

# Protecting our children's lungs

Tackling air pollution across  
London's schools

The logo for ASTHMA+ LUNG UK features a stylized cross shape composed of four overlapping rectangular blocks. The top block is purple, the left block is blue, the right block is green, and the bottom block is orange. The text 'ASTHMA+' is positioned above 'LUNG UK' in white, bold, sans-serif font, centered within the intersection of the blocks.

ASTHMA+  
LUNG UK

December 2023

**Toxic air is harmful for anyone to breathe, but hits vulnerable lungs, especially children's lungs, the hardest.**

**Around 20% of primary schools in London are in areas that breach the Government's legal air pollution levels.**



Breathing in toxic air can stunt children's lung growth and reduce their life expectancy. This project was motivated by toxic air quality and the effect that it has on people's health, especially children and their growing lungs. By empowering young people to monitor the air quality around their schools, this project aims to raise awareness of the impact of air pollution on children's health.

Around 20% of primary schools in London are in areas that breach the Government's legal air pollution limit (annual average concentrations of nitrogen dioxide exceeding  $40\mu\text{g}/\text{m}^3$ ). Analysis by Asthma + Lung UK found that 99% of primary school children in the UK – more than 750,000 children in London alone – are put at risk from air pollution, not just on their way to and from school, but also whilst they are at school.

The pilot project ran for 18 months from September 2022. During this time, the main aims were to create and disseminate a health education programme into schools and complete air pollution monitoring at 150 primary schools in London. The results were to be shared with each school, with information about ways they could reduce children's exposure to toxic air, leading to schools having increased awareness, committing to making further changes and taking extended action with Asthma + Lung UK.

**As well as the above written aims, here are the objective numbers:**

**150**

primary schools included across Greater London.

**50**

secondary schools – extension to project, from May 2023.

**25%**

of the schools to be in deprived boroughs.

**900**

monitors sent to schools in 2023.

**800+**

usable readings collected from the laboratory.

In addition to the monitoring and education goals, the aim of this project was to also build lasting links between schools and Asthma + Lung UK through tailored support and engagement opportunities, such as supporting the Government's objective that 55% of primary school children should walk to school by 2025.

By the end of 2022, the first 14 schools had joined the project and received their monitoring packs. Following the start of a dedicated Schools Engagement Officer in March 2023, recruitment began for the remaining 136 primary schools.

**In Autumn 2022, we began making connections across London to discuss alignment opportunities with those already involved in clean air projects. Direct contact was also made with schools which had already shown interest in Asthma + Lung UK's clean air schools work, and a paid marketing campaign was completed with The Education Company to enable us to reach all schools across London.**

A number of communication tools were used to contact schools – starting with contacting warm schools from the November 2022 campaign, sending direct emails targeting those in the most deprived boroughs across London and working with aligned organisations and school networks including NEU and EcoSchools.

**During 2023, we had three main recruitment stages, spread across the school terms.**

In May 2023, it was confirmed by The Kusuma Trust (our pilot funders) that our request to extend the project to an additional 50 London secondary schools had been approved. At this point, there had been interest from several secondary schools, who were now able to join the pilot.

An additional paid marketing campaign was completed across July and September to aid recruitment of the 50 secondary schools as well as the outstanding primaries. This was aimed at senior leadership team (SLT) members and Geography/Science leads, and in total attracted 83 schools (40 primary, 43 secondary), completing the secondary school recruitment, with a waiting list. During the recruitment period, we also received direct contact from parents, school staff and local stakeholders showing interest. Information about the project was shared via Instagram and a blog post on the Asthma + Lung UK website, and a standalone webpage was created to enable schools to directly access information.

During 2023, we had three main recruitment stages, spread across the school terms. In April 2023, 34 primary schools started the project, followed by 67 schools (44 primary/23 secondary) across the rest of the summer term (following our expansion to secondary schools in May). The final 72 schools (46 primary/26 secondary) began their monitoring journey between September and December. A total of 13 schools signed up to the project, but did not progress beyond the sign up stage.

Once a school has started the project, they followed a number of steps (below) which took them on an 8-12 week journey from the first mailing and monitors being posted to the final evaluation survey (this could be extended depending on time taken to return monitors and receive results from lab). Contact was made to schools by direct email from the Schools Engagement Officer and through an automated journey triggered by engagement steps from schools.

Project steps	
<b>Step 1</b>	School confirms interest in project and the date they'd like to receive the monitors
<b>Step 2</b>	Instructions shared with school along with clean air worksheets and videos
<b>Step 3</b>	Monitor pack posted to school, including monitors, fixings, instruction and record sheets and return postage
<b>Step 4</b>	Check-in emails sent to school confirming monitors have arrived and reminder to take them down after 4 weeks and return them to the Asthma + Lung UK office
<b>Step 5</b>	Reminders sent if monitors are not received 6-8 weeks after send out
<b>Step 6</b>	Once monitors are received to office, confirmation is sent to school and monitors are returned to the lab for analysis
<b>Step 7</b>	Results received from the lab and transferred into easy-read document with behaviour change suggestions
<b>Step 8</b>	Results document shared with schools, with further learning resources including assemblies and lesson plans
<b>Step 9</b>	Reminder of further actions, engagement activities and support available sent to schools
<b>Step 10</b>	Feedback survey link sent

Throughout the journey, schools received a variety of educational assets. We worked with The Education Company to produce learning resources, developing lesson packs and assemblies for KS1, KS2 and KS3. These had three main themes: clean air, what can be done to make change, and education on lung conditions. The primary school assemblies were created to align with Clean Air Day and World Asthma Day. Lesson packs also matched curriculum learning objectives for English, Citizenship, Geography, Biology and Science.

Internally, as well as primary worksheets, Pledge Posters were developed to encourage schools to commit to three clean air behaviour pledges. Schools also received certificates once their monitors had been received by Asthma + Lung UK.

Within the project aims, air pollution monitoring was used as an engagement opportunity for schools to embark on their clean air journey, as well as a tool for them to utilize when trying to make change in their local communities.



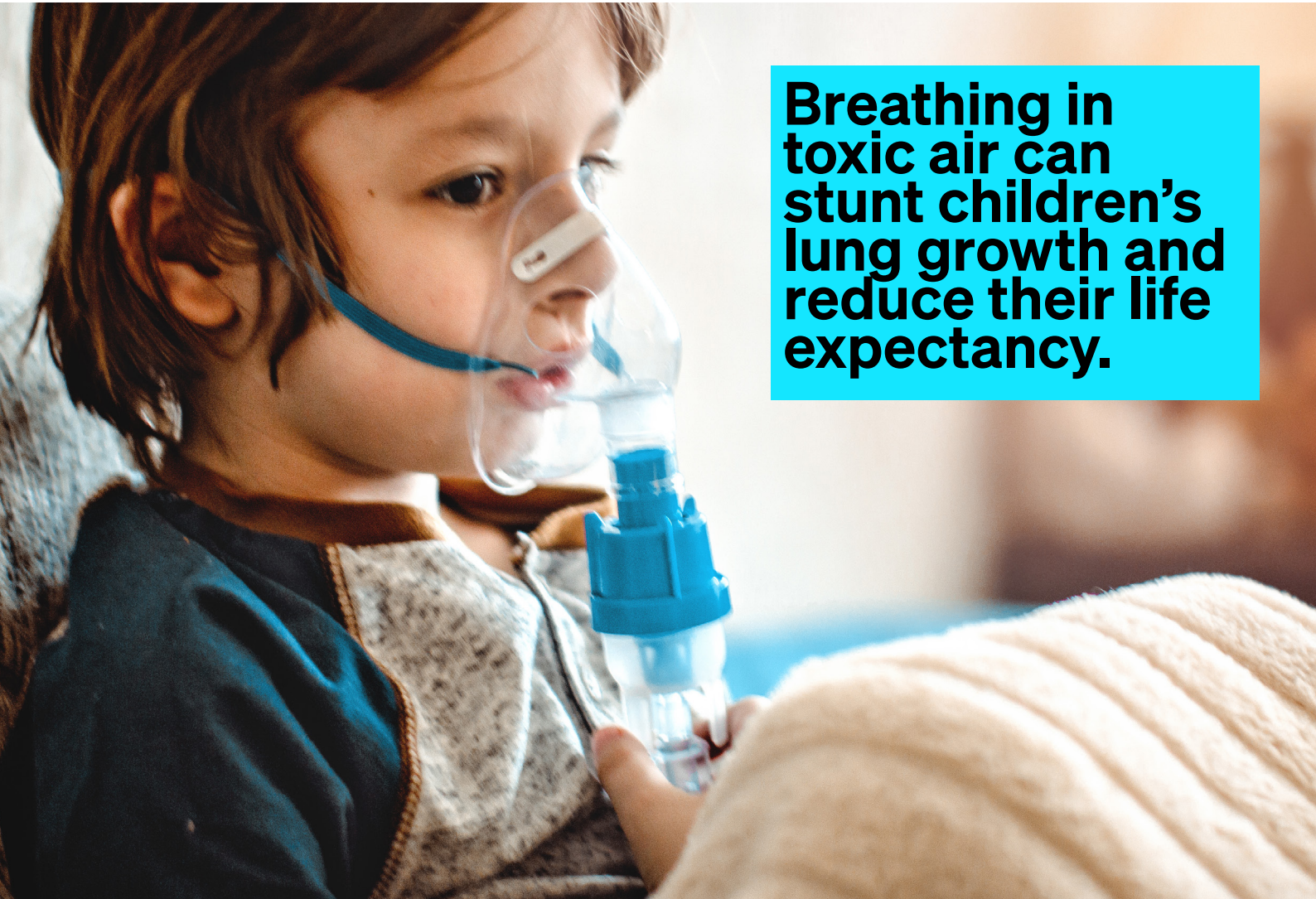
# Monitoring process

For this project, diffusion tubes were used, which measure the nitrogen dioxide levels in the air for the time they are up to give a snapshot of the local pollution level. Diffusion tubes are the standard for air pollution monitoring across local authorities.

The tubes have a grey cap on one end and a white cap on the other. They are positioned in outside areas at schools at heights ideally above two metres, with the grey cap at the top and the white cap removed. The diffusion tubes are left up for a four-week monitoring period. It is advised to schools that they place two tubes up in each location to enable them to get a mean of the result.

**The experiments conducted by schools give a snapshot of the local air quality for the period measured, and can be used by schools to give an indication of the air pollution in their local area.**

In the diffusion tubes, just underneath the grey cap, there is a steel mesh disc (this can be seen through the tube if looked at closely). The disc is coated in triethanolamine (TEA) which is what absorbs the nitrogen dioxide. When the white cap is off, air enters the tube and when gases pass over the mesh it reacts and this change is what shows the nitrogen dioxide levels during the monitoring period.



**Breathing in toxic air can stunt children's lung growth and reduce their life expectancy.**



# Analysis

When the tube is returned to the lab, they complete a test where the mesh is removed, washed with distilled water and analysed. The nitrogen dioxide levels are found by shining UV through the water sample.

Following analysis, the results are shared with Asthma + Lung UK. They are then incorporated into a document which, as well as the results, features information about the local borough's nitrogen dioxide levels and ideas for ways they could address and reduce children's exposure to toxic air.

There are various guidelines that we look to regarding nitrogen dioxide levels. The World Health Organization's Air Quality Guidelines (via [www.who.int](http://www.who.int)) are a global target for governments to work towards in improving their nation's health by reducing air pollution. In 2021, these guidelines were updated and the recommended level for annual average concentration of NO<sub>2</sub> was 10 µg/m<sup>3</sup>. In the UK, the Air Quality Standards Regulations 2010 require that the annual mean concentration of NO<sub>2</sub> must not exceed 40 µg/m<sup>3</sup> (via [www.gov.uk](http://www.gov.uk)). The experiments conducted by schools give a snapshot of the local air quality for the period measured, and can be used by schools to give an indication of the air pollution in their local area.

**We found that 99% of primary school children in the UK are put at risk from air pollution.**



# In total, this project surpassed its aim of working with 150 primary schools and 50 secondary schools.

Participants were included from a number of sources, and within this there was a variation between primary and secondary schools. The majority of secondary school participants came from marketing campaigns and through Asthma + Lung UK Policy team contacts in the Greater London Authority (GLA). These contacts subsequently introduced us to programmes such as 'Schools Superzones' that are run by London boroughs directly with dedicated environmental health officers. There were also incidences of students and parents putting their schools forward during an engagement stall at the Mums for Lungs Clean Air Carnival in Lambeth and through direct contact made with schools in the most deprived boroughs.

The primary school participant sources were more varied and also included contact made directly from school staff, governors and parents to the Asthma + Lung UK Community team, and from public health, housing and school climate network teams, plus participants already taking part in our Clean Air Champions scheme

There was a mix of schools participating across all the boroughs bar one, Kensington and Chelsea. Out of the 200 schools who signed up to this project, there were 64 schools in Inner London and 136 schools in Outer London. The number of schools in Outer London was significant as the Ultra Low Emission Zone was extended to cover the whole of Greater London in August 2023, during the course of this project.





# Participants

Borough	Inner/Outer London	Number of primary schools	Number of secondary schools	Total number of schools
Barking and Dagenham	Outer	4	2	6
Barnet	Outer	18	2	20
Bexley	Outer	11	2	13
Brent	Outer	3	2	5
Bromley	Outer	1	4	5
Camden	Inner	3	1	4
City of Westminster	Inner	2	2	4
Croydon	Outer	3	3	6
Ealing	Outer	10	1	11
Enfield	Outer	5	2	7
Greenwich	Inner	2	0	2
Hackney	Inner	7	2	9
Hammersmith and Fulham	Inner	0	1	1
Haringey	Outer	10	3	13
Harrow	Outer	1	2	3
Havering	Outer	2	2	4
Hillingdon	Outer	5	3	8
Hounslow	Outer	2	2	4
Islington	Inner	1	2	3
Kensington and Chelsea	Inner	0	0	0
Kingston upon Thames	Outer	1	0	1
Lambeth	Inner	9	3	12
Lewisham	Inner	10	0	10
Merton	Outer	2	1	3
Newham	Outer	11	1	12
Redbridge	Outer	6	2	8
Richmond upon Thames	Outer	2	2	4
Southwark	Inner	3	1	4
Sutton	Outer	0	1	1
Tower Hamlets	Inner	9	0	9
Waltham Forest	Outer	1	1	2
Wandsworth	Inner	6	0	6

We know that the UK has dismal rates of childhood asthma, with the poorest communities being the most severely affected, so wanted to ensure that a good number of schools in boroughs with above average asthma hospitalisation rates were included. Using data collated by Asthma + Lung UK from the following sources: Public health profiles - OHID (via phe.org.uk), Pupils Eligible for Free School Meals, Borough - London Datastore (via data.london.gov.uk) and Indices of Deprivation - London Datastore (via data.london.gov.uk) we ensured this was achieved. We sent monitor packs to a total of 77 schools (55 primary, 22 secondary) in these boroughs. 65 primary schools and 21 secondary schools that we sent monitor packs to are in boroughs of above average Free School Meal levels.

**When asking participating schools about their reasoning behind joining the project, these were some of the top reasons:**

- ➔ **Concern over pollution levels, their impact on students and local community and their health.**
- ➔ **High traffic density near school.**
- ➔ **Having an eco-group, travel ambassadors or student council at the school.**
- ➔ **Raise awareness of air pollution hotspots near the school. Looking for ways to make improvements.**



**This project aims to raise awareness of the impact of air pollution on children's health.**

Monitoring packs have been sent to 82 schools (67 primary schools and 15 secondary schools) in boroughs that had a roadside nitrogen dioxide high over the legal limit in 2021.

The aim was also to include schools from academy trusts: we had 48 schools from 33 different trusts sign up to the project. There was also a variation of schools types taking part, such as community schools, foundation schools, free schools, voluntary aided, voluntary controlled, special educational needs (SEN) schools and independent schools.

### Primary schools:

School type	Number of participants
Academy converter	10
Academy sponsor led	12
Children's centre	1
Community school	76
Community school - SEN	2
Foundation school	4
Free school	4
Independent school	13
Independent school – SEN	1
Voluntary aided school	26
Voluntary controlled school	1

### Secondary schools:

School type	Number of participants
Academy converter	20
Academy sponsor led	6
Community school	4
Community school - SEN	2
Foundation school	2
Free school	2
Independent school	8
Independent school – SEN	1
Voluntary aided school	5



# Findings

Engagement levels from schools was mixed when comparing between primary and secondary schools. When looking at the return rate of monitors compared to those sent out, the level was just under a half, with around 46% of primary schools returning their monitors, compared to 32% of secondary schools.

We received a number of tubes that included spiders/webs and insects that the lab warned may have compromised the results. On occasion, we also received tubes that were dirty or contained water, which meant that they could not be analysed. Out of the total monitors received, around one third (36%) were unable to be analysed.

London borough	Highest result ( $\mu\text{g}/\text{m}^3$ ) from pilot	Average of results ( $\mu\text{g}/\text{m}^3$ ) from pilot
Barking and Dagenham	44.2	22.1
Barnet	54.0	17.0
Bexley	38.6	14.8
Brent	21.9	18.5
City of Westminster	34.6	29.2
Croydon	23.5	17.4
Ealing	21.3	17.0
Enfield	25.8	18.8
Hackney	19.3	16.9
Haringey	51.5	22.5
Havering	21.1	18.5
Hillingdon	23.0	19.2
Islington	22.7	20.2
Lambeth	14.1	11.2
Lewisham	31.6	16.3
Merton	39.2	36.1
Newham	32.4	18.9
Redbridge	10.8	9.1
Richmond upon Thames	33.0	21.7
Tower Hamlets	18.6	15.8
Wandsworth	20.2	15.3

In the data we have received so far from 66 schools, we have been able to average the results to see how they compare to information we have about their local boroughs. We have found that the snapshots from schools are much lower than 2021 nitrogen dioxide roadside high data (via Defra) in all boroughs except Merton, where results from this pilot were higher. Due to the nature of our experiment, where we have no specific controls in place except advising on temperature control and monitoring period, this may mean that our results are less precise than hoped.

We can also see there are some trends for our averaged results when looking at the months that schools monitored, with colder months showing higher levels of nitrogen dioxide.

Average of results ( $\mu\text{g}/\text{m}^3$ )	Start month	End month
31.6	Nov-22	Dec-22
47.6	Dec-22	Jan-23
14	Apr-23	Apr-23
22.6	Apr-23	May-23
10.8	May-23	Jun-23
12.7	May-23	Jul-23
15.6	Jun-23	Jul-23
12	Jun-23	Aug-23
14.9	Jul-23	Jul-23
11.6	Jul-23	Aug-23
10.6	Sep-23	Sep-23
18.5	Sep-23	Oct-23
23.1	Oct-23	Nov-23

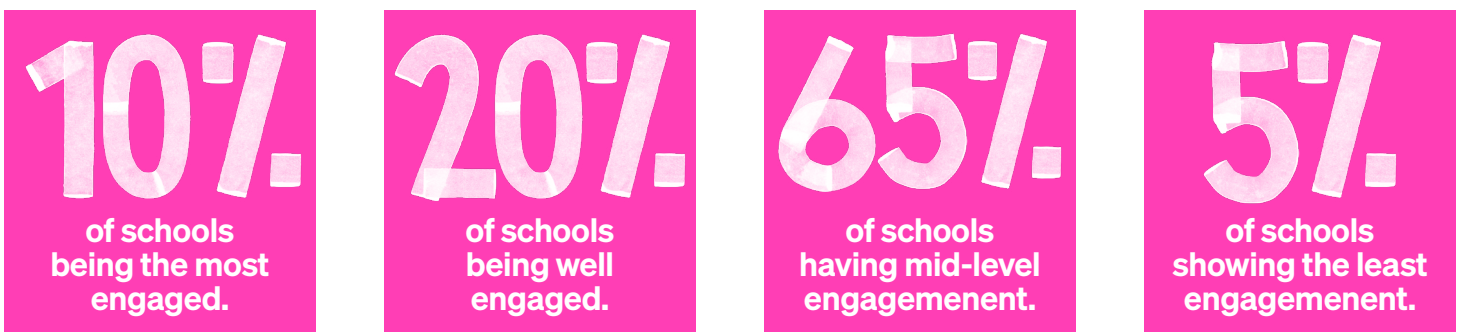
Overall, these results have given us an indication of the air quality at each school for the period measured. As well as this initial monitoring, some primary schools also have the opportunity to conduct a second round of monitoring to see what change has taken place since their first round, which will take place in January-February 2024. Results for this will not be available until March 2024. It is hoped that they will show an improvement in air quality from the behaviour changes they have made. Schools involved in the re-monitoring have also expressed interest in finding out what impact the ULEZ extension has had in its first six months of implementation.



**We know that the UK has dismal rates of childhood asthma, with the poorest communities being the most severely affected.**



We envisaged that the level of ongoing engagement from schools would be tiered, with 10% of schools being the most engaged, 20% being well engaged, 65% having a mid-level of engagement and 5% showing the least engagement. This has been tracked by the steps schools have taken, such as returning monitors, downloading school resources, interest in assemblies and workshops, sharing clean air actions and signing up to future engagement. These levels are still being observed but we have so far reached the goal for most engaged at primary school age.



During the pilot, a small number of schools were visited to complete assemblies and present the results to students, with the help of respiratory nurse colleagues. These continue to run and continue to be booked in for the beginning of 2024.

In May 2023, a workshop was created with the Asthma + Lung UK policy team, named Clean Air Activists. This included a campaigning guide and in-school workshops aimed at both primary and secondary school students where they could create posters or letters to be displayed in their schools and sent to local MPs. During the project period, there have also been two poster competitions shared with engaged schools: one from the Mayor of London's office to tie-in with Clean Air Day 2023, and another run by Asthma + Lung UK for school children to create a poster on the theme 'healthy air + healthy lungs'. A selection of these posters were chosen to be included in our schools resource offer.





There have also been a number of schools who have already gone on to complete further action with Asthma + Lung UK by joining the Clean Air Champions scheme or choosing us as their Charity of the Year. It is expected that numbers will grow with further schools finishing their monitoring project journey.

A stakeholder event was held in Islington in October 2023 to showcase the pilot to contacts across London and participating schools. As well as an update on the project and its progress, attendees heard from two speakers and saw first-hand some of the school poster creations. The two speakers were Deborah Waddell, a respiratory nurse specialist sharing insight on supporting children and young people with asthma, and Dr Yasmin Mahfouz, speaking about her paper 'Polluted Playgrounds', which looks at the air quality around building new schools.

## **In February 2024, we are holding an online event to mark the end of this pilot, alongside the issue of this report.**

As well as the events and opportunities that were shared, schools were asked during the evaluation stage how they used their data. Responses included that they had shared the results with pupils, parents and governors through assemblies, school newsletters and eco club meetings. It has also been used as evidence when applying for School Streets and campaigning for change.

### **Changes schools said they were going to make included:**

-  **Promoting more active travel initiatives and walk to school groups.**
-  **Setting up School Streets.**
-  **Building a new bike shed to encourage active travel.**
-  **Planting more trees.**

# Here are a **reminder** of the objective numbers



**150**

primary schools and  
50 secondary schools  
across Greater London



**25%**

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**900**

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**800+**

usable readings  
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laboratory.

The target of 200 schools sign ups across this pilot project was reached in November 2023, with an additional four London secondary schools on a waiting list. 87 of these schools are in deprived boroughs. Over 1,400 monitors have been sent to schools and monitors are being returned weekly, with over 300 results having already been shared with schools.

Over the coming months, it is expected that a large number of monitors will be returned for analysis and results will continue to be shared with schools until the project end. The engagement from this project continues to build, and schools with a total of over 30,000 pupils have had the opportunity to access learning resources and increase their knowledge on toxic air and behaviour changes that can be made to reduce pupils' exposure.

Throughout the project there have been a number of learning opportunities that can be brought into future projects around how best to work with schools and what they benefit from the most. Other learnings include what timings work best with schools, how to effectively market the project and general project workings and organisation.

**Over the coming months, it is expected that a large number of monitors will be returned for analysis and results will continue to be shared with schools until the project end.**

Although some results have not been quite as expected and, as mentioned earlier, there may be further conditions that need introducing to achieve more controlled experiments, the engagement with schools across London is invaluable, especially with the anticipation of future collaborations and expansion of this project to benefit more pupils.

**We would like to thank The Kusuma Trust for their funding for this pilot.**

**THANK YOU!**



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