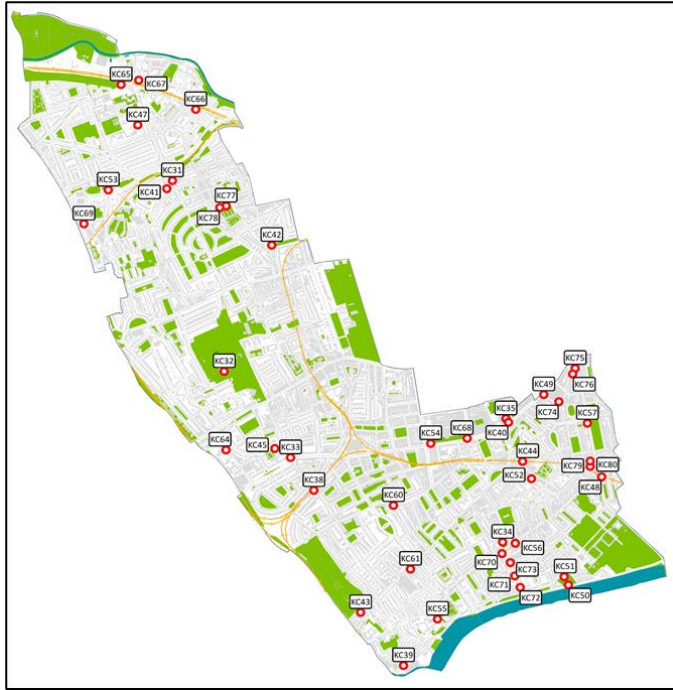
Fixed automatic stations



Sensors



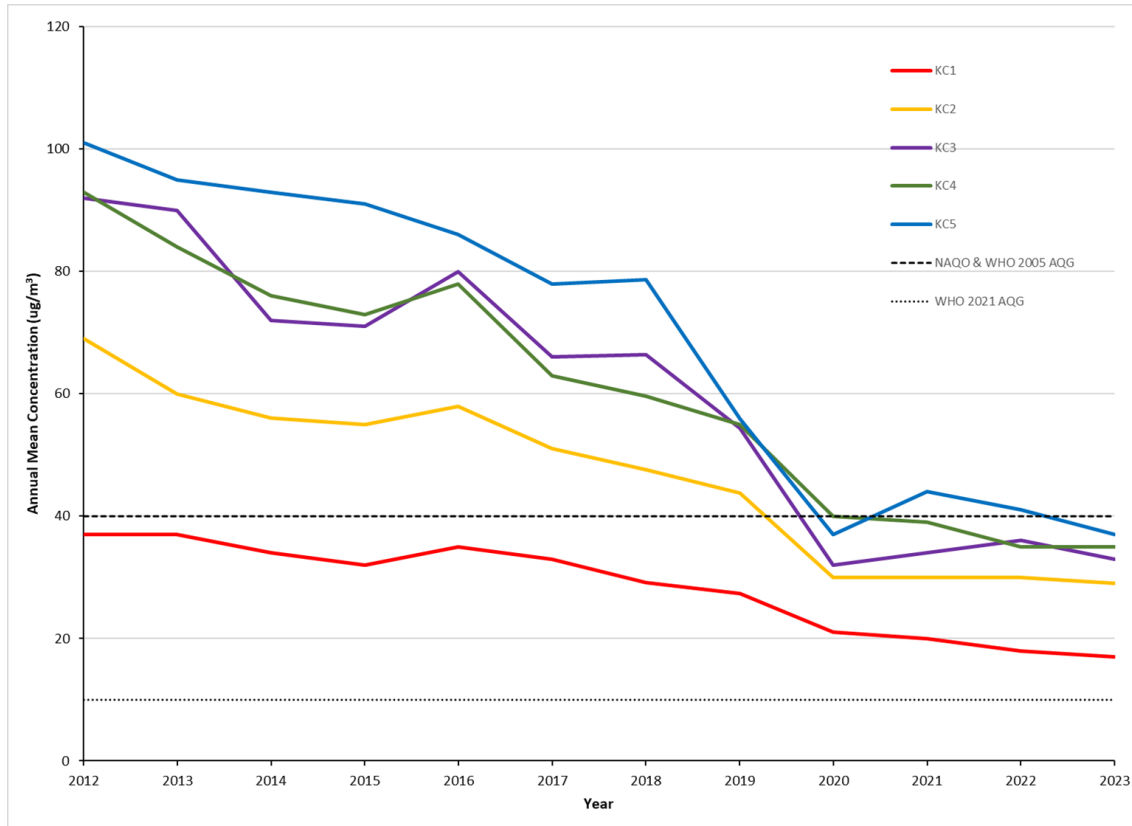
Passive NO₂ diffusion tubes



Along Kensington High Street.

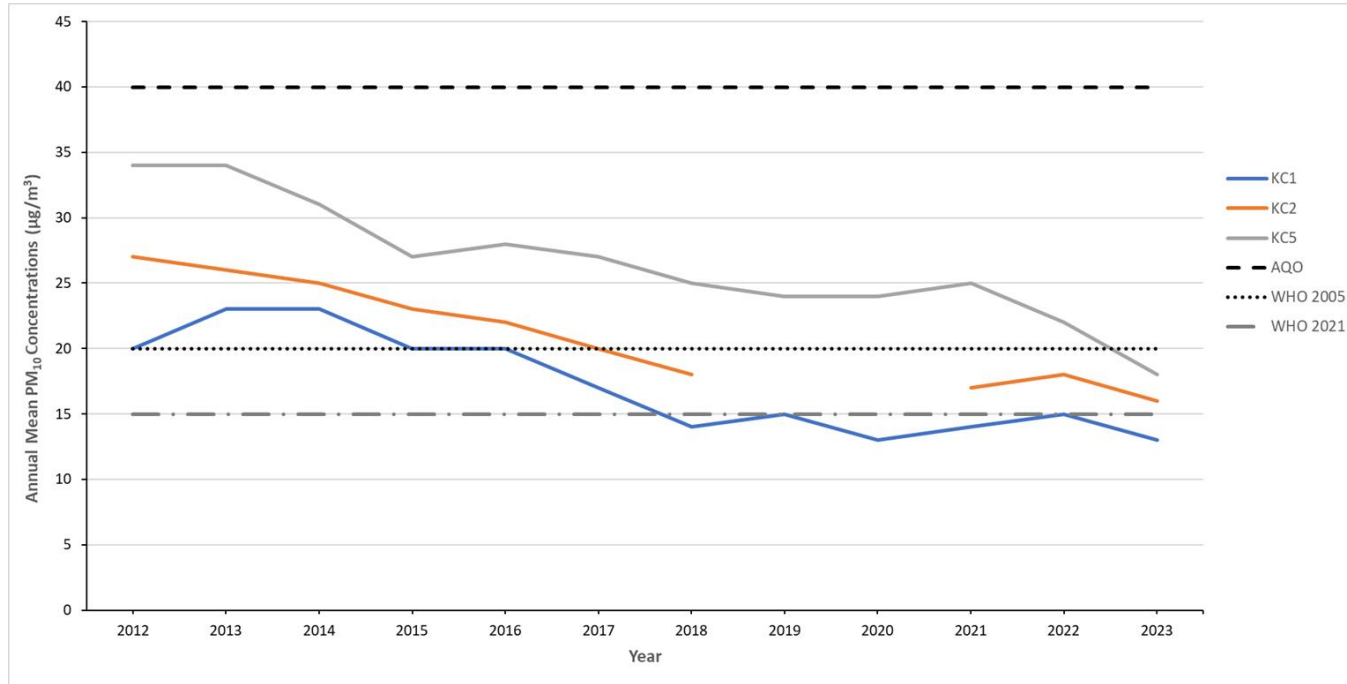
Excluding Kensington High Street

Annual average NO₂ concentrations



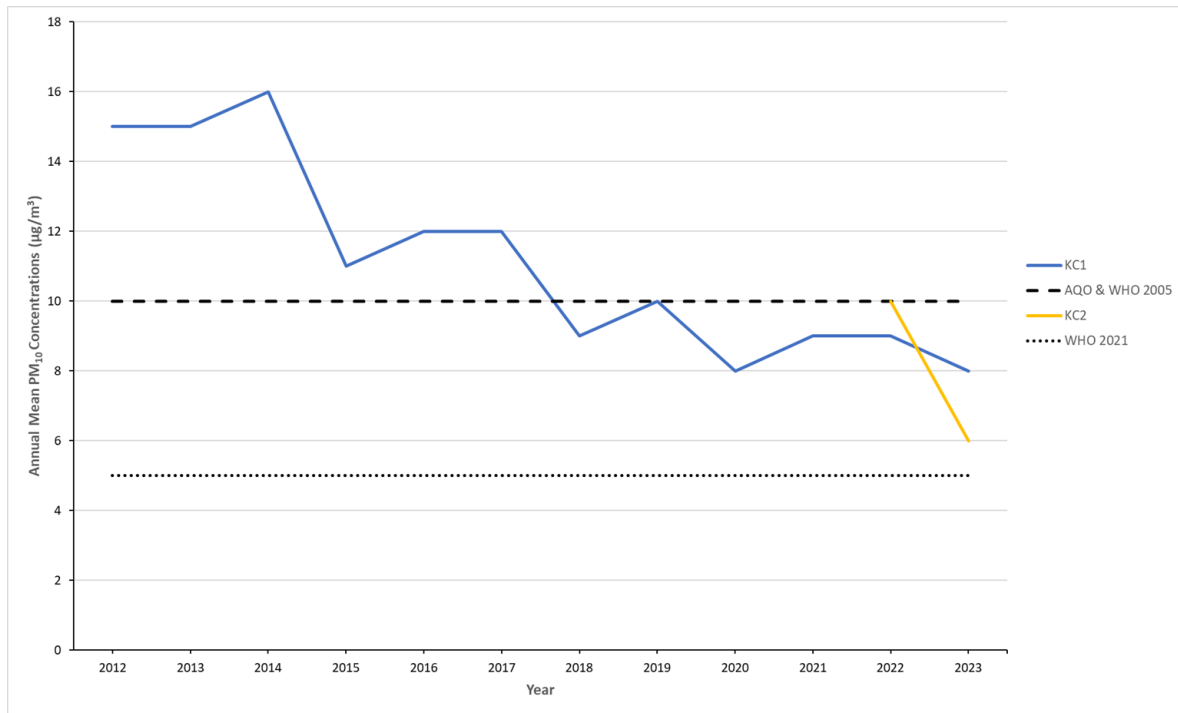
Data from 2023 is provisional and subject to change.

Annual mean PM₁₀ concentrations



Data from 2023 is provisional and subject to change.

Annual mean PM_{2.5} concentrations



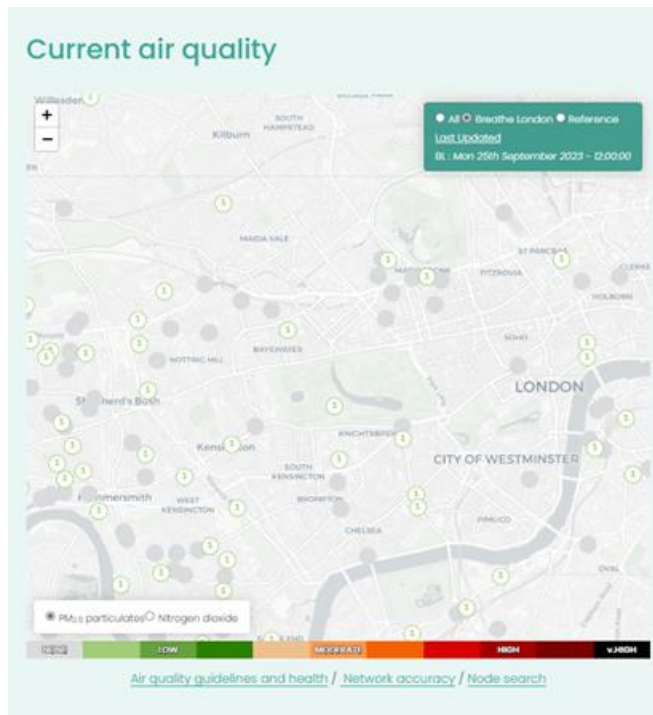
Data from 2023 is provisional and subject to change.

Where to find live data

Air Quality England www.airqualityengland.co.uk

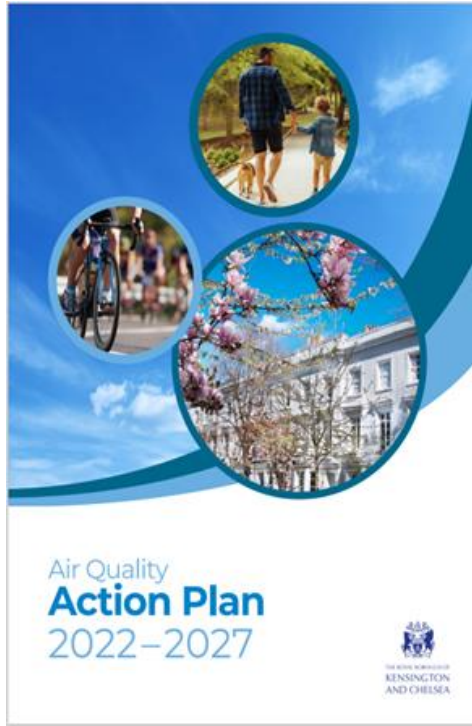
Active local authority funded monitoring sites							
Monitoring Site	Ozone (O ₃)	Nitrogen Dioxide (NO ₂)	Sulphur Dioxide (SO ₂)	Particulate Matter (PM _{2.5})	Particulate Matter (PM ₁₀)	Highest Pollution Band	Last Updated
RBKC Chelsea Old Town Hall	n/m	56 (1 Low)	n/m	n/m	n/m	Low (Index 1)	25/09/2023 12:00
RBKC Cromwell Road	n/m	11 (1 Low)	n/m	2 (1 Low)	15 (1 Low)	Low (Index 1)	25/09/2023 12:00
RBKC Earl's Court Road	n/m	22 (1 Low)	n/m	n/m	16 (1 Low)	Low (Index 1)	25/09/2023 12:00
RBKC Holland Park Avenue (sensor)	n/m	11 (1 Low)	n/m	7 (1 Low)	12 (1 Low)	Low (Index 1)	25/09/2023 12:00
RBKC Kensington High Street 1 (sensor)	n/m	28 (1 Low)	n/m	7 (1 Low)	11 (1 Low)	Low (Index 1)	25/09/2023 12:00
RBKC Kensington High Street 2 (sensor)	n/m	39 (1 Low)	n/m	9 (1 Low)	17 (2 Low)	Low (Index 2)	25/09/2023 12:00
RBKC Knightsbridge	n/m	19 (1 Low)	n/m	n/m	n/m	Low (Index 1)	25/09/2023 12:00
RBKC Sedding Street (sensor)	n/m	27 (1 Low)	n/m	9 (1 Low)	16 (1 Low)	Low (Index 1)	25/09/2023 12:00
London N. Kensington	53 (2 Low)	7 (1 Low)	1 (1 Low)	5 (1 Low)	9 (1 Low)	Low (Index 2)	25/09/2023 12:00

Breathe London www.breathelondon.org



www.rbkc.gov.uk/environment/air-quality

RBKC's Air Quality Action Plan



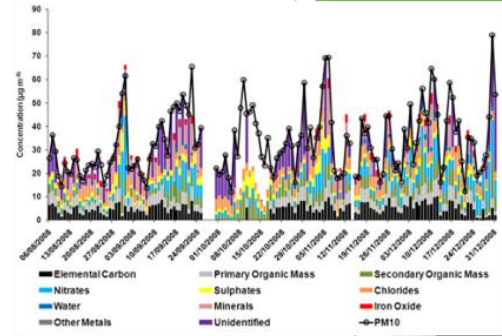
- ▶ **Monitoring and other core statutory duties**
- ▶ **Public health and awareness raising**
 - ▶ [airText https://www.airtext.info/](https://www.airtext.info/)
 - ▶ Raising awareness about pollution associated with wood burning - significant source of PM_{2.5}
 - ▶ Working with schools to raise awareness and reduce exposure
- ▶ **Cleaner transport and active travel**
- ▶ **Localised solutions**
- ▶ **Emissions from developments and buildings**
 - ▶ Air quality audits in schools and nurseries
 - ▶ Reviewing planning applications for potential impacts on air quality
- ▶ **Working in partnership**

<https://www.rbkc.gov.uk/media/document/annual-status-report-2023-covering-2022>

Outdoor Air Quality Monitoring and Breathe London

Timony Baker – Environmental Research Group at Imperial College London

Measuring air pollution in London for last 30 years



Community engagement, data visualisation and knowledge exchange

Kayla Schulte - Environmental Research Group at Imperial College London
Georgina Hammerton – The Social Innovation Partnership (TSIP)

- Provide 60 funded air quality sensors to communities in London over 3 years
- Empower communities to improve air quality in their neighbourhood
- Try to reach disadvantaged communities
- Achieve geographic & demographic spread
- Foster a sense of community and facilitate knowledge exchange between groups



Figure. 3 – Breathe London community sign

Kerbside cabinet – as small as it gets with reference analysers



Continuous Analysers



Small Sensors – Breathe London

Put them just about anywhere sunny



Easy to put up – got them with scouts and allotment groups.



Mounting

- Can be easily mounted on poles with cable ties
- Screw mounted to walls/fences
 - V2 (just being launched) will be even easier with side mounting tabs



Data Quality Assurance and Quality Control (QAQC)

- We came at Breathe London from a different perspective
 - we didn't think that small sensors were “god's gift” to monitoring
- We had the knowledge and techniques to make their data better.
- And 27 years experience of air pollution in London

Issues with small sensors

- Particles

- Sensor counts particles not mass
- Assumes particles are round/spherical
- Assumes all particles have same light properties
- Misses some parts of particles
 - Sea salt
 - Nitrate
 -

- NO₂ – Nitrogen Dioxide

- Sensor reacts to other things too !
 - Carbon Dioxide
 - Relative Humidity/moisture
 - Temperature
 - Ozone
 - Day/night cycle $\text{O}_3 \leftrightarrow \text{NO}_2$
 $\text{NO} + \text{O}_3 \leftrightarrow \text{NO}_2 + \text{O}_2$

If you are unsure of reading -
cross check/adjust it against a known measure





DATA Correction



**Reference
Node**



Calibration at
background

Colocation at
reference sites

Daily calibration
factor

Hourly corrected
sensor data



Aggregate
calibration
factors by site

**Breathe
London
Node**



Calibration at
background

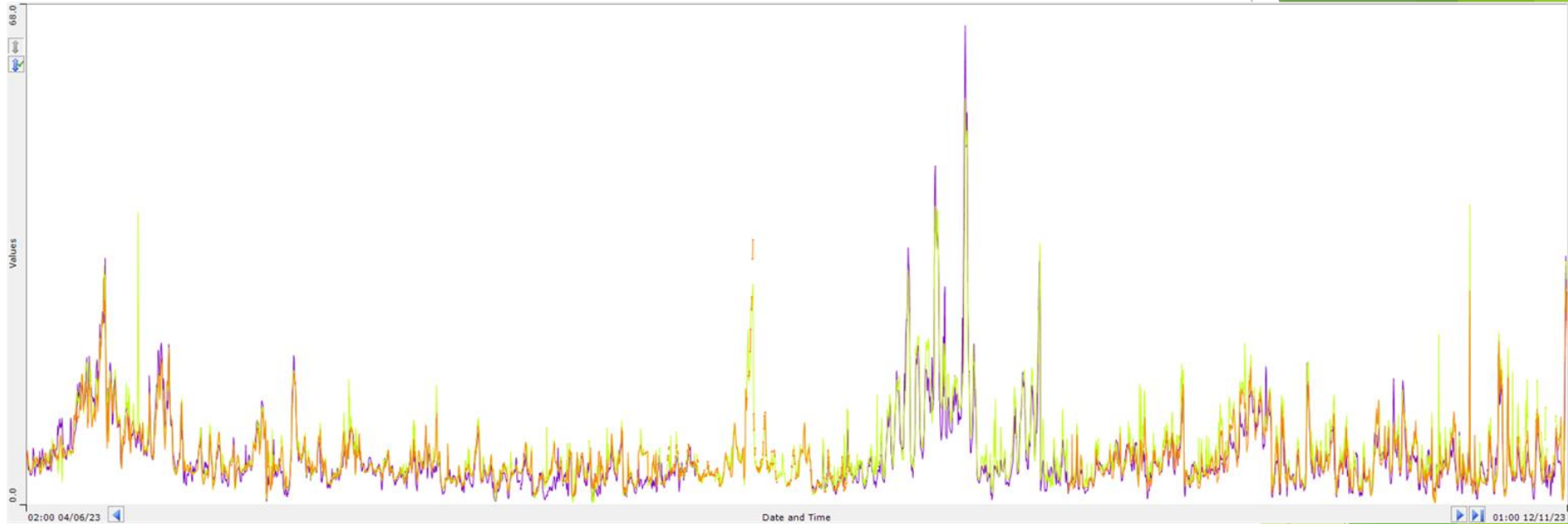
Breathe London
sites

Daily calibration
factor

Hourly corrected
sensor data



PM_{2.5} June to Nov 2023



Orange – St Francis of Assisi primary school
Light Green – Lancaster West RA Node
Purple - North Kensington Background reference Station.

www.breathelondon.org

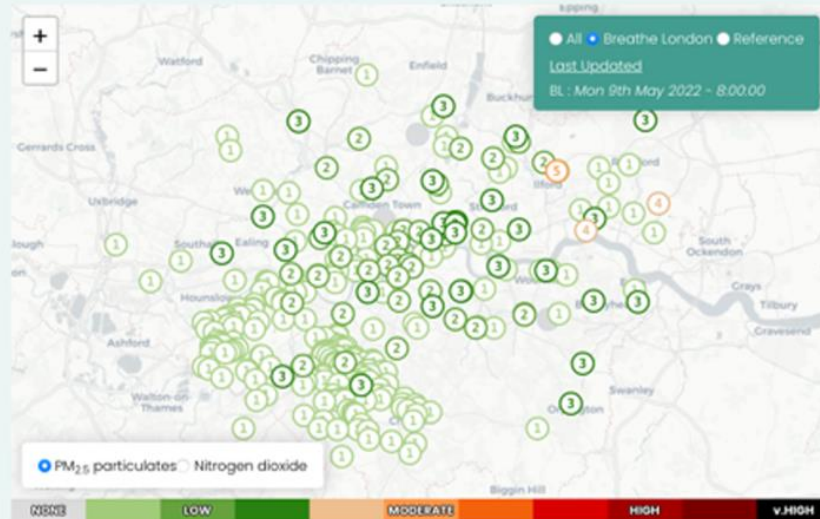


Breathe London
the community sensing network

[About](#) [Shop](#) [Community Programme](#) [Press releases](#) [Pilot](#)



Current air quality



[Air quality guidelines and health](#) / [Network accuracy](#) / [Node search](#)

Community stories



Mar 20, 2022

William Patten Primary's Story

William Patten School students and their families campaigning for cleaner air with the help of Breathe London.

[Read More](#) →

Click on the dot on map to see graph of data and more info



- Change the period using the two date boxes at top
- Compare to UK & WHO guidelines and objectives by clicking buttons below graph
- Grab the image or download data via the three lines top right

Breathe London Community Guidelines

1. **Mutual respect** – all voices are valid and opposing views are welcome. However, there is no tolerance for disrespectful language, noises, or behaviours. This is a community focused programme at heart and we want to create safe spaces that value the lived experience of our members.
2. **Equal participation** – to support equal participation, it is important that we each have an opportunity to share, practice good listening, and take care not to dominate the discussion. If something is unclear or uncomfortable (language, topic, behaviour), people are encouraged to raise their hands and we can take a brief pause.
3. **Active learning** – this community programme is a part of a wider project that not only looks to raise awareness and generate knowledge about air quality, but provide local communities the ability to create and imagine knowledge and solutions. It is an opportunity for all of us to learn, and to support this, it is important to stay open and curious.



Breathe London

the community sensing network

Programme Ethos and Aims

Embracing Evolution: While we maintain a structured programme of activities, we embrace change, iteration, learning and growing together.

Unite for Creation: Breathe London springs to life through the unique contributions of each participant. It's a symphony of voices that brings it into being.

Empower Data Democracy: We empower each group and individual to be a catalyst for change by producing and leveraging their own air pollution data.

Guided by Transparency: The Imperial & TSIP team stands as a pillar of support, committed to accountability and transparency.

The aim of the programme is to:

to democratise air quality monitoring and create a community of groups who support each other and share their experiences and ideas.”

Overview of activities



- *Key facets of BLCP*

- Community Guidelines
- Groups select node location
- Shared learning through in-person and online knowledge exchange-focused activities (**data viz focus group**)
 - In-person events
 - Virtual events
 - Hybrid focus groups
 - Maintain 'social media' style platform (Circle) -
 - Maintaining 'Repurposable' Resource bank – flyers, lesson plans, etc. (Google Drive)

- *Capacity for unique attention*

- One-on-one email exchanges
- Phone/video calls
- Responding to DMs via Circle

Local Engagement



What does the future of air pollution in London look like? © News

Key Learning

Key Learnings (to date)

Node data is not intuitive, comprehensible

Capacity related challenges

Different audiences warrant different visuals & core messages – information must be contextualised!

Enhance the quality of air pollution communications

Listening & remaining reflexive



Thank you and contact us to learn more!

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Website: www.breathelondon.org | www.kaylaschulte.com



The background of the slide features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

West London Healthy Home and Environment Study

Esther Lie - WellHome Community Engagement Coordinator



A community based research project in west London focusing on the indoor/outdoor air pollution continuum and its impact on asthma



WellHome
West London Healthy Home and Environment Study

Our local community at White City



Population and Economy

Population of
~100,000¹



46% of adults born
outside of the UK²



In some areas, 20% of households
are without an adult with English as a
first language³

45% of housing is
socially rented⁴



36% of households
are estimated to be living in
relative poverty⁵

23% of children live
in families that receive
of out of work
benefits⁶



MRC
Centre for Environment & Health



Medical
Research
Council

Imperial College
London



Centre for Climate Change
and Social Transformations



Asthma UK Centre
for Applied Research



Our local community

- We are extremely proud to be part of the local community at White City, where we **work with local partners** to create an **inclusive innovation district** through outreach and engagement.
- We have a **dedicated community engagement team** supporting and empowering residents through science, innovation and collaboration. Throughout the pandemic we stayed connected with residents by switching to online engagement activities to continue providing vital support to the community.
- **The Invention Rooms** is our dedicated space for innovation and the community in White City. Imperial's inventors and entrepreneurs make use of specialist prototyping equipment, while local people of all ages and background can build things, learn coding, develop digital skills and turn their ideas into working prototypes.



Family science for parents and children aged 5-11



Maker Challenge programmes for young people aged 11-18

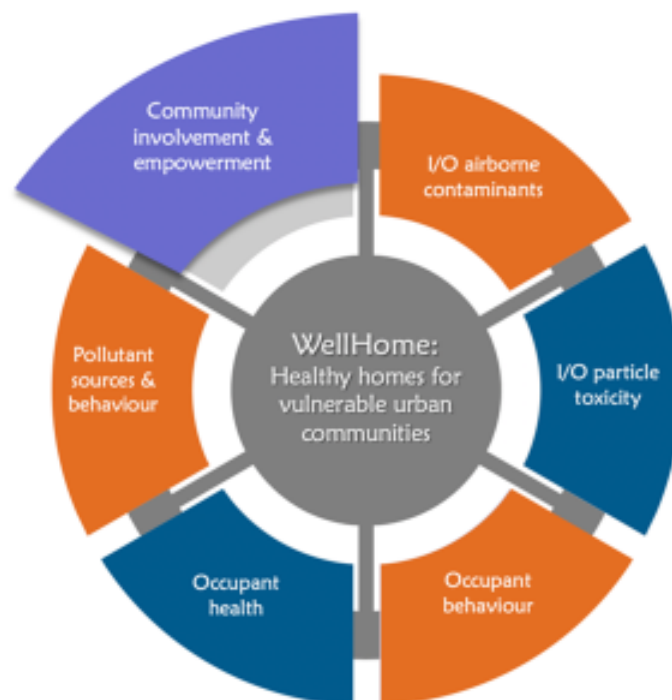


What the Tech? digital support for older residents

A strategic and inclusive approach to Indoor/Outdoor air quality and its health effects



WellHome
West London Healthy Home and Environment Study



MRC
Centre for Environment & Health



Centre for Climate Change
and Social Transformations



Asthma UK Centre
for Applied Research



A strategic and inclusive approach to Indoor/Outdoor air quality and its health effects

Engagement



West London
Community



Through educational campaigns and engagement activities, residents have the opportunity to learn about the causes and health effects of air pollution and ways in which they could reduce their exposure to harmful pollutants.



Clean Air Wins @CleanAirWins · Jun 15
We're delighted to be here at the @StudyWellHome and @VespeneCollege Asthma & Air Quality Breakfast to learn more about the impact of air pollution on respiratory health.
#CleanAirDay



- Local festivals and community events
- Educational sessions with local community partners
- Air quality Discovery day
- Air quality discussion panels
- STEM themed activity packs and materials about our research that can be done at home



A strategic and inclusive approach to Indoor/Outdoor air quality and its health effects



Involvement

To co-design feasible and effective methodologies for the gathering of long-term residential air quality measurements, that are engaging, useful and stimulate participation.

- Workshops
- Focus groups
- Panel discussion



A strategic and inclusive approach to Indoor/Outdoor air quality and its health effects



WellHome
West London Healthy Home and Environment Study



Participation

- Gather own indoor air pollution data
- Ambassador-led participatory video
- Actively involved in the development of an online community air quality research hub (legacy)



A strategic and inclusive approach to Indoor/Outdoor air quality and its health effects









WellHome

West London Healthy Home and Environment Study



Join an Air Quality and health study!



Did you know?

Air pollution is the biggest environmental risk to health in the UK, affecting every organ in the body.

Although we spend approx. 90% of our time indoors, almost all research on this topic is based on measurements of outdoor air pollution. We need to better understand air pollution in our homes - where it comes from, how it behaves and how harmful it is, particularly for **children with asthma**. In partnership with local **families** and residents, the WellHome project will involve 100+ homes to investigate indoor and outdoor air quality in West London.



If you...

- **Live in West London (e.g. W10/W11/W12 or surrounding area)**
- **Are 18 + and the main householder**
- **Expect to live at the same address for at least 12 months**

...And are interested in health and our environment, get in touch to join this exciting project!



Sign up now!

The WellHome study is a unique opportunity to co-produce new air quality research with world-leading researchers from Imperial College London.

We are inviting families on a rolling basis to join us until late Autumn 2023. We are also running events, activities and workshops for the whole community about air pollution and health – so get in touch if you have any ideas!

The project is open for all. We particularly welcome families with **children with asthma**, from **Black/Black British, North African and Asian** backgrounds, and from countries such as Poland and the Philippines to take part. We want the study to reflect West London's rich diversity, including families who speak **Somali, Arabic, Albanian, Spanish, Amharic and Portuguese**.

Why should I take part?

- **Measure indoor air quality in your home**
- **Free family-friendly educational activities & workshops**
- **Be part of a community air quality research network**
- **Help improve the air for all!**



Residents will host small air pollution sensors in their home for two four-week periods separated by 6 months, and complete questionnaires throughout. As a thank you for participating in the study, households will receive a total of £100. Please note that this payment can be seen as taxable income, so if you are receiving benefits, you will need to seek individual advice as to whether accepting the payment would affect your benefits.

Watch our 2 min video here:



wellhome@imperial.ac.uk



linktr.ee/WellHomeStudy



@StudyWellHome



Call/text 07596955261



@wellhomestudy

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Airbus UK Centre
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and Social Transformation



nova
welcome to a better world



Natural
Environment
Research Council



WellHome

West London Healthy Home and Environment Study

Email: wellhome@imperial.ac.uk

Text/call: 07596955261

Twitter: [@StudyWellHome](https://twitter.com/StudyWellHome)

Instagram: [@wellhomestudy](https://www.instagram.com/wellhomestudy)

Website: [Linktr.ee/WellHomeStudy](https://linktr.ee/WellHomeStudy)

Sign up for updates: bit.ly/WellHomeUpdates

Thank you!



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Q&A

