

CALM

Clean Air Living Matters
Exploring Reading

A CALM:ER approach to air quality education

Use of low-cost sensors to increase
awareness and invite behavioural change

Reading Borough Council
DEFRA Air Quality Grant Fund 2022/2023
End of Programme Review – October 2025



Project and contact details

Lead Local Authority Name: Reading Borough Council

Project Partners: University of Reading, Stantec and Design Nature

Key contact details:



Reading Borough Council:

Ross Jarvis

Principal Air Quality Project Officer

Ross.jarvis@reading.gov.uk

0118 937 2314

Project partner contact details:

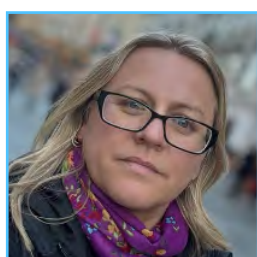


Stantec:

Emma Rigler

Principal Air Quality Consultant,

Emma.rigler@stantec.com



University of Reading:

Marta O'Brien

Research Scientist,

m.obrien@o2blife.com



Design Nature:

Mark Mason

Company Director

mark@designnature.world

Executive summary

Clean Air Living Matters: Exploring Reading (CALM, or CALM:ER) was a two-year educational programme funded by the Department for Environment, Food and Rural Affairs' (DEFRA's) 2022-2023 Air Quality Grant scheme. The programme was based in schools in Reading Borough Council (RBC) with the purpose of engaging primary and secondary school pupils to increase knowledge and awareness of air quality, learn about its causes, and understand impacts and find solutions through behavioural change.

Due to Reading's strategic location as a transport interchange, with heavy M4 commuter and freight traffic, the town experiences localised peaks in nitrogen dioxide (NO₂) and particulate matter (PM_{2.5}) emissions, especially along busy roads. Concentrations of PM_{2.5} are also affected by domestic burning, making them key targets for the CALM education initiative.

According to the 2021 Census, the population of Reading, UK, was recorded at 174,200, reflecting an 11.9% increase since 2011. There were estimated to be 67,700 households in the borough, while the greater urban area is currently estimated to have a population of around 233,000¹.

Reading is a relatively young town, with 33.7% of residents aged 20–39. The 65+ age group also grew significantly, increasing by 17.2% between 2011 and 2021. The town is culturally diverse, with 46.5% of residents identifying as Black, Asian, or from a Minority Ethnic (BAME) background making Reading one of the most ethnically varied towns in the Southeast. Many languages are spoken locally, including Polish, Nepalese, Romanian, Arabic, Portuguese, and Spanish. This diversity provided valuable insight for designing an inclusive air quality programme, especially as about 56% of primary pupils come from BAME backgrounds, highlighting the importance of cultural sensitivity in educational outreach (RBC 2024).

Despite its economic strengths, parts of the borough face significant deprivation, including some of the most disadvantaged wards nationally. This further motivated CALM's commitment to reaching all communities. The programme was able to:

- Engage pupils from a wide range of backgrounds;
- Address air quality issues relevant to their daily lives;
- Explore and impact behavioural change in schools and communities; and
- Prepare pupils with practical STEM skills via curriculum-aligned activities.

The programme made substantial progress across all key performance indicators (KPIs), exceeding many of its original targets while leaving a lasting educational and environmental legacy. A main success of the programme is highlighted by the inclusive engagement, having directly reached over 9,000 children, over 2,000 through practical knowledge sessions and nearly 7,000 through awareness activities.

The programme also made significant progress in terms of community and parental engagement. Through face-to-face conversations at school gates and participation in community events, over 860 parents and carers were directly engaged, and the estimated total reach extended to over 17,000–24,000 adults through indirect channels such as CALM materials shared at home and public events. This outreach helped to stimulate important conversations about air quality at home, contributing to behaviour changes such as reduced car idling and more frequent active travel.

Knowledge acquisition was measured through pre- and post-assessments, revealing an average knowledge increase of 28% among primary school pupils and 9% among secondary school pupils. These improvements demonstrate that the educational components were well-structured, accessible, and impactful. Pupils actively engaged with resources such as interactive presentations, videos, practical monitoring activities, and were able to confidently apply this knowledge during action planning and discussions.

¹Reading Borough Council (2024). Profile of Reading. Retrieved 04/08/2025, from <https://www.reading.gov.uk/about-reading/profile-of-reading/>

Executive summary (continued)

Beyond knowledge gains, the programme succeeded in supporting behavioural change. Action planning activities were completed in 8 primary schools and 5 secondary schools, where pupils developed and presented proposals to improve air quality in their schools and wider communities.

CALM also made a strong contribution to curriculum integration. Although air quality is not currently a standalone topic within the national curriculum, the programme's materials aligned well with subjects such as science, geography, mathematics, and citizenship. The development of a dedicated Key Stage 2 lesson plan, in collaboration with the University of Reading and a local teacher, has further embedded air quality education into mainstream learning and will remain accessible as part of the university's climate education resources. Additionally, the availability of materials on the RBC and Design Nature websites ensures that the programme's legacy will continue beyond the programme's official end.

In conclusion, the CALM programme has delivered a high-impact, comprehensive approach to air quality education, engagement, and action. It not only met and exceeded key targets but also created a model for meaningful, community-focused environmental education that is scalable and sustainable. By combining scientific understanding, behavioural change, community outreach, and long-term resource development, CALM has put in place a strong foundation for ongoing efforts to improve air quality and build environmentally responsible communities in Reading and beyond.

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1. Project Summary

1.1 Background

Clean Air Living Matters: Exploring Reading (CALM, or CALM:ER) was a two-year educational programme funded by the Department for Environment, Food and Rural Affairs' (DEFRA's) 2022-2023 Air Quality Grant scheme. The programme was based in schools in Reading Borough Council (RBC) with the purpose of engaging primary and secondary school pupils to increase knowledge and awareness of air quality, learn about its causes, and understand impacts and find solutions through behavioural change.

Reading is a heavily built-up area, in which the roads get congested during peak times. Local air quality monitoring has shown that nitrogen dioxide (NO₂) concentrations exceed the national air quality objective in central Reading, predominantly due to road traffic emissions and congestion. An Air Quality Management Area (AQMA) was declared in the town centre in 2009 for consistent exceedances of the annual mean NO₂ objective.

Although NO₂ is the only pollutant currently exceeding a national air quality objective in Reading, particulate matter (PM₁₀ and PM_{2.5}) is also a pollutant of concern due to its effects on health even at low concentrations. The Public Health Outcomes Framework (PHOF) suggests that the fraction of mortality attributable to PM_{2.5} air pollution in Reading in 2023 was 5.3%, above the national rate of 5.2%². Domestic solid wood burning contributes the single largest local contribution of PM_{2.5} (estimated at 38% nationally³) and is a key air pollution of concern in Reading given the high percentage of terraced houses (26%) in the borough that burn solid fuel. The use of solid fuels is expected to have risen with the recent energy crisis.

Despite this, awareness of air quality issues in Reading is considered to be limited. Although numerous projects to improve air quality have been carried out over the years, air pollution remains high due to people's entrenched behaviours. The CALM programme was therefore introduced and set out to target specific areas through a school engagement programme, aiming to directly engage 33 of the 49 RBC schools with a knowledge and awareness campaign, with the potential to reach over a quarter of the population of RBC through engagement with the wider community.

The programme was funded under Lot 2 of the 2022-2023 DEFRA Air Quality Grant and, while it covered a wide range of air pollutants, it had a particular focus on raising awareness of the impacts of particulate matter and solid fuel burning.

1.2 Programme Overview

The CALM programme ran between February 2023 and July 2025, engaging thousands of children and residents across Reading in air quality workshops and activities. RBC were the sole applicant of the DEFRA Air Quality Grant funding but were supported by three project partners over the duration of the programme: Stantec, University of Reading and Design Nature.

The roles of the project partners were as follows:

- **Stantec** – overall programme management, coordination and management of air quality monitoring programme, provision of air quality technical advice.
- **University of Reading (UoR)** – school and stakeholder engagement, managing and leading school deliveries, preparation of school materials, evaluation of programme progress and outcomes, provision of air quality technical advice. The CALM programme builds on a PhD research project currently undertaken by Marta O'Brien within the Department of Geography and Environmental Science at the UoR which focuses on air pollution spikes at school gates, community engagement and air quality education.
- **Design Nature** – school and stakeholder engagement, managing and leading school deliveries, preparation of school materials, management and co-ordination of the programme's branding and graphic design.

² Department of Health & Social Care (2023). Public Health Outcomes Framework. Retrieved 11/07/2025, from <https://fingertips.phe.org.uk/profile/public-health-outcomes-framework>

³ Department for Environment, Food and Rural Affairs (2019). Clean Air Strategy. Retrieved 11/08/2025, from <https://assets.publishing.service.gov.uk/media/5c3b9debe5274a70c19d905c/clean-air-strategy-2019.pdf>

1. Project Summary

At the outset, the programme aimed to work with 24 primary schools and 9 secondary schools in Reading over 4 school terms, with a supporting package of engagement across all schools and the wider community. The programme used air quality sensors that measure concentrations of nitrogen oxides (NO_x), particulate matter (PM₁, PM_{2.5}, PM₁₀), carbon dioxide (CO₂) and total volatile organic compounds (TVOCs) to aid in the learning activities carried out at the schools.

The programme aimed to bring about behaviour change through an interactive programme with school children and pupils, and which was supported by a multimedia marketing campaign which shared the learning with the wider community. While the programme focused on air quality, it also covered synergies between air quality and climate change.

1.3 Aims

The primary objectives of the CALM programme were to:

- Increase knowledge of air quality, its causes, impacts and solutions, for primary and secondary school children with a range of age suitable programmes.
- Use the programme to increase awareness in the wider community including schools outside of the programme, parents, and the communities around the schools.
- Encourage behavioural change both in activities that impact on poor air quality by parents and the wider community, and in terms of measures that the school children, and others, can take to reduce their exposure to poor air quality.

To monitor progress against the aims and to evaluate the success of the programme, 14 Key Performance Indicators (KPIs) were set by the CALM team and are outlined in **Table 1** below.

Table 1 Summary of Key Performance Indicators for CALM

Key Performance Indicator (KPI)	Description of KPI	Method of Evaluation
KPI001 - Number of Children Engaged	Target: Direct: 2,800 pupils Awareness: 16,000 pupils	Number of children engaged would be measured at each CALM delivery and outcomes would be categorised by 'increased awareness' (e.g. assembly) or 'increased knowledge' (e.g. lesson/workshop).
KPI002 - Number of Schools Engaged	Target: 9 secondary schools 24 primary schools	Number of school visits to be recorded.

1. Project Summary

Key Performance Indicator (KPI)	Description of KPI	Method of Evaluation
KPI003 – Impact on Parents and Community	Target: Direct: 3,000 parents and guardians Awareness: 40,000 adults	Record to be made of: Number of adults engaged at each CALM event (such as teachers, parents) Numbers of children engaged who take activity sheets home. Webpage and social media views/engagement Approximate number of people engaged in wider marketing (posters, billboards etc.)
KPI004 – Deployment of Sensors	Target: 10 No. static monitors 20 No. portable sensors	Record to be made of number of static sensors installed at schools and when portable sensors are used in activities at schools.
KPI005 – Legacy Teaching Aids	Resources to be made available for teachers and wider community following completion of the CALM programme.	Teaching aids to be prepared and uploaded to the CALM website. Record to be made of the number and description of teaching aids produced.
KPI006 – Knowledge Acquisition	Pre- and post-assessments to be used to evaluate the level of knowledge children have about air quality before and after educational sessions.	Quizzes and tests to be used to measure the retention and understanding of key concepts related to air pollutants, sources and their effects.
KPI007 – Behavioural Changes	Determine whether there is evidence of behavioural change following activities in schools, engagement with parents and the wider community.	A parent's questionnaire is to be developed to understand behavioural response. Questions to be asked at school gates and/or link to be provided to an online questionnaire. Follow-up activities to be provided to pupils during CALM deliveries. Data to be collected on changes in behaviour, such as whether children are more likely to adopt practices that reduce air pollution exposure, reduce personal pollution sources, or encourage environmentally friendly habits at home.

1. Project Summary

Key Performance Indicator (KPI)	Description of KPI	Method of Evaluation
KPI008 – Participation in Environmental Initiatives	Encourage children to increase their involvement in wider environmental initiatives.	Questions to be asked during class activities to see how many pupils are involved in environmental initiatives such as environmental clubs, community clean-up events etc.
KPI009 – Communication Skills	Improve children's communication skills through the CALM sessions.	Evaluate pupils' ability to communicate air quality concepts through presentations, posters or projects.
KPI010 – Attitude and Perception Shifts	Determine whether attitudes to air quality improve as a result of the programme.	Undertake focus group discussions with a sub-set of schools to discuss attitude and perception to air quality and air pollution exposure.
KPI011 – Integration into the Curriculum	Seek opportunity to integrate air quality education into the school curriculum.	Review CALM activities against the existing school curriculum and discuss the potential to incorporate air quality elements into the curriculum with a sub-set of schools.
KPI012 – Parental Involvement	Determine whether children's involvement in the CALM programme has influenced household behaviours or encouraged discussions about air pollution.	Online survey to be created and promoted to parents through materials sent home with children, an air quality brochure, a poster competition and engaging parents at school gates.
KPI013 – Use of Technology and resources	Assess how well pupils utilise educational resources, such as books, videos, or guest lectures, to enhance their air quality knowledge.	Record through observation in class during activities and recording downloads from website.
KPI014 – Levelling Up Agenda	Determine whether the programme has been delivered in an equitable way across school children from different socio-economic backgrounds.	Plot engaged schools against deprivation indices to identify whether catchments are reflective of the economic mix of RBC.

1. Project Summary

The programme had educational and health benefits, and school engagement was initially prioritised in line with the Government's levelling up programme and in the most built-up locations where air quality is typically poorer. It is in these areas where reduction in air pollution exposure has the largest potential.

Given the scale of the programme, the CALM programme also covered schools in more affluent areas where vehicle ownership and commuting to school by car is more commonplace, and where parents are more likely to have open fires and wood burning stoves. These schools are considered to have the largest potential to tackle air pollution sources and reduce emissions.

By covering schools across the Government's deprivation deciles, the programme aimed to reduce both exposure to poor air quality and emissions of air pollution.

1.4 Links to the RBC Air Quality Initiatives

The CALM programme directly relates to several actions outlined within the RBC Air Quality Action Plan (AQAP) 2024-2029⁴. The relevant AQAP measures are outlined below:

RDAQ7 – Promoting Travel Alternatives: School Streets

RDAQ8 – Promoting Travel Alternatives: Continue to Promote Active and Low Emission Travel Options

RDAQ11 – Traffic Management: Healthy Streets and Quiet Neighbourhoods

RDAQ16 – Transport Planning and Infrastructure: New Pedestrian and Cycling Routes

RDAQ28 – Promoting Travel Alternatives: School Awareness Events

RDAQ29 – Public Information: Health Promotion Work with NHS

RDAQ32 – Public Information: Smoke Control Area Awareness Campaign

RDAQ34 – Public Information: Engagement in National Clean Air Day

RDAQ35 – Public Information: Indoor Air Quality Awareness Campaign

⁴ Reading Borough Council (2024). Air Quality Action Plan 2024-2029. Retrieved 05/09/2025, from: <https://www.reading.gov.uk/climate-and-pollution/air-quality-action-plan/>

1. Project Summary

1.5 Programme Timeline

A summary of the work undertaken as part of the CALM programme is described in Table 2 below, split by quarter.

Table 2 Summary of Work Undertaken During the CALM Programme

Quarter	Summary of progress
Q1: April to June 2023	The first quarter of the CALM programme was focussed on onboarding the three project partners: Design Nature, Stantec and UoR.
Q2: July 2023 to September 2023	The first quarter of the CALM programme was focussed on onboarding the three project partners: Design Nature, Stantec and UoR.
Q2: July 2023 to September 2023	Two pilot schools (one primary and one secondary) were identified to co-design the first CALM deliveries. A market review of air quality sensors to use with the schools was completed. Programme branding, marketing engagement, engagement with RBC's transport-led schools programme were also completed.
Q3: October 2023 to December 2023	Air quality sensors were procured and tested and the team developed guidance for installation in the schools. The collateral for school engagement was further developed and largely completed. Messaging about CALM was pushed out through the Headteacher's briefing packs and the school's climate engagement programme to identify interest.
Q4: January 2024 to March 2024	School engagement materials were finalised including assembly PowerPoints, activity sheets and materials for secondary school STEM activities. We commenced school engagement, including delivery and installation of sensors at the schools.
Q5: April 2024 to June 2024	UoR were fully onboarded, and deliveries were accelerated in quarter 5. We ran a workshop for Clean Air Day for over 60 children from 4 schools as part of the Reading Climate Festival. The CALM team also attended and engaged children and adults at other engagement opportunities in the Reading area including Kidical Mass cycling event in Wokingham. Further collateral was developed, including a brochure on air quality (physical and online), case studies, a poster competition to run in Autumn 2024, and animations to use in engagement.
Q6: July 2024 to September 2024	CALM deliveries continued over the summer term and into the summer break through attending Civitas Academy Family Fun Day, Reading Cycle Festival, Apollo Youth Club, Southcote Community Event and running sessions with 99 th Reading Scouts. Our poster competition for primary school children was launched and animation videos commissioned to spread awareness in the wider community. Undergraduates were recruited to support the engagement with parents at school gates.

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Q7: October 2024 to December 2024	Activities were run with 4 primary schools, 1 secondary school and 2 independent schools, and nearly 900 parents were engaged during pick-up and drop-off times at school gates. We procured and tested an additional 15 outdoor and 15 indoor sensors to maintain stocks until the end of the programme. Four CALM animation videos were created and published to increase awareness of pollution, with a particular focus on the recently expanded Reading Smoke Control Area. An associated marketing plan was created to complement these videos and maximise engagement with the public. We also ran a poster competition themed around 'What's in our air and how can we improve it?' in this quarter. The poster competition was open to Key Stage 2 children, with the winning poster distributed around Reading including within GP surgeries and community centres.
Q8: January 2025 to March 2025	The activities undertaken during this period focused on term-long engagement where possible, including monitoring sessions and follow-up action planning workshops. We completed an indoor air quality workshop at the UoR laboratories for pupils of Civitas Academy which involved completing experiments that recreated common sources of indoor air pollution. We also loaned portable air quality monitors to four families and conducted follow-up interviews for each to discuss how the monitor improved air quality awareness and encouraged behavioural change. To raise awareness of the impacts of wood burning, we ran a marketing campaign for Clean Air Night, reaching 5,220 people across several social media platforms. We also ran a month-long campaign with Reading Buses which used four images from our animation videos on in-bus digital screens. During this quarter, our focus started to shift to the legacy of the CALM programme. We contacted the Institute of Education at UoR to produce lesson plans that can be used by schools long-term following completion of this programme, as well as Nicely Done Animations to create an end-of-programme video/animation.
Q9: April 2025 to June 2025	Quarter 9 began with a final call for school involvement and then focused on finalising CALM deliveries and planning for the legacy of the CALM programme. The final school workshops and sessions were delivered, and we ran another workshop on 24th June to coincide with Clean Air Day following the success of a similar workshop last year. This workshop was promoted as part of the Reading Climate Festival. Twenty lamppost wraps were procured to encourage anti-idling and burning better. The wraps were distributed across Reading at key air pollution hotspots and outside schools. A final marketing video was prepared with support from Nicely Done Animations. The aim of the video was to signpost air quality resources after the programme ends, to give a summary of the CALM programme and to act as a call to action for behavioural change and improving local air quality. Other resources were also prepared and the website updated to reflect the end of the programme. This included a lesson plan prepared by UoR that teachers can use and more case studies. Plans were made to redistribute unused air quality sensors to local schools and community groups with RBC.

1. Project Summary

1.6 Deviations from Initial Scope

As discussed in more detail in section 7.1, engaging schools in the CALM programme has been the key challenge over the last two years. During quarter 6, it was decided to reevaluate the programme's targets and KPIs as the initial ambitious targets of 16,000 children with increased air quality awareness and 2,800 children with increased air quality knowledge were proving to be unachievable despite persistent efforts to increase engagement.

As a result, we proposed to re-base the targets to 50% of those originally proposed in terms of school engagement, and to reduce the number of primary schools engaged by a third from 24 to 16.

The programme was on budget for a programme end in March 2025 with contingency, and therefore we also proposed to extend the school deliveries to the end of the summer term (quarter 9) as opposed to quarter 8 as originally proposed, in order to maximise school engagement.

A summary of the changes is below:

1. The target number of engaged pupils was reduced by 50%.
2. School engagement was extended into the summer 2025 term with final reporting in July 2025.
3. The target number of primary schools engaged was reduced from 24 to 16.
4. The programme would now consider both private sector and state sector schools in the secondary school target of 9 schools.

This resulted in the following targets that remained in place until the end of the programme:

Table 3: Summary of Revised KPIs

Key Performance Indicator	Revised Targets
KPI001 - Number of Children Engaged	- Air Quality Awareness: 8,000 children - Air Quality Knowledge: 1,400 children.
KPI002 - Number of Schools Engaged	- Engagement with 16 primary schools - Engagement with 9 secondary schools, including those in both the public and private sector.

Despite the need to reduce our targets, at the time we had already engaged over 4,300 pupils from 17 schools and the programme had delivered on the provision of high quality, and well received, engagement, therefore the programme was still successfully achieving its aims. No further deviations were required throughout the programme.

2. Air Quality Monitoring

2.1 Monitor Selection

The CALM programme utilised low-cost air quality sensors as educational aids to engage pupils in learning about air pollution and local air quality. A total of 120 monitors were purchased and distributed as part of the programme.

Sensor technology for monitoring the concentration of air pollutants is relatively mature and has a key advantage that low-cost (and even portable) air quality sensors can be located on lampposts or other infrastructure and can provide useful data as to the trends and ranges of pollutant concentrations. It should be noted that the advantages as regards cost and practicality of sensor-based air quality monitoring technology does come with lower accuracy due to sensor interferences (other gases, temperature and humidity) and sensor drift; however, the accessibility of the sensors for education far outweighed the need for technical accuracy in this instance.

A market review of available low-cost sensors was undertaken by the CALM team at the beginning of the programme, focusing on 11 key areas:

1. Sensor Accuracy
2. Pollutants of Interest
3. Reliability
4. Instructions and user guide(s)
5. Power
6. Data Transmission and Data Processing
7. Customer Service
8. Ease of Use
9. Data Handling and Access
10. Cost
11. Security

The key pollutants of concern for this programme were particulate matter (PM_{10} and $PM_{2.5}$), however CO_2 was also considered a useful indicator for indoor activities due to the comparatively high natural concentrations (parts per million as opposed to parts per billion) providing for cheaper and improved quality sensors, as well as the concept of respiration being easier to comprehend for pupils.

Two types of monitors were considered: 'Stationary' monitors and 'Citizen Science' (CS) monitors. Given the requirements of this programme, CS sensors were recommended due to their low-cost, portability and flexibility for the educational environment. As the basis of the CALM programme was an education campaign, the monitors were to be used as educational aids as opposed to data collection. The use of CS sensors allowed greater engagement with pupils through both their quantity and interactivity; therefore, CS sensors have more benefit as an educational aid to raise awareness and inspire behavioural change.

Following the market review, the preferred monitors were selected to be the Atmotube PRO and AirGradient DIY Pro as a result of the use of the data platform being customisable and user-friendly and given their previous use within education setting (as part of the SAHME project⁵). Although it was initially proposed to engage pupils in assembling the AirGradient monitors as part of the CALM deliveries, it was later decided that the monitors would be pre-assembled to maximise the use of the monitors during CALM deliveries.

⁵ Schools' Air Quality Monitoring for Health and Education (SAHME) website. Retrieved 04/08/2025, from <https://www.samhe.org.uk/>

2. Air Quality Monitoring

An initial purchase of 30 No. AirGradient Open Air monitors, 30 No. AirGradient ONE monitors and 30 No. Atmotube PROs was made, with an additional 15 No. AirGradient Open Air and 15 No. AirGradient ONE monitors purchased in Summer 2024 ahead of the second year of CALM deliveries.

Upon signing up with the CALM programme, each school was initially provided with 1 No. AirGradient Open Air and 1 No. AirGradient ONE monitor, although several schools were provided additional monitors depending on the nature of the proposed CALM deliveries. The Atmotube PROs were used on an ad-hoc basis by both the CALM team and pupils/parents for portable monitoring and mapping. Monitor instructions were provided to the school, alongside technical support as required.

Although stationary monitors were not the primary focus for the CALM programme, the UoR had three existing Airly monitors that were installed for a short period of time outside three schools: Civitas Academy, Blessed Hugh Faringdon Catholic School and Geoffrey Field Junior School.

2.2 Monitor Testing and Installation

Prior to distributing monitors to schools, all air quality monitors were tested by the CALM team and any discrepancies queried and resolved with the manufacturer. Calibration of the monitors is undertaken at the AirGradient and ATMO factories prior to dispatch. Both companies have embedded calibration factors and algorithms to ensure the monitors auto-calibrate when in use, therefore significant long-term testing of the monitors was not considered to be required.

Notwithstanding the above, all 30 No. Atmotube PROs were tested ahead of use in CALM deliveries through a walk around Bristol city centre. All 30 portable monitors were taken to known air quality hotspots to ensure that spikes of air pollution were detected by the monitors. Results of the tests are shown in Figure 1 below and indicate that the Atmotube PRO monitors can successfully detect peaks in particulate matter concentrations from both road traffic and commercial kitchen emissions, although detection occasionally lagged by approximately 30 seconds.

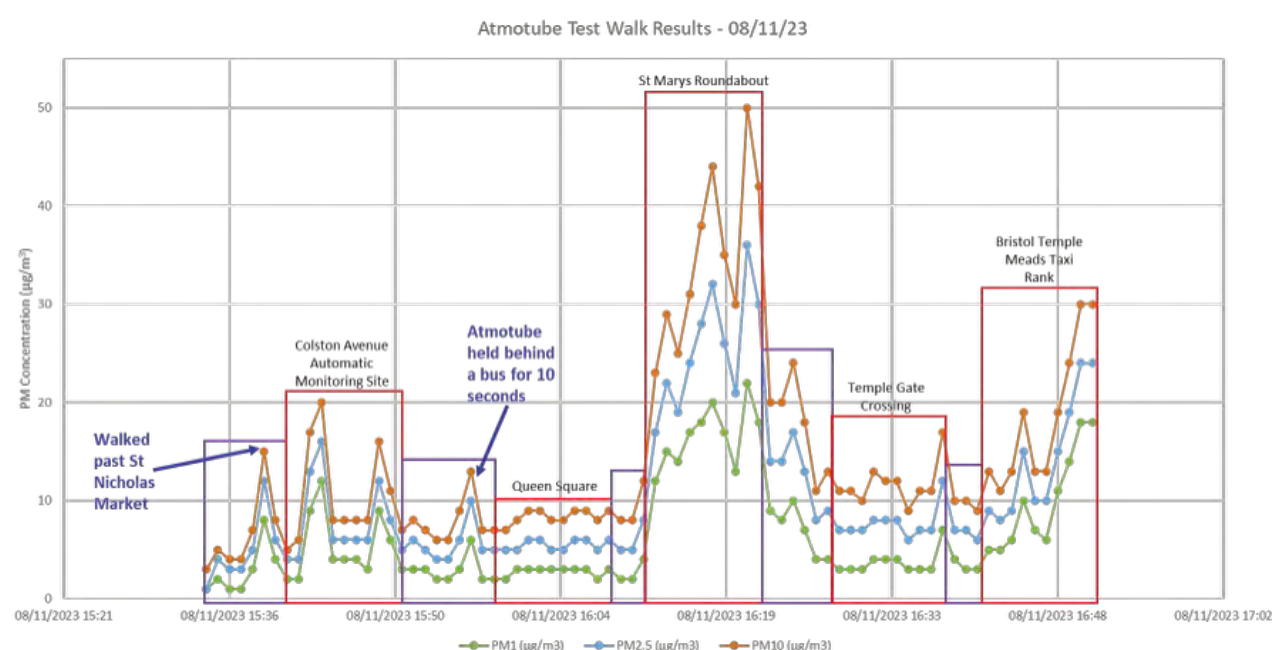


Figure 1: Results of the Bristol City Centre Atmotube PRO test

2. Air Quality Monitoring

Once these tests were complete, the monitors were distributed to schools with instructions. A total of 28 schools within the Reading area were provided with monitors over the duration of the CALM programme.

A key challenge during the installation of the AirGradient Open Air monitors was limited access to external power supplies. To combat this, solar panels, waterproof boxes and battery packs were provided to schools without external power supplies to allow them to operate the outdoor monitors. Key challenges are discussed in more detail in section 7.1.

2.3 Data Collection

The following parameters were monitored as part of the programme:

- AirGradient Open Air (ambient) – particulate matter (PM_{10} , $PM_{2.5}$, PM_{1p}), temperature, relative humidity
- AirGradient ONE (indoor) - $PM_{2.5}$, CO_2 , total volatile organic compounds (TVOCs), NO_x , temperature and relative humidity.
- Atmotube PROs (portable) - PM_{10} , $PM_{2.5}$, PM_{1p} and TVOC.

The AirGradient monitors were connected to the AirGradient online dashboard which allowed trends to be analysed by the CALM team. Where anomalies or peaks in air pollution were identified, schools were contacted to identify whether air quality improvements could be implemented. Teachers were also provided access to the AirGradient dashboard and encouraged to discuss the readings with the pupils. The AirGradient dashboard is user-friendly and allows concentrations to be analysed across a range of dates, pollutants and monitors, as shown in **Figure 2**.

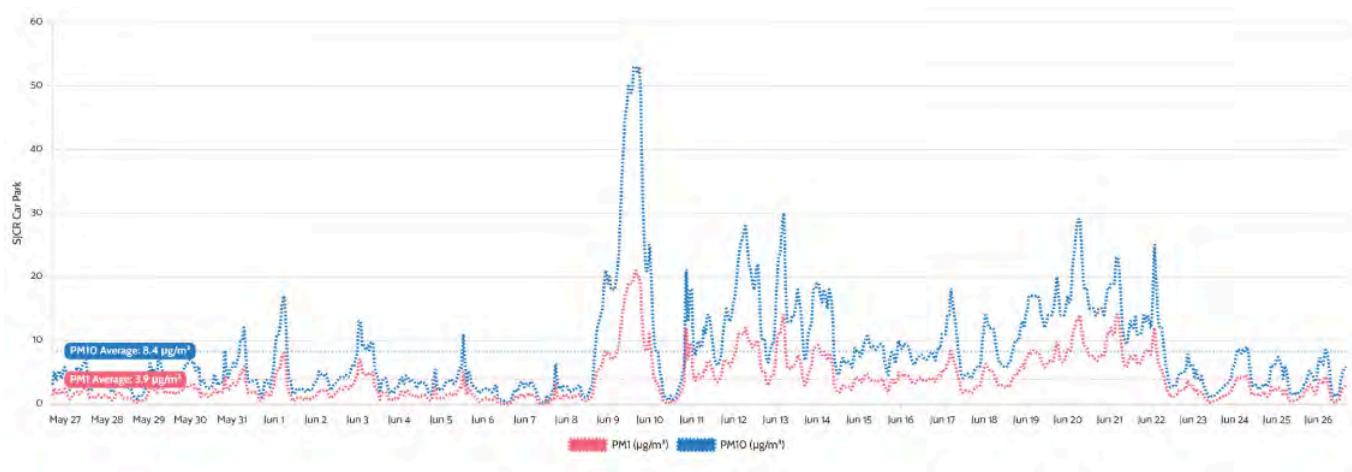


Figure 2: Analysis of ambient particulate matter concentrations for St Joseph's College on the AirGradient dashboard.

Real-time readings of air pollutant concentrations were also used to engage pupils during CALM deliveries, as discussed in Section 3. The majority of AirGradient ONE monitors were installed in classrooms to allow pupils to engage with and record air quality data during the school day. An example of a data collection spreadsheet used by pupils in short-term monitoring studies is also shown in **Figure 3** (next page).

2. Air Quality Monitoring

School: _____
Term: _____

Class: _____
Date: _____

Week _____



Record:
The numbers that you see on the digital display & the LED colour.

Temperature → 20.6°C

CO2 → 1031 ppm

VOC → 57% (ug/m³)

PM 2.5 → 3 (ug/m³)

	1	2	3	4	5	6
Temp						
CO2						
VOC						
PM 2.5						








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Figure 3: Example Air Quality Indoor Data Collection Sheet used by CALM Pupils

The results of the monitoring studies were discussed in CALM deliveries and played a key role in improving pupils' air quality awareness, while supporting the school curriculum and encouraging development of STEM skills, such as critical thinking and data analysis.

3. Summary of CALM Activities

3.1 Introduction

As part of the CALM programme, a total of 53 interactive activities were delivered to 28 schools during the 18-month delivery phase, which began in January 2024. These activities ranged from whole-school assemblies to practical, hands-on air quality monitoring sessions conducted both indoors and outdoors. The delivery culminated in dedicated action-planning workshops and creative sessions designed to be fully interactive, engaging, and aligned with curriculum objectives across Key Stages 2 to 5.

Initial brainstorming sessions, conducted during the early planning stage in Autumn 2023, played a crucial role in shaping the educational design and delivery of the programme. These sessions explored how best to engage children in complex environmental topics and laid the foundation for the programme's inquiry-based learning approach. Pupils were introduced to key guiding questions such as "What is air quality?", "What is air pollution?", and "What can we do about it?" (**Figure 4**). These questions encouraged children to reflect on their existing knowledge and started curiosity-led discussions.

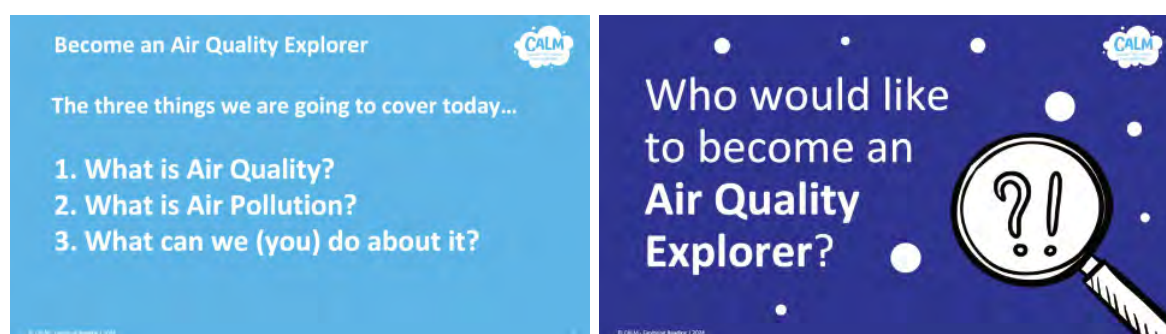


Figure 4: An invitation slide to become an Air Quality Explorer and list of subjects covered during the assembly session.

Building on this foundation, pupils took part in a series of practical activities that helped them investigate air quality more deeply. Using air quality monitors, children gathered real-world data. Guided exercises followed, during which pupils worked collaboratively in small groups to identify realistic and meaningful ways to improve air quality in their classrooms, schools, and local communities.

The action planning sessions emphasised creativity and pupil ownership. Pupils were encouraged to think "outside the box" and propose ideas that reflected both their environmental understanding and their lived experience of school, home and community life. These sessions produced a wide range of outputs, including anti-idling campaigns aimed at parents and carers, greening initiatives such as planting trees and indoor plants, and active travel promotions encouraging walking, cycling, or scooting to school. Pupils also designed posters and ran awareness campaigns to engage their wider school communities. These ideas formed the school-level air quality action plans, some of which have already been implemented.

To reinforce learning and extend the programme's impact beyond the classroom, each participating pupil received a worksheet or booklet to take home. These materials enabled children to share their knowledge with their families, facilitating indirect community engagement and promoting household awareness of air quality issues, extending the engagement and success of the programme.

All educational resources used in the programme, including lesson plans, activity guides, data collection sheets, and presentation slides were carefully developed to align with national curriculum frameworks. Subjects such as Geography and STEM (Science, Technology, Engineering, and Mathematics) were integrated, ensuring that activities supported key learning outcomes. These materials are hosted on the RBC website and will remain accessible and downloadable beyond the lifespan of the programme, supporting continued use by schools and educators in the future.

Further details on each format of CALM deliveries are provided in section 3.3.

3. Summary of CALM Activities

3.1.1 Connections to Curriculum

Although air quality is not currently included within the school curriculum, the CALM programme aligns strongly with the secondary school science curriculum aims by promoting active scientific inquiry throughout its activities. Pupils carried out investigations using air quality monitors measuring CO₂, TVOCs, particulate matter, temperature, and humidity. The pupils gathered and analysed data, compared readings over time, reflected on indoor versus outdoor air quality, and learned to interpret results using scientific reasoning. These activities, supported by the CALM team, allowed pupils to view data and evaluate classroom conditions, reinforcing skills in data analysis, hypothesis testing, and evidence-based communication.

CALM activities also embedded geographical enquiry, mathematics and environmental thinking, earth and atmospheric science, citizenship and biology. Children collected air quality data on school playgrounds or local streets using low-cost sensors and discussed how urban factors, such as traffic, can affect air quality in schools. The pupils considered human–environment interactions, evaluated how their surroundings shaped pollution exposure, and applied this understanding when designing sustainable air quality action plans.

For younger learners, CALM's hands-on use of sensors and data logging created meaningful, age-appropriate STEM experiences. Pupils engaged in structured investigations exploring, for example, how CO₂ levels change during a lesson or how air quality shifts upon opening windows. This direct engagement supported skills in technology (operating monitors), mathematics (interpreting results), and science (understanding pollutants), connecting real-world activities with national learning objectives.

By drawing on proven educational methods, real-time data and curriculum linked activities, the CALM team ensured that every lesson plan and activity:

- Delivered curriculum goals in Geography and STEM subjects;
- Engaged pupils in real-world investigations with meaningful outcomes;
- Encouraged data-driven actions; and
- Supported shared values of critical thinking, collaborative inquiry, and environmental responsibility.

3.1.2 Stakeholders' Engagement

The CALM team recognise that improving air quality and introducing environmental responsibilities and healthy living goes beyond this programme. Therefore, the conversation about environmental education also involved external stakeholders.

The team were fortunate to have had the support of 28 schools that took part in the programme. Support was provided by headteachers, deputy headteachers, teachers, and support staff who accommodated the delivery of activities, the installation and use of monitoring equipment, the completion of data sheets, and contributed to the delivery and implementation of action plans. Support from parents and their willingness to take part in this research was also invaluable, as was the enthusiasm and commitment shown by all the pupils.

Local teams at RBC explored connections with the Transport Team, including discussions on sustainable travel and existing school engagements. The aim was to avoid overloading school staff with similar activities or topics and to combine efforts where possible, using available time with schools efficiently.

The team also engaged with the SAMHE³ project team. The SAHME project started before the CALM programme and focused on indoor air quality monitoring in schools. The SAHME team exchanged experiences on school engagement, monitoring methods, equipment use, and shared lessons learned to support smooth and effective delivery. This collaboration also acknowledged the challenge that improving air quality in schools and educating pupils on the subject represents.

3. Summary of CALM Activities

The programme was offered to schools via the STEM Ambassadors⁶ platform and included engagement with the Climate Ambassadors⁷ scheme lead by the UoR as well as the Nature Park programme⁸, which forms part of climate education efforts. Both the 2024 and 2025 Clean Air Day workshops were included and promoted as part of the Reading Climate Festival event that links organisations from the local area to businesses, academia, community groups and authorities that are working on the climate strategy for Reading⁹.

Other stakeholders involved in the CALM programme included organisations that provided monitoring equipment: AirGradient and ATMO. These partners readily offered assistance as needed. The programme was featured on both suppliers' websites, including in an online webinar showcasing the work, which helped extend the programme's reach globally.

3.2 School Engagement

A range of targeted recruitment methods were employed to engage schools in the CALM initiative. The comprehensive approach was designed to reach a broad spectrum of local schools and ensure inclusive participation across the Reading area.

RBC played an important role in outreach through its established connections through Brighter Futures for Children (BFfC) - an independent, not-for-profit company providing services to support children and families in Reading. An invitation to participate in the programme was shared on several occasions via the Headteachers' Briefing which is a trusted communication channel that effectively reaches school leadership teams and their decision makers. This formal endorsement from the local authority added credibility and visibility to the programme, encouraging school engagement.

In parallel, the UoR supported recruitment by sending direct email invitations to every school in the borough. These communications highlighted the educational benefits of the programme and reinforced the opportunity for schools to engage in environmental learning at no cost. This direct approach aimed to cut through competing priorities and reach teachers and administrators efficiently.

Additionally, the programme was promoted through national networks including the STEM Ambassador and Climate Ambassador platforms. These platforms are frequently accessed by educators seeking enrichment opportunities in science and sustainability and helped to amplify the programme's reach beyond traditional school communication channels.

Project partners also utilised their collective social media presence to spread awareness. Posts on Facebook, Twitter (X), LinkedIn, and Instagram helped to generate visibility and allowed the programme to connect with both educators and the wider community, demonstrating the value of social engagement in educational recruitment.

Despite the digital and formal outreach, one of the most effective recruitment methods proved to be in person engagement. Printed leaflets were hand delivered to schools, and this personal touch resulted in a noticeable increase in signups. It became clear that schools were more likely to respond positively when approached face-to-face, particularly by individuals who were already familiar to them.

⁶ STEM Ambassadors webpage. Retrieved 04/08/2025, from <https://www.stem.org.uk/stem-ambassadors>

⁷ Climate Ambassadors webpage. Retrieved 04/08/2025, from <https://climateambassadors.org.uk/>

⁸ Nature Park webpage. Retrieved 04/08/2025, from <https://www.reading.ac.uk/planet/climate-education/nature-park>

⁹ ReadingCAN Climate Action Network webpage. Retrieved 04/08/2025, from <https://readingcan.org.uk/about-us/>

3. Summary of CALM Activities

The most successful recruitment strategy was the use of the personal relationships between project team members and local schools. The trust and rapport already established through previous collaborations or community presence significantly enhanced engagement. Once a school requested an assembly, it was often followed by further involvement in the programme, such as participation in workshops and extended learning activities. This progression from initial engagement to deeper involvement highlights the importance of creating accessible entry points and maintaining sustained communication. It also shows how a strong foundation of local knowledge, trust and understanding of the school needs was essential to the success and lasting impact of the programme.

Despite strong interest in the programme, several schools were unable to take part due to limited staff capacity and tightly packed timetables. These are challenges that are common across the education sector. These constraints highlighted the importance of offering flexibility in how and when sessions were delivered. In response, the CALM team adapted by providing flexible scheduling options, tailoring session lengths, offering alternative locations for the sessions, integrating workshops into existing curriculum areas such as science, geography, and PSHE (Personal, Social, Health and Economic) or afterschool activities such as Eco Clubs. Emphasising the educational value of the sessions, such as alignment with national curriculum objectives, opportunities for skill development, and 'hands on' learning helped schools see the relevance and benefits of participation.

However, reaching the appropriate decision makers, such as headteachers or curriculum leads, was not always straightforward. Building relationships over time, attending local events and school fairs, engaging with families and communities, maintaining a visible presence in local education networks were all vital strategies in overcoming this barrier. Crucially, the fact that the workshops were offered free of charge enabled the schools' involvement and reinforced the programme's accessibility and inclusiveness. The challenges involved in school engagement are discussed in section 5.1.

3.3 School Deliveries

3.3.1 Overview of Deliveries

Engagement with schools was delivered through a variety of formats adjusted to the needs and preferences of each participating school. These included whole school assemblies, interactive indoor and outdoor workshops, laboratory-based sessions, PSHE classes, and Q&A style engagements. This flexible and responsive approach allowed the CALM team to meet the schools' individual needs, both in terms of curriculum alignment and practical logistics, ensuring that participation could be as beneficial as possible.

For primary schools, the general approach was to begin with a whole school assembly, aiming to be an accessible and engaging entry point. These assemblies focused on delivering knowledge about air quality and air pollution, in an age appropriate and visually engaging manner. This initial exposure sparked curiosity and welcomed engagement. Following the assembly, smaller group workshops were offered to selected classes or year groups, providing an opportunity to deepen understanding of the subject. These sessions often involved hands-on activities, discussions, and local data collection exercises, helping pupils connect the global issue of air quality to their immediate environment and everyday choices.

In the case of secondary schools, the engagement strategy was adjusted to better align with older pupils' learning needs and curricular structure. Workshops were the primary format offered, allowing for more in-depth exploration of scientific and health related aspects of air quality. Where requested, PSHE sessions were delivered, enabling pupils to explore the personal and social implications of air quality and other environmental issues. When available, science laboratories were used to facilitate experiments and data analysis, helping pupils to build practical skills and apply critical thinking.

In total, 28 schools have engaged with the CALM programme: 20 primary schools (one independent), eight secondary schools (including two independent). Two of the secondary schools were from neighbouring councils, however these schools were included as part of the CALM programme as they were deemed to have a high percentage of pupils living in RBC's area. Details of the engagement levels at each school are illustrated in **Figure 5** and listed below in **Table 4**.



3. Summary of CALM Activities

Table 4: List of primary and secondary schools including the type and level of engagement with children and adults. Type and number of engagements are represented by ✓

School name	Number of Children	Number of Teachers	Engagement type		Additional info
			Assembly	Workshop	
Primary Schools					
All Saints CE Junior School	100	2	✓		
Caversham Primary School	240	8	✓		
	60	5		✓	Year 6
Christ the King RC Primary School	320	20	✓		
Civitas Academy	260	8	✓✓		
	46	6		✓	Year 5 laboratory session (UoR Campus)
	50	4		✓✓	Year 5
Coley Primary School and Nursery	210	8	✓		
	24	3		✓✓	Eco Warriors
Emmer Green Primary School	180	8	✓		
English Martyrs Catholic Primary School	400	20	✓		
	124	7		✓✓✓ ✓	Year 5 and Year 6
E P Collier Primary School and Nursery	240	10	✓		
	120	5		✓✓✓ ✓	Year 5 and 6

3. Summary of CALM Activities

Geoffrey Field Junior School	360	10	✓		
Green Park Village Primary Academy	200	1	✓		
The Hill Primary School	180	3	✓		
	120	4		✓✓✓	Year 5 and 6
Katesgrove Primary School	360	18	✓		
	90	6		✓✓✓	Year 5
Manor Primary School	180	6	✓		
Moorlands Primary School	300	13	✓		
	100	7		✓✓✓	Year 5 and 6
New Christ Church CE Primary School	200	5	✓		
Oxford Road Community Primary School	180	10	✓		
Southcote Primary School	360	18	✓		
	180	8		✓✓✓	Year 5 and 6
St Anne's RC Primary School	115	5	✓		
Thameside Primary School	380	12	✓		

3. Summary of CALM Activities

Independent Primary Schools					
Hemdean House School	12	2		✓	
Secondary Schools					
Blessed Hugh Faringdon Catholic School	12	2		✓	Clean Air Day Workshop (UoR Campus)
	186	8		✓	Year 7: 1hr PSHE session
	5	4		✓	After school parents' engagement session
	15	2		✓	Air Quality Workshop (UoR Campus)
Reading Girls' School	30	2		✓	STEM session Year 7
Reading School Boys	25	2		✓	STEM session Year 9
River Academy	186	12		✓	Year 7: PSHE session
Neighbouring councils					
Little Heath (West Berkshire)	270	10		✓✓✓ ✓✓✓	Eco Day 2024 West Berkshire / Reading Borough split Year 7 WBC 125 / RBC 145
	130	8		✓✓✓ ✓✓	Year 7 Eco Day 2025
	30	3		✓	Clean Air Day Workshop (UoR Campus)
Waingels (Wokingham)	11	2		✓	Air Quality Workshop (UoR Campus)
Independent Secondary Schools					
The Abbey	12	2		✓	Clean Air Day Workshop (UoR Campus)
St. Joseph's College	9	1		✓	Clean Air Day Workshop (UoR Campus)
	5	1		✓	Geography and Eco Club

A total of 53 school sessions were delivered as part of CALM. Multiple knowledge workshops have been included in one 'session' if these were delivered on the same day.

3. Summary of CALM Activities

3.3.2 Assemblies

School assemblies were a very popular forms of engagement offered to primary schools, helping to raise awareness about air quality, where the children were invited to become ‘Air Quality Explorers’. These were often delivered during the school’s daily assembly, typically lasting 20–30 minutes and involving either the entire school or just Key Stage 2 pupils. In total, 4765 children participated in the assemblies, supported by 185 teachers during 20 sessions.

The locations of the schools that took part in the assemblies are presented below in Figure 6.

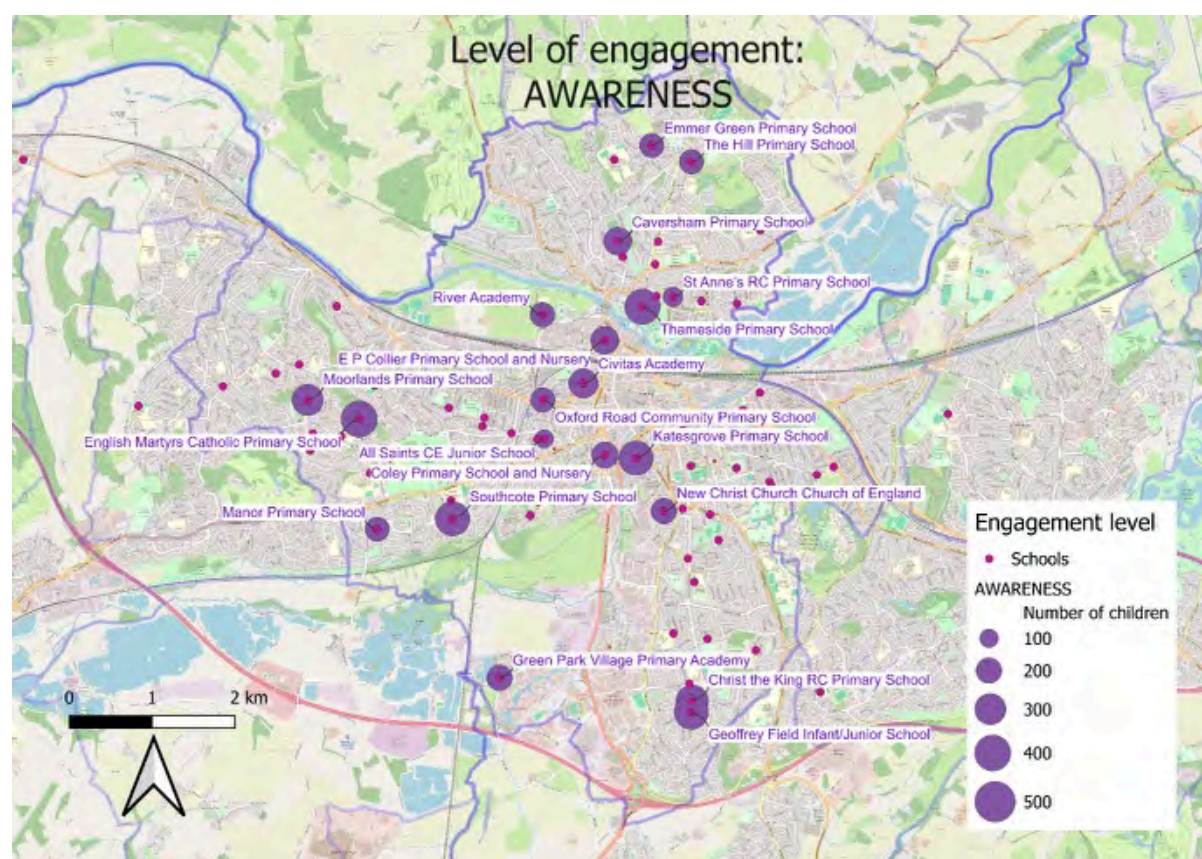


Figure 6: Total engagement via assemblies delivered in Reading.

A typical assembly presentation began with an introduction to the programme and its project partners, highlighting the roles of DEFRA and RBC. Children are invited to become “Air Quality Explorers” and to consider ‘What is air quality?’, ‘What is air pollution?’ and ‘What can we do about it?’.

Engagement is encouraged through simple Q&A, introducing important topics such as the main gases that make up the atmosphere, the importance of clean air both indoors and outdoors, and the factors that can affect air quality. Sources of pollution are discussed, including outdoor sources such as transport and bonfires, and indoor sources such as woodburning, cooking, cleaning and decorating. The significance of measuring CO₂ levels indoors was also highlighted. The presentation also focused on particulate matter and its impact on human health.

3. Summary of CALM Activities

Children were encouraged to think more deeply about ways to reduce and avoid exposure to air pollution. Topics include walking, using public transport, cycling, and car sharing as ways to minimise ambient air pollution during school commutes, and cooking, cleaning and heating at home were discussed in relation to minimising indoor air pollution.

Local and national events and initiatives were also discussed. References were made to Clean Air Night and Clean Air Day, explaining their significance and how improvements can be integrated into everyday life. Schemes run by Sustrans and RBC such as Active Travel, The Big Walk and Wheel, and School Streets were introduced. Many children are already familiar with these initiatives, having participated in them through their school years. There are currently six School Streets implemented in Reading, covering 10 schools in total. Children are aware of the impact these schemes have had, as well as the rules they follow and the benefits it gives.

Since December 2024, as a learning support, the CALM animation video has been included and embedded into the assembly presentation. The animation videos are discussed further in section 4 and have been valuable in piquing the interest of pupils during deliveries.



Figure 7: Civitas Academy - School Assembly April 2024



Figure 8 Geoffrey Field Junior School Assembly January 2024



Figure 9: Christ the King RC Primary School Assembly July 2024

3. Summary of CALM Activities

3.3.3 Workshops and Mapping Exercises

3.3.3.1 Overview

Knowledge-based workshops have been delivered to pupils in various formats, predominately as mapping and measuring exercises. These included indoor and outdoor monitoring at schools using AirGradient equipment, mobile measurements with Atmotube sensors, laboratory sessions and workshops at the UoR campus, as well as activities conducted in off-site locations during school trips or as part of afterschool and holiday activities.

Schools were able to focus on geography and STEM curriculums by partaking in longer, more focused, hands-on sessions, often over 60 minutes in length. Example lesson plans for CALM mapping sessions are presented in Figure 10 and Figure 11, and the level of engagement in knowledge sessions is illustrated in Figure 12.

A total of 33 individual 'knowledge' sessions were delivered across the duration of the programme to 2,071 children across Key Stage 2 and Key Stage 3 age groups.

Lesson Plan 01
PM Monitors

KS2
Y5/6

Duration
20 mins

Activity 1

- Work in groups of two or three pupils
- Collect data inside and outside the classroom – Air Gradient sensors
- Collect data twice a day – in the morning and in the afternoon (you find a time that's convenient for you)

National Curriculum Links:
Science: planning and carrying out scientific investigations; gathering, analysing and evaluating evidence; generating and testing theories; and communicating scientific information.

What you will need

- Air Gradient sensors (indoor/outdoor)
- Data sheets (printed – one for each week of the intervention)
- Pens / pencils colouring pencils

Measure

- Particulate Matter (PM 2.5 & PM 10)
- Temperature
- Humidity
- Carbon Dioxide (CO2)

School:
Term:

Class:
Date:

Week
1



Record: The numbers that you see on the digital display & the LED colour:

Temperature: 10.6°C
CO2: 1034/22
VOC: 378
PM 2.5: 10

	Monday 6 th November	Tuesday 7 th November	Wednesday 8 th November	Thursday 9 th November	Friday 10 th November
PM 2.5	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐
Temperature	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐
VOC	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐
CO2	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐	AM ☐ PM ☐

Figure 10: Example lesson plan (Key Stage 2) for monitoring activity using air quality sensors and a weekly data recording sheet.

AQ Mappers – Activity 1

Lesson Plan S01
AQ Mappers

KS3/4
Y9

Duration
60 mins

Activity 1

- Work in groups of five or six pupils
- Use AQ sensors, laptops & *phones
- Observe / collect data – using sensors
- Record data – using XLS data sheets

National Curriculum Links:
Geography: undertaking a geographical enquiry, asking geographical questions, collecting and recording evidence, recognising how people can improve or damage the environment, explaining their views on a geographical issue, identifying opportunities for their own involvement in managing environments sustainably and communicating in ways appropriate to the task and audience.

What you will need

- Air Gradient AQ sensors
 - Indoor & Outdoor (installed in advance)
- Portable AQ sensors & *Smartphones
 - ATMO & Pollution Guardian
- Data sheets (printed and / or XLS)

Measure

- Particulate Matter (PM 2.5 & PM 10)
- Temperature
- Humidity

*we will provide these

AQ Mappers – Outline

Lesson Plan S01
AQ Mappers

KS3/4
Y9

Duration
95 mins

Proposal

- Provide an enrichment activity for Y9 GCSE Geography pupils
- Session to be provided to 25 pupils (part of total cohort)
- Pupils to be divided into groups of 5 or 6 – encouraging teamwork and collaboration

Reading School

Session Details / Timings

- 00 Short presentation to introduce the air quality subject and set context
- 10 Review map of area and make informed assumptions on AQ
- 20 Observe / Collect Data
- 60 Return to classroom & next steps
- 70 Analyse data
- 80 Create action plans / 'Urban Air Quality Reduction Proposal'
- 90 Very quick share of action plans
- 95 Session ends

Figure 11: Example lesson plan and activity sheet (Key Stage 3/4) using air quality sensors.

3. Summary of CALM Activities

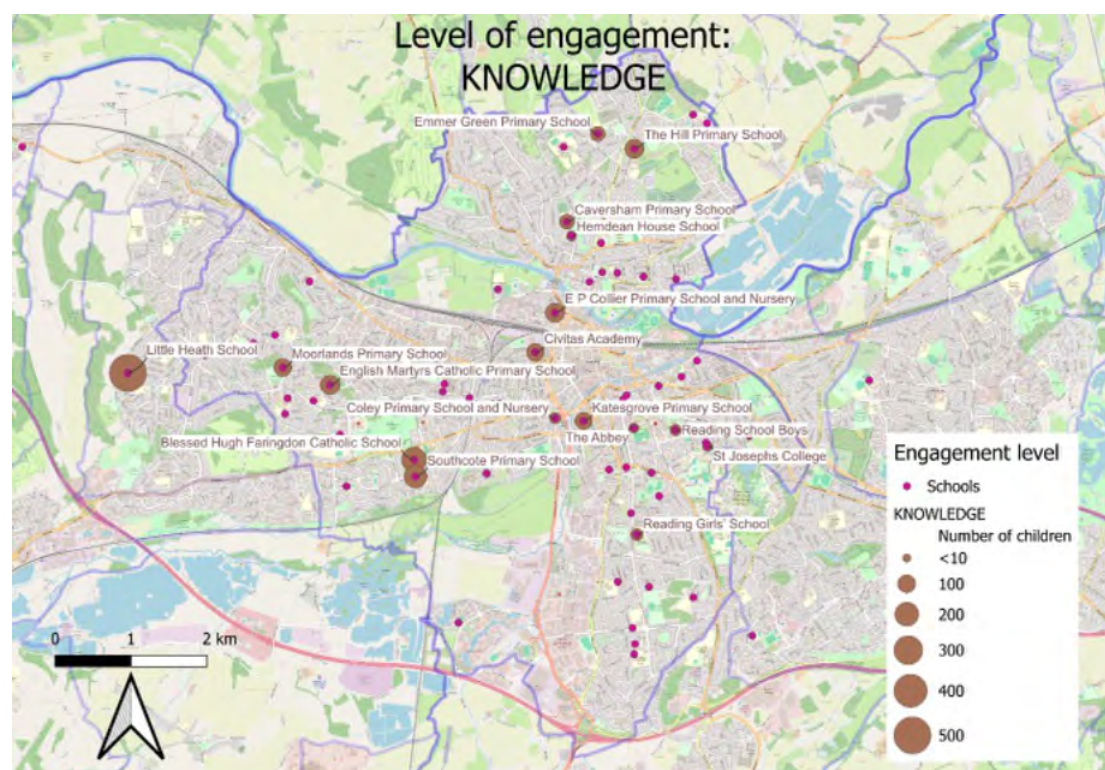


Figure 12: Level of knowledge-based activities delivered to schools.

3.3.3.2 Outdoor and Indoor Air Quality Monitoring

Before CALM sessions were delivered, AirGradient monitors were provided to schools to carry out indoor and outdoor air quality measurements. This gave schools the opportunity to assess and explore their own air quality. Using worksheets, pupils conducted measurements. If results had been recorded in advance, they were analysed during in-person sessions, where pupils discussed the pollutants detected, their levels, and potential sources of air pollution. Pupils also had the opportunity to take real-time measurements during the CALM sessions by recording data from the monitor's display and/or the dashboard.



Figure 13 Example of the class indoor CO₂ data, highlighting the increase in CO₂ through the day. Data was collected using a datasheet such as that shown in Figure 3.

3. Summary of CALM Activities



Figure 14: Outdoor air quality monitoring using Atmotube handheld sensor with Primary school children.



Figure 15: Example of data sheet for outdoor measurements used during the practical session.

Primary school pupils' knowledge was assessed both before and after the presentation and practical activity to measure learning outcomes and knowledge gains. The assessment consisted of multiple-choice questions, with answers provided during the session. These questions covered key areas such as the average number of breaths taken per day, the primary cause of air pollution in the UK, who breathes the cleanest air while traveling, and actions individuals can take to help ensure they breathe cleaner air.

Following the delivery of the session to 60 Year 6 pupils, results showed a measurable knowledge increase of 28% between the pre- and post-activity assessments. This clearly demonstrates that the workshop had a strong positive impact on pupils' understanding of air pollution, its effects, and the practical steps they can take to reduce an exposure to polluted air.

3. Summary of CALM Activities

3.3.3.3 Key Stage 3 Clean Air Day Workshops

Opportunities were offered to secondary school pupils to take part in more involved air quality workshops. These included a workshop on Clean Air Day in June 2024 (58 children) and the Clean Air Workshop in June 2025 (26 children). A total of 84 pupils from five different secondary schools participated in the workshops, exploring both indoor and outdoor air through hands-on experiments.

Both events were included in the Reading's Climate Festival which takes place in June and has the aim of inspiring community action towards climate change. The festival features a two-week programme of engaging events organised by the Reading Climate Action Network (RCAN) and, in 2025, included the launch of the Draft Reading Climate Emergency Plan for 2025-2030. This festival provides opportunities for local schools, organisations, and individuals to contribute to Reading's journey towards becoming a net-zero, climate-resilient town and gave the CALM programme further opportunity to engage with local community and schools.

The workshops included ambient outdoor air quality mapping (Figure 16 and Figure 17), indoor air quality experiments (Figure 18) and action planning sessions.

Activity:
Collect AQ Data

School: _____
 Names: _____

Date:
24/06/25



Sensor ☐ Phone ☐

Location	PM 2.5	PM 10	AQ Score Pollution
1			
2			
3			
4			
5			
Average			

Duration: Approximately 30 Minutes



What can you identify as a 'possible' source of air pollution at:

Location ☐ _____

Location ☐ _____

What can you do to avoid exposure to polluted air at:

Location ☐ _____

Location ☐ _____

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1

Figure 16: Activity map specifying sampling locations across the Whiteknights Campus at the UoR.

3. Summary of CALM Activities



Figure 17: Outdoor air quality measurements supported by a CALM team member during the Clean Air Day Workshop.



Figure 18: Clean Air Day session June 2024 indoor air quality exploration with secondary school pupils delivered at the School of Geography and Environmental Science at the UoR.

An additional activity on air quality and biodiversity indicators was delivered during the June 2025 workshop at the UoR, as part of the Nature Park aligned with the National Education Nature Park scheme. In addition to using handheld sensors to measure outdoor air quality, pupils had the opportunity to conduct tree measurements and assess nitrogen-sensitive and nitrogen-loving lichens, as well as algae on the Campus (Figure 19).

3. Summary of CALM Activities



Figure 19: Tree measurements during the Clean Air Workshop undertaken by secondary school pupils for air quality bioindicators experiment.

A short survey was conducted during the workshops (Figure 20) to explore pupils' existing understanding of air pollution, as well as to assess the effectiveness of the delivered session and accompanying teaching activities. Pupils' knowledge was assessed both before and after the activities. The assessment consisted of targeted questions, with answers included in the content of the sessions. These questions covered key areas such as the average number of breaths taken per day, the leading cause of air pollution in the UK, who breathes the cleanest air while traveling, and actions individuals can take to help ensure cleaner air. Each question included multiple-choice answers to facilitate consistent measurement and analysis.



Figure 20: Pupils undertaking an air quality survey to measure their existing knowledge on air quality.

3. Summary of CALM Activities

The survey responses clearly (Figure 21) demonstrated that the workshops were beneficial, and not only increased pupils' knowledge of air pollution but also provided an opportunity for deeper engagement and ongoing learning. Moreover, the feedback indicated a positive influence on pupils' attitudes and behaviours, encouraging them to consider how their actions impact air quality and how they can contribute to cleaner environments both at school and at home (Figure 22 and Figure 23).



Figure 21: Workshop feedback and impact for the Key Stage 3 activities undertaken during the Clean Air Day 2024.

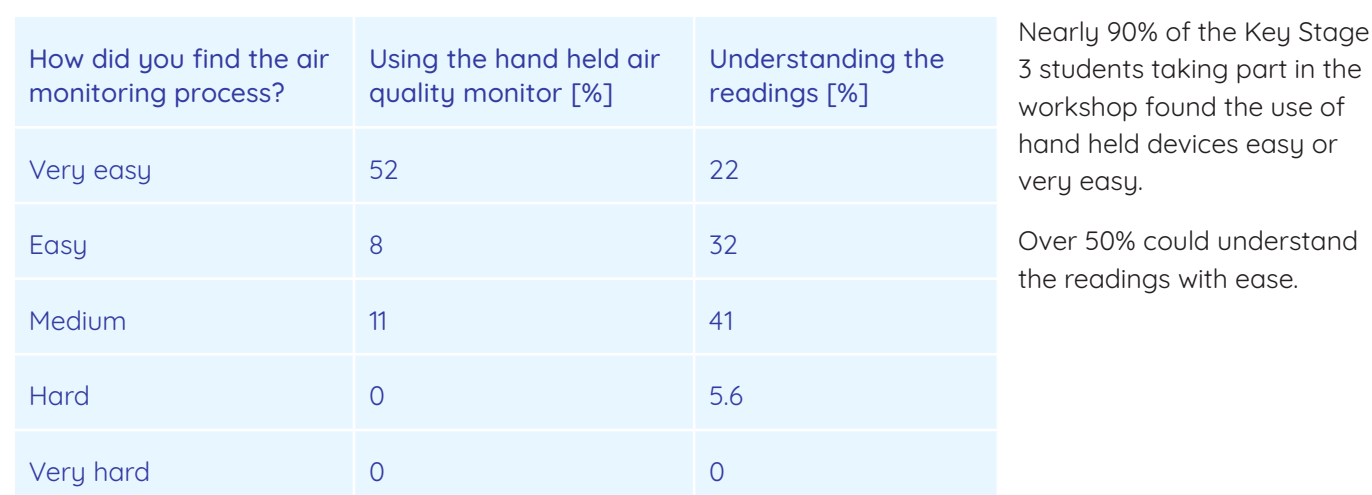


Figure 22: Survey responses for the air quality measurements processes.

3. Summary of CALM Activities



Figure 23: Key Stage 3 pupils brainstorming ideas and preparing their action plan for the school to reduce air pollution.

Following the delivery of the two workshops with secondary school pupils, results showed a measurable increase in knowledge, with an average improvement of 9% between the pre- and post-activity assessments. This indicates that the workshops had a positive impact on pupils' understanding of air pollution and its effects, as well as their awareness of practical steps they can take to contribute to cleaner air.

3.3.3.4 Laboratory Indoor Air Quality Experiments

UoR's laboratory space at the School of Geography and Environmental science was used by the CALM team to host indoor air pollution workshops with 84 No. Key Stage 3 and Key Stage 4 pupils, as well as 46 No. Year 5 pupils from Civitas Academy Primary School. Further sessions were also delivered at Little Heath Secondary school as part of Eco Day to four Year 7 groups (approximately 130 pupils). Several experiments were undertaken as part of the workshops to highlight sources of indoor pollution, as described below:

Smog in a jar - this experiment demonstrated how smog forms by simulating the conditions that lead to air pollution and the mixing of pollutants with condensation in the atmosphere (Figure 24). It involves creating a miniature smog environment inside a jar, allowing pupils to observe the process of condensation and how pollutants can become trapped. The experiment also gave an opportunity to reference the Great London Smog of 1952, which affected many people and resulted in thousands of deaths. It prompts discussion on the conditions that allowed such an event to occur and raises awareness that similar risks can still exist today.

3. Summary of CALM Activities



Figure 24: Pupils undertaking particulate matter measurements using Atmotubes caused by smoke created in a jar.

Frying – in a controlled and safe environment, a sausage was cooked using a laboratory gas burner as the heat source (Figure 25). This was followed by an analysis and identification of the pollution produced during the cooking process, highlighting the types of emissions typically generated in everyday indoor settings and discussing ways to prevent and reduce it.



Figure 25: Indoor air pollution measurements using Atmotube sensors following the frying process.

3. Summary of CALM Activities

Volatile Organic Compounds (VOCs) – using a simple “spray under box” approach, pupils were able to observe the measurement of VOCs using indoor AirGradient monitoring equipment (Figure 26). This activity highlighted the crucial importance of proper ventilation. Other sources of VOCs were also discussed during this practical exercise, such as painting and decorating.



Figure 26: Box used to trap vapour from air freshener to undertake measurements using an AirGradient indoor sensor.

3.3.3.5 PHSE Sessions

Extended one-hour PSHE sessions, including content on climate change, were delivered to Key Stage 3 and Key Stage 4 pupils, reaching over 360 participants. The sessions included an introduction to the concept of warming stripes (#ShowYourStripes, developed by UoR Professor Ed Hawkins), the UN Sustainable Development Goals, and the different types of waste.

Pupils were also introduced to Air Quality Stripes and the impacts of air pollution, with discussion on sources such as wildfires, bonfires, and their effects on local air quality. The sessions encouraged pupils to explore additional sources of air pollution, including indoor air pollutants, and how indoor air quality can be influenced by outdoor conditions. They were introduced to the programme, air quality monitoring equipment and ways to improve their local air quality.

Participants were given the CALM booklet, directed to the programme website and further learning.

3. Summary of CALM Activities



Figure 27: Blessed Hugh Faringdon Catholic School PHSE session delivered to Year 7 pupils.

3.3.4 Air Quality Action Planning

Following a practical activity (indoor and/or outdoor), pupils participated in a creative brainstorming session designed to consolidate their learning and inspire real-world idea implementation. This collaborative exercise encouraged pupils to think critically and imaginatively about air quality issues, aiming to develop an action plan for their classroom, school, or wider community.

The session provided a valuable opportunity for children to embed clean air living principles into their everyday routines, promoting both awareness and ownership. By encouraging ‘outside the box’ thinking, pupils explored innovative ways to make meaningful changes to the environments they inhabit daily.

This activity was structured to take place over a single session initially, with an intention to support the implementation of the action plans if needed. The pupils were encouraged not only to involve fellow pupils and class teachers but also wider stakeholders such as the school leadership, eco council, families or community members.

Pupils used a variety of resources to support their planning, including drawing materials, research tools, and example plans from other schools. Eight primary schools and five secondary schools created action plans, and several of these schools have already implemented these, looking at improvements in classroom air quality, around school premises, and within local neighbourhoods. This approach has proven effective in embedding clean air habits and inspiring long-term environmental responsibility among young learners.

One of the most popular actions identified by pupils during the brainstorming sessions and action planning was choosing to walk to school instead of being driven. This not only promotes healthier lifestyles but also directly reduces vehicle emissions around schools, making a noticeable impact on local air quality. In addition to walking, children explored other active travel options such as cycling and scootering, all of which support cleaner air and more sustainable habits.

A key area of concern raised by the pupils was vehicle idling outside school gates during drop-off and pick-up times. Many action plans included campaigns to raise awareness about the negative effects of idling, alongside strategies to encourage parents and carers to switch off their engines while waiting (Figure 28).

3. Summary of CALM Activities



Improving indoor air quality was another important focus. Children showed interest in simple, actionable changes such as opening classroom windows regularly to increase ventilation. This action was made more effective with the help of indoor air quality monitoring equipment, which allowed pupils and staff to understand and respond to changes in air quality in real time.

Many pupils expressed enthusiasm for implementing or improving their school's green spaces. They proposed planting trees, flowers, and plants both for their air-purifying qualities and for the added benefits of biodiversity and mental wellbeing. Through these collective efforts, pupils are not only learning about environmental issues but also are becoming active participants in creating a healthier, greener schools.

Figure 28: A poster prepared to support an anti-idling campaign following the action planning activity.



Figure 29: Ideas clouds for both indoor and outdoor settings – pupils identified sources of air pollution and ways to improve or avoid it.

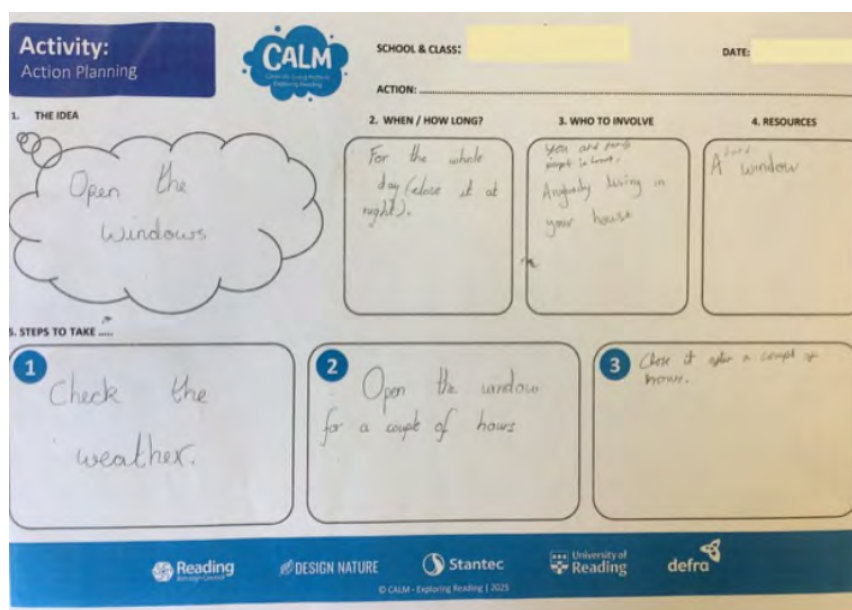


Figure 30: Action plan looking at indoor air and ventilation of the class to minimise the effects of CO₂.

3. Summary of CALM Activities

3.3.5 Air Quality Action Planning

Between September and November 2024, the CALM team ran a poster competition centred around the question ‘What’s in our air and how can we improve it?’. The competition was open to pupils in Key Stage 2 (7-11 years old) and could be completed as part of a class group activity, or as an exercise at home. The poster competition encouraged children to create artwork that helps raise awareness of the prolonged danger to our health of breathing in indoor and outdoor air pollution, and the actions everyone can take to improve local air quality.

The winner poster was announced in November and distributed around local community centres and GP surgeries to spread awareness within the wider community. The winning poster is shown in Figure 31.



Figure 31: Winning poster of the ‘What’s in our air and how can we improve it?’ poster competition.



Figure 32: Councillor John Ennis presenting the winner of the poster competition with a prize.

3.3.6 Portable Air Quality Monitors and Citizen Science

Handheld air quality monitors (Atmotube PROs) were made available to families, enabling them to explore sources of air pollution and their personal exposure both at home and during daily activities, particularly the school run. This citizen science approach encouraged active participation in data collection and helped families gain a deeper understanding of how everyday behaviours contribute to air quality. By engaging directly with the monitoring process, participants became more aware of pollution sources and more motivated to consider lifestyle changes. The initiative successfully promoted increased awareness and supported positive behavioural change toward healthier and more sustainable travel and living habits.

Following the loan of the Atmotube PROs, participants were invited to take part in a short interview exploring their experience and learning as well as their opinion on the CALM programme. Parents responded positively to the use of the Atmotube PRO handheld air quality devices, highlighting its effectiveness in raising awareness about environmental conditions both indoors and outdoors. Many appreciated the way it engaged not only children but adults as well, offering a hands-on opportunity to monitor air quality in real time. While some expressed minor concerns about the device’s precision, they agreed that its greatest value is in increasing awareness and prompting discussion.

3. Summary of CALM Activities

Observing how external sources and indoor activities such as the presence of VOCs within the house affected readings was particularly eye-opening. Several parents noted the surprising variation in air quality across different locations in town, which made the experience both informative and impactful. They also praised the educational value of the CALM initiative, seeing it as a great opportunity for both children and adults to deepen their understanding of clean air. The school activities (workshops and assemblies) were well received, with parents highlighting the importance of continued education and raising awareness around air quality in schools and communities.

The CALM programme also promoted the Schools Street initiative, with parents encouraged to use the Atmotube PROs to monitor pollutant trends during school pick-up and drop-off. The School Streets initiative has made significant progress in creating safer, healthier environments around schools in Reading by restricting motor traffic during peak drop-off and pick-up times (Figure 33). Since its launch in 2020, the programme has expanded to cover six School Streets serving ten schools in Reading, including eight primary and two secondary schools. Two new schemes were introduced during the duration of the CALM programme: at Exbourne Road and Great Knollys Street, benefiting Civitas Academy, Geoffrey Field Infant & Junior Schools, and Christ the King RC Primary. The impact of these schemes is already visible; for example, Park Lane Primary, the first School Street in Reading, saw a 32% increase in active travel and a 50% reduction in car journeys during the trial. Additionally, cycling rose by 25%, and traffic volumes on surrounding roads dropped significantly¹⁰.

These initiatives support safer routes to school, promote daily exercise, improve mental well-being, and directly contribute to reduced air pollution around schools. The initiative aligns with Reading's Transport Strategy 2040¹¹, which encourages walking, cycling, and sustainable travel across the borough. Some of the volunteer marshals facilitating the School Streets schemes are also parents and have expressed their support for the CALM programme.

Overall, Reading's School Streets programme has proven to be an effective tool for promoting cleaner air, safer streets, and healthier school communities, with potential for further expansion across the borough. This is evidenced through feedback from CALM interviews with parents:

“Wilson school has introduced school street, there has been a HUGE improvement of air quality recently”

“We are lucky enough to have a school street which really helps but some vehicles (taxis in particular) still idle and cars waiting for children outside main pick up times”

“We already have school street closures and it's made a difference to air quality and safety”

¹⁰ RBC (2021). “One third more children walk to school as a result of Reading's first ever School Street”. Retrieved 04/08/2025, from <https://media.reading.gov.uk/news/one-third-more-children-walk-to-school-as-a-result-of-readings-first-ever-school-street>

¹¹ RBC (2024). “Reading Transport Strategy 2040.” Retrieved 15/07/2025, from <https://www.reading.gov.uk/vehicles-roads-and-transport/transport-strategy/reading-transport-strategy-2040/>

3. Summary of CALM Activities



Figure 33: Crescent Road School Street in action benefiting three schools from preventing car access during peak times.

3.3.7 School Gates Interviews

Between October and December 2024, over 50 school gate engagement and awareness sessions were delivered across Reading. These face-to-face interactions took place during morning drop-off and afternoon pick-up times, enabling direct communication with 860 parents, carers, and community members (Figure 34).

The engagement sessions focused on raising awareness about air quality and educating participants on related topics, including the expansion of the Smoke Control Area to cover the entire town. Key statistics from the engagement include:

- Gender of participants: 63% female, 30% male, 7% identified as 'other' or preferred not to say (Figure 34).
- Parental status: 76% of participants had children attending primary school.

Awareness levels:

- 48% were not concerned about air quality in Reading.
- 47% had not previously heard about the impact of wood burning and/or particulate matter.
- 78% were unaware of the Smoke Control Order and its expansion.

These engagement sessions also served as a platform to promote wider educational activities delivered to pupils across the borough. Each participant received a CALM booklet (see section 4) containing key information and practical advice. Participants were encouraged to share this material with friends and family, particularly considering the Smoke Control Order expansion, which came into effect on 1st December 2024.

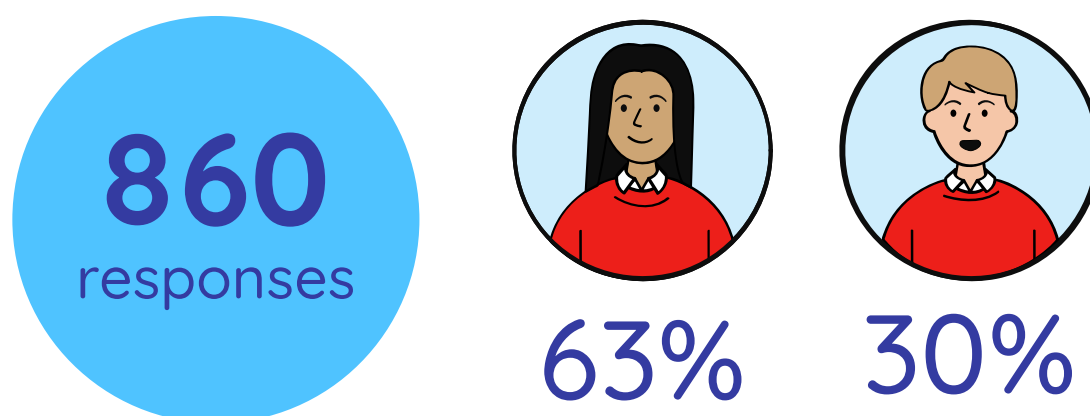


Figure 34: Split of engagement data collected by schools between male and female (other or not provided totals 7%).

3. Summary of CALM Activities

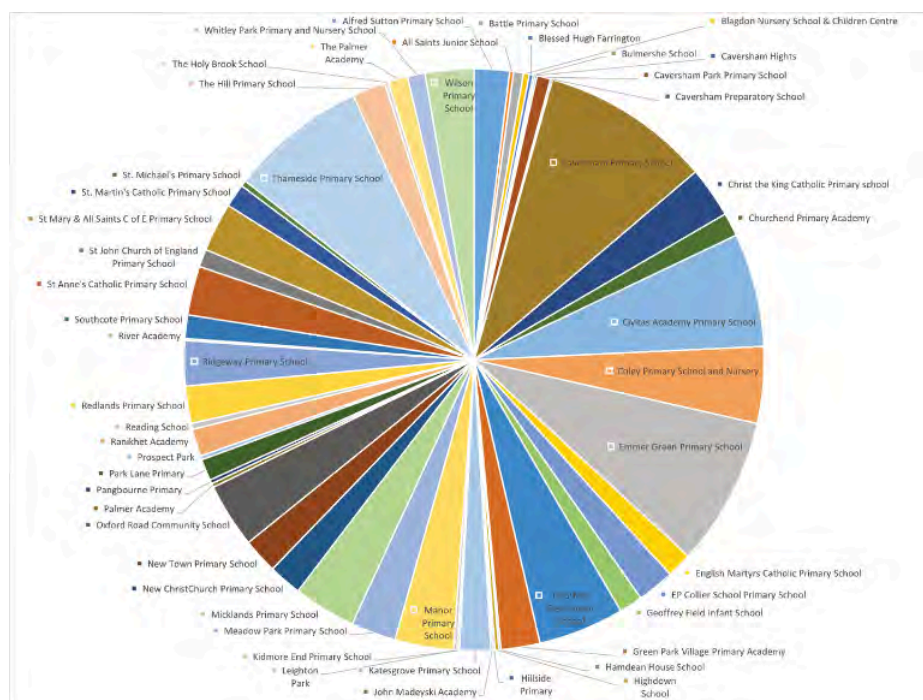


Figure 35: School gates engagement split between locations.

School gates engagement highlighted that the most common behavioural intentions to improve air quality were choosing to walk (34%), using cars less (27%), and cycle more (17%). A smaller portion of respondents indicated intent to use public transport or electric vehicles. 12% stated they were unsure or unwilling to make changes, highlighting the importance of continued education and community engagement. Awareness of indoor and outdoor burning impacts remains relatively low, suggesting a need for targeted messaging or adult education (Figure 36).

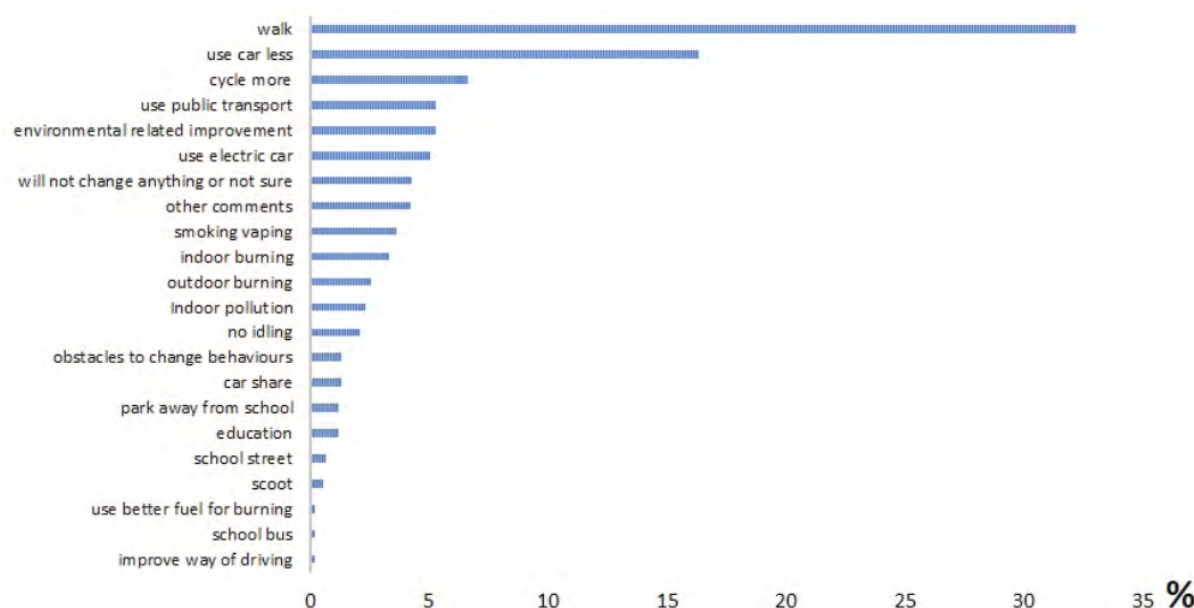


Figure 36: Responses to question ‘What behavioural change would you consider improving air quality around you?’ Responses analysed using NVivo¹²

¹² Lumivero (2025). NVivo (Version 12 Pro). Retrieved 04/08/2025, from <https://lumivero.com/025>

3. Summary of CALM Activities

Environmental issues were frequently highlighted, both directly and indirectly related to air quality. These included actions such as recycling, litter picking, tree planting, reducing air travel, and addressing smoking at school gates. Participants also expressed the need for improved public transport, including increased availability, reduced fares, lower costs for electric vehicles, and better cycling infrastructure.

UoR students were employed to support data collection and delivery of the school sessions. A total of thirteen students from the School of Geography and Environmental Science, including Second and Final Year students as well as postgraduate students, took part in the school gates data collection, with a small portion also supporting delivery of the practical sessions and assemblies. All students were already interested in environmental subjects and had experience or awareness of air pollution and air quality.

Students found the experience useful, with over 80% stating that it was ‘Extremely useful’ and the remaining stating that it was ‘Somewhat useful’ (Figure 37), highlighting how the experience directly supported their geography course, especially in areas related to human geography. One student stated that it gave them practical insight into how data is collected in the field and has inspired them to explore research-focused career paths in the future.

Another stated that the biggest takeaway from this work was gaining confidence in speaking to the public, as they had to approach parents and members of the general public, start conversations, and encourage them to participate in interviews. It helped them become much more comfortable engaging with people and taught them how to guide conversations effectively. They stated that they developed a better understanding of how to approach and talk to people in a respectful, confident, and professional manner.

One student said that the experience was eye-opening in terms of understanding how much time and effort goes into collecting high-quality data. They learned new human geography techniques such as surveys and interviews, which they can now confidently use again in future projects. The experience gave them ideas about how to carry out similar research more effectively, especially when working face-to-face with participants.

The initial training and project briefings helped set the tone and gave them a clear understanding of the programme’s goals. Throughout the process, they felt supported and encouraged to ask questions and seek guidance when needed.

How useful did you find this experience in supporting your understanding and confidence in conducting face-to-face interviews?

- Extremely useful
- Somewhat useful
- Neutral
- Somewhat not useful
- Extremely not useful

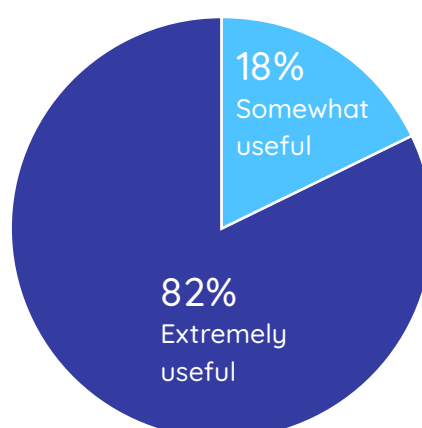


Figure 37: UoR students’ response to the value of supporting air quality data collection at school gates.

3. Summary of CALM Activities

In addition to communication and leadership skills, students felt that they were able to develop technical abilities. They improved the proficiency with Microsoft software, online forms, and working collaboratively with others. The work also helped them improve time management and self-discipline, as they learned to work independently and meet informal deadlines.

In some interviews, some of the students were able to use their language skills, Cantonese and Mandarin, Turkish, Polish Hindi and Punjabi which supported engagement with multicultural population and made it more inclusive.

Students said that connecting with people gave them a deeper appreciation for the power of impactful, real-world research. And that overall, this hands-on experience has made them more confident and better prepared for future research, both academically and professionally.

Students' decision to join this research was influenced by a combination of personal interest, academic alignment, and the opportunity to gain experience. They stated that they have been fascinated by climate change and environmental issues. Air pollution and sustainable travel were particularly important to one Environmental Science student, and this research aligned closely with the theme of their dissertation and offered a meaningful way to deepen their understanding of air quality, which is the area they are passionate about.

They were also drawn to the opportunity to gain hands-on experience in the field, develop new skills, and expand their CV with relevant work. Participating in a programme that allows them to engage with the public, raise awareness around clean air, and contribute to impactful research felt like a productive and purposeful way to use their time. They found the flexibility of the role was an added benefits that made this experience even more appealing. They saw this as a great opportunity to combine the academic interests with real-world experience in a way that supports both the personal development and future career goals.

Over 80% stated that this work helped them improve their air quality knowledge (Figure 38) and all the students would consider participating in similar work again in the future.

Do you think an engagement with the CALM project helped improved your knowledge in air quality?

- Yes
- No
- Not sure
- Other

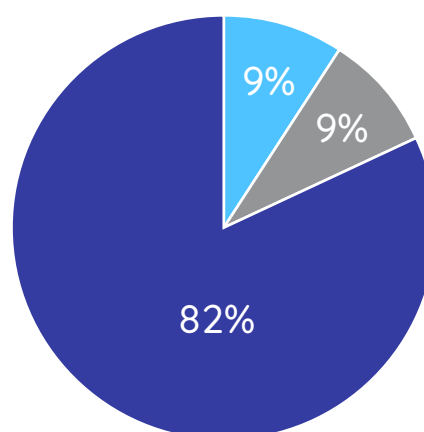


Figure 38: Students response to educational value of taking part in the CALM programme.

3. Summary of CALM Activities

3.4 Behavioural Change and Air Quality Promises

One of the core aims of the CALM programme was to not only raise awareness of air quality issues but to inspire behavioural change among children, families, and the wider community. This was effectively achieved through a range of structured activities, practical sessions, and engagement with both pupils and adults.

A key driver of behavioural change was the action planning process carried out in 13 schools (8 primary and 5 secondary), where children actively identified air quality concerns in their local environments and proposed practical solutions. These sessions empowered pupils to take ownership of their learning, transforming awareness into action. Pupils developed and presented their ideas ranging from promoting walking or cycling to school, encouraging car-free zones near school gates, to raising awareness about engine idling and the effects of indoor air pollution. This not only improved their understanding but encouraged them to act as advocates for clean air within their schools and communities.

In addition, direct parental engagement at school gates, with over 860 parents and carers, provided further opportunities to reinforce behaviour change messages. Many parents reported that their children had initiated conversations about air pollution at home, shared what they had learned, and in some cases, influenced household routines. These included changes such as choosing to walk or cycle short distances, turning off car engines when stationary, and becoming more aware of pollution sources inside and outside the home.

These conversations were supported by the distribution of nearly 7,000 worksheets and CALM booklets, which pupils typically took home and shared with family members. This informal but effective method of spreading knowledge helped extend the programme's reach and influence, fostering environmentally responsible behaviour beyond the classroom.

The CALM team also encouraged adults to make personal "Air Quality Promises", further reinforcing commitment to small but meaningful changes. These promises, initiated during the Community Festival at the UoR allowed adults to reflect on their role in supporting clean air and set achievable goals such as using active travel, reduce idling or reduce wood burning. These pledges served as both motivational tools and accountability markers, strengthening the link between environmental education and community actions.

Overall, the evidence gathered throughout the programme clearly demonstrates that behavioural change has been a key outcome of CALM. From school-based initiatives to household routines, the programme successfully empowered young people and adults to contribute to a cleaner, healthier environment across Reading. Over 80% stated that this work helped them improve their air quality knowledge (Figure 38) and all the students would consider participating in similar work again in the future.

3. Summary of CALM Activities

3.5 Additional Miscellaneous Activities

Engagement and air quality education has been extended beyond the school grounds. Project partners have attended many events across the duration of the programme promoting the air quality education and the programme, expanding on the air quality knowledge and engagement.

Additional school related events and activities:

- Reading School Career Convention (February 2024) – guiding over 1000 pupils (including Year 9 to 13 pupils from The Abbey and Kendrick School) to support their decisions about their GCSE, A-level and higher education options, giving an opportunity to network with professionals across a broad range of industries.
- The Abbey ‘Exploring Entrepreneurship’ Event (February 2024) - multi-school event, as part of ARCH programme, bringing together pupils from 14 schools across Reading and professional guests to inspire new entrepreneurial journeys. An estimated engagement with a total of 300 pupils and their parents.
- Civitas Academy Family Fun Day (July 2024) – summer community day for school children and their families. The event was used an opportunity to speak to parents and children about air quality and CALM programme, engaging with at least 15 families.
- Apollo Youth Club Holiday Club (August 2024) – central Reading holiday club. Children were engaged in air quality measurements using Atmotube PRO handheld devices, working with a group of 11 children and the club’s employees.
- 99th Reading Scouts (September 2024) – this group of children and their leaders took part in a presentation and practical measuring air quality during an afterschool activity, engaging with nearly 30 children and their parents.
- Royal Society of the Arts (RSA) (February 2025) - presentation and a ‘call to action’ delivered to around 30 adults comprising of RSA Fellows, local councillors and members of the creative community in Reading.

Additional community events:

- Wokingham Bikeathon (June 2024) - Berkshire based cyclists engaged in conversations about sustainable travel, air quality and CALM programme, speaking to at least 20 families.
- KidicalMass rides Reading (June and July 2024) – local parents cycling with their children were very interested in discussing air quality, sustainable travel, and the programme, which they were all pleased to see being implemented. The CALM team engaged with 10 families.
- Southcote Community Event at Coronation Square – this local event attracted residents allowing the CALM team to engage in air quality conversations with approximately 10 families.
- Reading Cycle Festival (September 2024) - this annual community event is designed to promote cycling in all its forms. The CALM team attended with a stall to raise awareness about air quality, engaging with families and the wider local community (Figure 39), sharing CALM booklets and educating the community about air quality. The CALM team engaged more than 30 families.



Figure 39: Reading Cycle Festival at the Christchurch Meadows in Reading attracting many families and community members.

3. Summary of CALM Activities



- Artisa Christmas Market, Caversham (November 2024) – local market enabling an engagement with over 20 families.
- UoR Community Festival (May 2025) – this community event attracted over 8,000 people with performances, research talks and other attractions. The CALM team engaged in air quality talks and completed live measurements (Figure 40).
- Reading Cycle Festival (September 2024) - this annual community event is designed to promote cycling in all its forms. The CALM team attended with a stall to raise awareness about air quality, engaging with families and the wider local community (Figure 39), sharing CALM booklets and educating the community about air quality. The CALM team engaged more than 30 families.

Figure 40: CALM team members and UoR students supporting the UoR Community Festival.

Symposiums, forums and conferences:

- Low-Cost Sensors Symposium London (July 2024) - the event connected 80 professional users of low-cost ambient air quality sensor systems from various communities, exploring best practice, sensor standardisation and interacting with case studies from citizen scientists, academics, industry and government. The CALM team presented a poster 'Empowering Change: Air Quality Awareness and Education Through Low-Cost Sensors Application'.
- Clean Air Conference (October 2024) – attended the UKRI/Met Office Clean Air Programme Conference 'Analysis and Solutions: Responding to the Clean Air Challenge' which brings together around 90 researchers, funders, policymakers, industry, and not-for-profit representatives. The CALM team presented a poster on PhD research into air pollution spikes near school gates in Reading as well as the CALM programme.
- Air Quality and Emissions Conference (October 2024) – this session brings together organisations involved in air quality and emissions reduction, including representatives from regulatory bodies, local authorities, consultants, instrumentation engineers, laboratory staff, researchers, and interested stakeholders such as clean air campaigners. A presentation was delivered to 30 participants on PhD research into air pollution spikes near school gates in Reading, alongside an introduction to the CALM programme as an example of initiatives aimed at increasing understanding of air quality. CALM booklets were made available for participants, along with a link to the CALM website for further information.
- Routes To Clean Air Conference (October 2024) – during this annual conference covering topics relevant to air quality attended by around 60 practitioners and associated professionals CALM team delivered a presentation 'A CALM:ER Approach to Air Quality Education – Use of Low-Cost Sensors to Increase Awareness and Invite Behavioural Change' and shared the programme booklets with participants (Figure 41).

3. Summary of CALM Activities



Figure 41: Routes To Clean Air Conference October 2024 presentation at the Conference Aston, Birmingham

- Local SoMe'24 Wroclaw, Poland (online) (November 2024) – this online Polish event is dedicated to social and technological communication, specifically designed for local governments. It provides a platform for exchanging experiences, gaining knowledge, building valuable networks, and co-creating the future of local government transport. The CALM programme was featured as an example of environmental education, with an animated video shared as a communication tool.
- Welsh Air Quality Forum Cardiff (November 2024) – during this annual seminar, a presentation was given on PhD research into air pollution spikes near school gates in Reading, alongside an introduction to the CALM programme as an example of measures increasing air quality knowledge. An animated video was also shared with over 60 participants from Welsh organisations.
- AirGradient online forum (January 2025) – the CALM team highlighted the importance of making air quality data accessible for children's education and engaging pupils, educators, and local communities in air quality conversations. Engaged an estimated 50 attendees from around the world.
- EGU25 General Assembly Vienna (April 2025) – an event bringing together over 20,000 geoscientists from all over the world, covering all disciplines of the Earth, planetary, and space sciences. The CALM programme was presented during the poster display as part of the 'Low cost air quality sensors: Challenges, opportunities, and collaborative strategies across the world' session (Figure 42).
- Interdisciplinary research, education and outreach to address the climate-nature crisis workshop, UoR (July 2025) - attended by 30 academic staff from UoR exploring possibilities of collaboration and expansion of the engagement work and environmental education. The end of programme video and CALM booklets were shared.

3. Summary of CALM Activities



Figure 42: Poster display presented at the EGU25 General Assembly Vienna 2025 'A CALM:ER approach to air quality education, use of low-cost sensors to increase awareness and invite behavioural change'.

4. Marketing to Increase Air Quality Awareness



Marketing has been an important tool throughout the CALM programme. In the first instance, marketing was used to reach out to schools to encourage their engagement and sign-up to the programme. This was achieved through the use of a number of different channels as described below:

- **Headteachers Briefing** – a flyer with links to a sign-up page was regularly included in this weekly briefing sent to headteachers at all the schools across Reading. This proved to be a successful method of engagement, as it highlighted RBC's endorsement of the programme.
- **Attendance of Events** – the CALM team regularly attended events in the area, such as the Reading Schools Climate Conference, to directly promote CALM to schools. This is discussed further in section 3.5.
- **Social Media Channels** – Once the first schools had taken part in CALM activities, the Council's and project partners' social media channels were used to showcase the programme to other schools and the wider community.
- **Webpage** – A CALM webpage was created, containing a sign-up section as well as other CALM-branded material, such as activities, lesson plans, animations and more general air quality awareness material. The webpage remained live throughout the programme and will remain on RBC's website as part of the programme's legacy discussed in section 6.
- **Poster competition** – in an attempt to engage more schools in the programme, in September to November 2024 we ran a school poster competition focussed around 'What's in our air and how can we improve it?', as discussed in section 3.3.5.

Although the marketing outlined above was directed at schools, it will have inherently reached additional members of the public. However, for the programme to engage a greater proportion of the community, a considerable amount of additional marketing that directly targeted the wider Reading community was carried out. This included:

- **Preparation of a CALM booklet** – approximately 5,000 booklets containing information on the programme and air quality were produced and distributed to the community at the events mentioned in section 3, as well as to parents outside the school gates. Booklets were also left in community areas such as GP surgeries. The booklets contained solutions to reduce personal exposure to air pollution and encouraged behavioural change.
- **Marketing associated with the poster competition** – the initial competition helped to engage schools but, to engage the wider community, the winning design was turned into posters with CALM logos and a QR code to the CALM webpage. The posters were distributed around community centres, the civic centre, the town hall, leisure centres and other community areas. They were also posted to all GP surgeries in Reading for display.
- **Lamp column wraps** – CALM branded wraps were secured to 20 lamp columns outside a selection of schools and at the main town centre interchange. The wraps focused on reducing idling and particulate matter, as shown in Figure 43.

Figure 43: Artwork used in the lamppost wrap marketing



4. Marketing to Increase Air Quality Awareness



- Animations and marketing videos – four animation videos and one end-of-programme marketing video were created to promote the CALM programme. These videos been used in classroom activities and were also posted on YouTube and shared on social media as an alternative way of presenting important air quality information to the community in a fun and engaging way.

[Welcome to CALM \(Clean Air Living Matters\)!](#)

[Clean Air Living Matters: Marta O'Brien from University of Reading](#)

[Clean Air Living Matters: Emma Rigler from Stantec](#)

[Clean Air Living Matters: Ross Jarvis from Reading Borough Council](#)

[CALM:ER - July 2025](#)

- Clean Air Night/Clean Air Day campaigns – The CALM programme material was used in social media posts to align with Global Action Plan's Clean Air Night and Clean Air Day events.
- Smoke Control Area (SCA) - An expanded borough wide SCA Area came into force on 1 December 2024. The CALM programme was used to raise awareness of the existence and purpose of the SCA, as well as the consequences of particulate matter on human health. This was done through an awareness raising campaign to promote best practice for people heating their homes using wood, coal and other solid fuels, and was aligned to the Clean Air Night campaign mentioned above.
- Reading Buses – a month-long marketing campaign was agreed with Reading Buses. A series of stills from the animation videos were displayed on on-bus screens as shown in Figure 44.



Figure 44: Example of Marketing used on Reading Buses

The communications plan used by the CALM team throughout the programme is presented in Table 5 below. Communications were aligned with key events as far as possible, and targeted both schools and the wider community.

4. Marketing to Increase Air Quality Awareness



The communications plan used by the CALM team throughout the programme is presented in Table 5 below. Communications were aligned with key events as far as possible, and targeted both schools and the wider community.

Table 5: CALM Communications Plan

Month	Events	Schools Communications	External Communications
2023			
November 2023	Pilot project under way with Reading School & The Ridgeway Primary School	22 Nov: Item in the BFfC Headteachers' (HT) Briefing with flyer encouraging schools to sign up/express an interest.	
December 2023	4 Dec: Carbon Literacy Action Day 8 Dec: Reading Schools Climate Conference – Civic Offices	6 Dec: November item repeated in HT Briefing.	
2024			
January 2024	Roll out of programme to schools. 24 Jan: Clean Air Night		RBC and project partner social media posts promoting Clean Air Night.
February 2024	w/c 19 Feb: Start of term	Item in HT Briefing with link to the press release.	Press release with pictures of a school taking part in the programme. Social media posts with links to press release and/or RBC CALM webpage.
March 2024	28 Mar: Schools Easter holidays start 23 Mar: Earth Hour	20 Mar: HT Briefing with link to new web pages.	New RBC webpages.
April 2024	22 Apr: Earth Day		
May 2024	Half term w/c 27 May	22 May: HT Briefing update	
June 2024	Reading Climate Festival Clean Air Day workshop at UoR		Social media & video for website

4. Marketing to Increase Air Quality Awareness



Month	Events	Schools Communications	External Communications
July 2024	End of academic year	10 July: HT Briefing featuring poster competition	
September 2024	4 Sep: Start of new school year.	11 Sep: HT Briefing inc. poster competition launch. Your Guide to Air Quality Education brochures ready for distribution. Atmotube PROs offered to parents	Web page updates with poster competition & Your Guide to Air Quality Education brochure. Video: Work on script & re-cording of video over following six weeks
October 2024	18 Oct: Deadline for poster competition. 28 Oct: Half term	9 Oct: HT Briefing – reminder of poster competition deadline.	Web page: Update of case studies inc. video of schools' workshop at UoR.
November 2024	4 Nov: Start of term. w/c 11 Nov: Winner of poster competition announced. w/c 18 Nov: Promotion of animation videos	HT Briefing and social media	Press release & social media: Poster competition winner. Tied in with RBC Climate Awareness campaign. Web page: Updated with winning poster. Posters created using winning competition entry to distribute to community/public spaces. w/c 18 Nov: Animation videos released and promoted on social media.
December 2024	20 Dec: End of term	HT Briefing including animation videos	
2025			
January 2025	6 Jan: Start of term. 22 Jan: Clean Air Night		Promotion of animated videos on run up to Clean Air Night
February 2025	Reading buses programme		Reading buses marketing campaign including stills from animation videos.

4. Marketing to Increase Air Quality Awareness



Month	Events	Schools Communications	External Communications
May 2025	Lamppost wraps distribution		Social media posts
17 May 2025	UoR Community Festival		Video for Clean Air Day
19 June 2025	Clean Air Day		Social media with video from UoR Community Festival event.
24 June 2025	Workshop at UoR	HT Briefing and social media	Social media posts
30 June 2025	End of CALM programme		

5. Evaluation of Programme Success

5.1 Introduction

Although not without difficulties the programme was highly successful and achieved its objectives. The programme has demonstrated strong effectiveness across several key areas:

- Public awareness and education**
 One of the core strengths of the programme lies in its ability to raise awareness around air pollution. By engaging directly with children and members of the public, it successfully promoted understanding of the sources and impacts of poor air quality. The CALM activities helped individuals understand air pollution and make more informed decisions about their travel habits and environmental behaviours. The initiative also served as a valuable educational opportunity for those involved in the organisational preparation for climate action plans, allowing them to refresh and deepen their understanding of key environmental issues.
- Support for local decision making**
 The data collected through the programme provides meaningful insights into public attitudes and behaviours, which in turn can inform local authority strategies. This evidence base is particularly valuable in supporting council decision-making, ensuring that policies and interventions related to air quality are grounded in current, community-level information. Additionally, it helps to target effective budget allocation, ensuring that resources are directed where they can have the greatest impact.
- Competency building and skill development**
 For participants, the programme offered hands-on experience in field research, public engagement, and data collection. This contributes to skill development in areas such as communication, teamwork, and time management, while also enhancing employability and academic learning, particularly for UoR students in environmental or geography related disciplines.

The CALM programme ended within budget of £387,020, with a final cost of £353,113.50. Based on the programme's total community reach of 26,000 – 33,000 people, as discussed in section 5.3, the cost of the programme was estimated to be approximately £10.70 - £13.60 per resident. This is considered strong value for money given the long-term educational and behavioural change outcomes of the programme.

5.2 Challenges and Lessons Learnt

The key challenges faced by the CALM team throughout the programme are detailed below.

5.2.1 Procurement and Staffing

Procurement of project partners was a significant challenge during the first year of the CALM programme. Although Design Nature and Stantec were successfully procured during the first quarter, there were delays to procuring a research scientist at the UoR as a result of contracting issues. The delayed procurement of UoR left the team with limited time to prepare materials for the delivery in the first term of the 2023/24 academic year as planned. Instead, it was proposed to carry out a pilot with a few schools in the first term to trial and develop the programme, before starting the full programme in the Spring Term.

UoR were procured in quarter 5 and had a key role in supporting the recruitment of schools, the delivery of sessions in schools and evaluation of the success of the programme. As such, this delay impacted school recruitment and resulted in other project partners incurring additional cost to deliver the programme in its first year. These additional costs were within the scope of contingencies, and it was possible to re-balance the workload to compensate for the slower start.

Ultimately, it was possible to procure a full-time resource from UoR for one year, as opposed to a part-time resource for two years as initially planned. This allowed UoR to commit to the original workload, albeit this was compressed into a single year. This resulted in a significant uplift in school engagement during year 2 of the programme and allowed us to meet our revised targets with only a small extension (3 month) to the overall school delivery programme.

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In addition to the challenges of procuring UoR, two key members left the CALM team mid-programme resulting in the handover of roles and temporary disruption to the programme. Both of these team members were from the same project partner who had lined up fall-back resources and were able to provide continuity of the programme management role with limited impact on the overall delivery of the programme.

Although the CALM programme funding was a sole proposal by RBC, the procurement of three additional project partners provided increased resilience to the CALM programme. The project partners not only brought complementary skills to the programme but could adapt and shift roles to compensate for the procurement/staffing issues outlined above, which resulted in minimal disruption to the overall programme. Fortnightly meetings between all partners allowed issues to be resolved quickly and effectively and prior established relationships between the project partners enabled the team to commence operations swiftly and efficiently when possible.

5.2.2 School Engagement

The most significant challenge the CALM team faced was getting schools to engage in the programme. Teachers are inherently time poor, and on multiple occasions it was difficult to find capacity for CALM deliveries, particularly during exam season for secondary schools. CALM deliveries had a slow start due to the procurement issues outlined above, and therefore we did not have the experience or case studies from previous schools to use to help sell the programme to others until approximately a year into the programme.

We attempted to engage schools through multiple avenues such as sending out advertisements in Headteacher's briefings, email correspondence, telephone correspondence, school gate engagement and leafleting. Unfortunately, several schools did not engage with the CALM programme despite these attempts.

Notwithstanding the challenges when engaging schools, we were able to identify several schools that were enthusiastic and keen to push the CALM programme further. We found that identifying a CALM 'champion' within a school could prove valuable; this was often a teacher who leads an eco-club or the school's sustainability champion. Schools with CALM 'champions' were often keen to keep up the momentum and arranged for repeat visits and more in-depth and involved activities, such as using workshops using hand-held monitoring devices and laboratory sessions.

By quarter 6, it became apparent that the challenges faced in engaging the schools would mean we were not able to achieve our initial ambitious engagement targets of 16,000 children with increased awareness and 2,800 children with increased knowledge. In quarter 6, we were only 25% of the way towards these targets and were not able to achieve a significant step up in school engagement that needed to propel us towards the targets. As a result, we re-based the targets as described in section 2.5.

Although it was disappointing to not achieve the target engagement rates, it is important to note that the programme successfully engaged with thousands of pupils across 28 schools, delivering on the provision of high quality, and well received engagement. Should RBC receive more funding in the future, a greater proportion of time and costs would be allocated to stakeholder engagement to combat these issues.

5.2.3 Surveys and Interviews Participant Recruitment

Another significant challenge faced by the team was the recruitment of parents and carers who were available and willing to participate in data collection. An online approach had already been explored during existing PhD research conducted by one of the team members. However, this method achieved limited engagement, particularly among individuals that are not interested in air quality and environmental studies. As a result, it became clear that a different, more direct and accessible approach would be needed for this phase of the programme.

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To overcome this obstacle, the team implemented an in-person approach, conducting short face-to-face interviews with parents and carers at school gates during morning drop-offs and afternoon pick-ups. This method proved highly effective, enabling the team to engage with a total of 860 adults. These informal but structured conversations allowed the team to gather valuable insights while also fostering a sense of involvement among parents and carers, reaching even those that wouldn't naturally engage in such subject, triggering behavioural change, and reducing air quality and exposure in the immediate surroundings.

The success of this approach was possible by involving the UoR students, who supported the data collection process. Their contribution enabled the team to reach a greater proportion of schools across Reading, including those that were not formally participating in the CALM programme. As a result, the programme's reach extended well beyond the immediate school partners, raising awareness of air quality issues and encouraging broader community engagement among parents and carers in the wider area (Figure 35).

5.2.4 Air Quality Sensors

As outlined in section 3, each school signed up to the CALM programme received one outdoor air quality monitor and one indoor air quality monitor that could be connected to a common AirGradient dashboard. These monitors were selected, in part, due to their ease of use and it was found that the uptake for the indoor air quality monitors was very high as a result. However, only a handful of schools managed to successfully operate the outdoor air quality monitors.

AirGradient Open Air monitors require a connection to the mains supply for power, which very few schools could accommodate. To combat this, schools struggling to connect their outdoor monitors were provided with waterproof boxes and battery packs. However, as the battery packs had to be reasonably small, the battery supply would last approximately one week. We found that staff at schools were struggling to keep up with the need to charge these batteries over the weekend and, as a result, many of these monitors were operational for only a small period of time.

Towards the end of the programme, the CALM team also supplied Civitas Academy with a solar panel to investigate whether the combination of a solar panel and the battery pack would keep the monitor online. This appeared to be a good option for the first few weeks, however inclement weather meant this was unreliable in the winter months. It is understood that AirGradient will be introducing solar-panelled powered outdoor monitors in the near future that could resolve this issue for future programmes.

Once a power source was located, it was found that the monitors were generally reliable and fit for purpose. Only one monitor had to be replaced, and this was due to a CO₂ sensor becoming dislodged in the casing after the monitor was knocked over in the classroom.

Air quality measurements at schools were monitored by the CALM team, and any anomalies were reported to the schools and investigated. It was very difficult to engage the school staff in this conversation, and air quality advice was provided to only a couple of schools who responded. One school in particular commented that the elevated pollutant concentrations were causing worry amongst pupils and therefore the decision was taken to turn the monitor off. It is hoped that the increase air quality awareness in RBC as a result of the CALM programme will help to alleviate these problems in the future.

5. Evaluation of Programme Success

5.3 Key Performance Indicators

Fourteen Key Performance Indicators (KPIs) were set by the CALM team as presented in **Table 1** and **Table 3**. An evaluation of the performance of the CALM programme against these KPIs is presented in **Table 6** below.

Table 6: Evaluation of Key Performance Indicators for CALM*

Key Performance Indicator	Description of KPI	Evaluation
KPI001 - Number of Children Engaged	Target: - Direct: 1,400 children - Awareness: 8,000 children	The engagement targets were adjusted to reflect more realistic levels of participation. Over 9,000 children were engaged all together, with 4,765 taking part in awareness sessions at schools, 2,234 engaged at community events and 2,071 engaged through knowledge practical sessions.
KPI002 - Number of Schools Engaged	Target: - 9 secondary schools - 16 primary schools	A total of 28 schools engaged with the programme: 20 primary schools and 8 secondary schools. Although this exceeds the revised total target, it is important to highlight the particular challenge of recruiting secondary schools to participate in such activities.
KPI003 - Impact on Parents and Community	Target: - Direct: 3,000 parents and guardians - Awareness: 40,000 adults	Direct and indirect engagement of parents and the wider community has been successful, achieved through a variety of approaches involving schools and children. This also included face-to-face interactions at school gates and conversations during various community events. Each participating child received a worksheet or CALM booklet, resulting in nearly 7,000 individual engagements. Given that most children typically share these materials with at least one adult at home, this significantly extended the programme's reach. In addition, 860 parents and carers were engaged directly through in-person conversations at school gates enhancing the already planted knowledge. Further connections were made during a range of public events. Based on these figures, we estimate that school-based engagement alone reached over 11,000 adults, or over 18,000 adults if a second parent/guardian/adult sibling or grandparent engaged with materials at home. In addition, over 1,200 adults were reached through events, though the actual number is likely higher, considering the size and scale of some of the events attended by CALM team members. Additional engagement was achieved through digital platforms, as well as through physical outreach such as posters and lamppost wrap campaigns. While it is difficult to quantify the exact impact of these methods, their prominent locations suggest that reach and visibility were likely significant. Numbers that can be confirmed are: 743 online YouTube views and 5,220 Clean Air Night social media views. More information on numbers in summary section 7.3. In total, it is estimated that between 17,000 - 24,000 adults were engaged through the CALM programme.

5. Evaluation of Programme Success

Key Performance Indicator	Description of KPI	Evaluation
KPI004 – Deployment of Sensors	- Target: - 10 No. static monitors - 20 No. portable sensors	45 No. AirGradient Open Air monitors, 45 No. AirGradient ONE monitors and 30 No. Atmotube PROs were used during the delivery of the programme. More details on monitors in section 2.
KPI005 – Legacy Teaching Aids	Resources to be made available for teachers and wider community following completion of the CALM programme.	Throughout the delivery period, a range of educational materials was developed to support teaching and learning across Key Stages 2, 3, and 4. These resources include lesson plans, data collection sheets, and supporting presentations, all of which are available on the RBC website and will remain downloadable after the programme concludes. An electronic version of the CALM booklet is also available in both web and PDF formats as well as the videos that were produced to support the delivery of activities. Additionally, a Key Stage 2 lesson plan is being developed in collaboration with the Department of Education at the UoR. This resource, supported by input from a local teacher, will be permanently hosted on the UoR's website as part of its climate education resources. Further information on legacy resources is provided in section 6.
KPI006 – Knowledge Acquisition	Pre- and post-assessments to be used to evaluate the level of knowledge children have about air quality before and after educational sessions.	Knowledge acquisition assessment has been undertaken during the practical workshops through targeted questions with multiple-choice answers to facilitate consistent measurement and analysis. Results showed a measurable increase in knowledge, with an average improvement of 9% between the pre- and post-activity assessments for the secondary school children and 28% for the primary school children, indicating a positive impact on pupils' learning.
KPI007 – Behavioural Changes	Determine whether there is evidence of behavioural change following activities in schools, engagement with parents and the wider community.	Significant behavioural change actions have been implemented by children in schools taking part in the action planning (8 primary schools and 5 secondary schools). Behavioural change conversations have been taking place during the face-to-face engagement with parents at school gates (860) and during various events (over 4000) reaching not just parents directly but wider community. While the extent of impact on behavioural change is hard to quantify, engagement suggests that CALM has had a significant positive impact in this area.

5. Evaluation of Programme Success

Key Performance Indicator	Description of KPI	Evaluation
KPI008 – Participation in Environmental Initiatives	Encourage children to increase their involvement in wider environmental initiatives.	All schools taking part in the delivered activities either already had eco/environmental groups/clubs or were using the engagement with the programme as an opportunity to implement one. The air quality action planning sessions encouraged children to take action related to environmental issues.
KPI009 – Communication Skills	Improve children's communication skills through the CALM sessions.	As part of the action planning activities, children had the opportunity to present their ideas and promote their proposals for actions to improve air quality. These sessions took place both during in-school activities and at off-site workshops.
KPI010 – Attitude and Perception Shifts	Determine whether attitudes to air quality improve as a result of the programme.	Following engagement with both adults and children, it has become clear that, as a result of the educational sessions and discussions, participants are increasingly aware of the impact of air pollution and are willing to make changes to help improve it. This is evident in the action planning activities with school children, as well as in the feedback received during the school gate engagements (Figure 36).
KPI011 – Integration into the Curriculum	Seek opportunity to integrate air quality education into the school curriculum.	Although air quality is not explicitly included in the national curriculum, it is directly connected to climate change and strongly linked to several subjects across Key Stages 2 to 5. These include Science, Mathematics, Earth and Atmospheric Science, Geography, Citizenship, Biology, all of which were integrated into the programme's teaching approach. All the programme's teaching materials are available on the RBC website. Through the development of a dedicated lesson plan, now hosted on the UoR's platform, air quality education has been effectively embedded into curriculum teaching and is readily available for use in schools.
KPI012 – Parental Involvement	Determine whether children's involvement in the CALM programme has influenced household behaviours or encouraged discussions about air pollution.	Initial feedback suggests that children's involvement in the CALM programme has positively influenced household behaviours and encouraged discussions about air pollution at home. Parents and carers engaged during school gate interviews reported that children shared what they had learned, prompting conversations about air quality and, in some cases, small behavioural changes such as walking to school more often or reducing car idling. These early signs indicate that the programme's impact extended beyond the classroom, raising awareness and promoting healthier habits within families.

5. Evaluation of Programme Success

Key Performance Indicator	Description of KPI	Evaluation
KPI013 – Use of Technology and resources	Determine whether the programme has been delivered in an equitable way across school children from different socio-economic backgrounds.	The programme was delivered in an area with very diverse population, with 46.5% belonging to a Black and Minority Ethnic community, which was reflected across schools. All activities were designed to be accessible and adaptable to varied school contexts. Evidence from knowledge assessments, feedback, and parental engagement indicates that pupils from different backgrounds were able to benefit from the programme's content and contribute meaningfully to discussions around air quality. Figure 45 plots CALM schools against the index of multiple deprivation and illustrates the CALM programme reach across all ten deciles.
KPI014 – Levelling Up Agenda	Improve children's communication skills through the CALM sessions.	As part of the action planning activities, children had the opportunity to present their ideas and promote their proposals for actions to improve air quality. These sessions took place both during in-school activities and at off-site workshops.

*Evaluation has been based on the revised targets discussed in section 2.5.

Schools by Decile and Progress

Progress

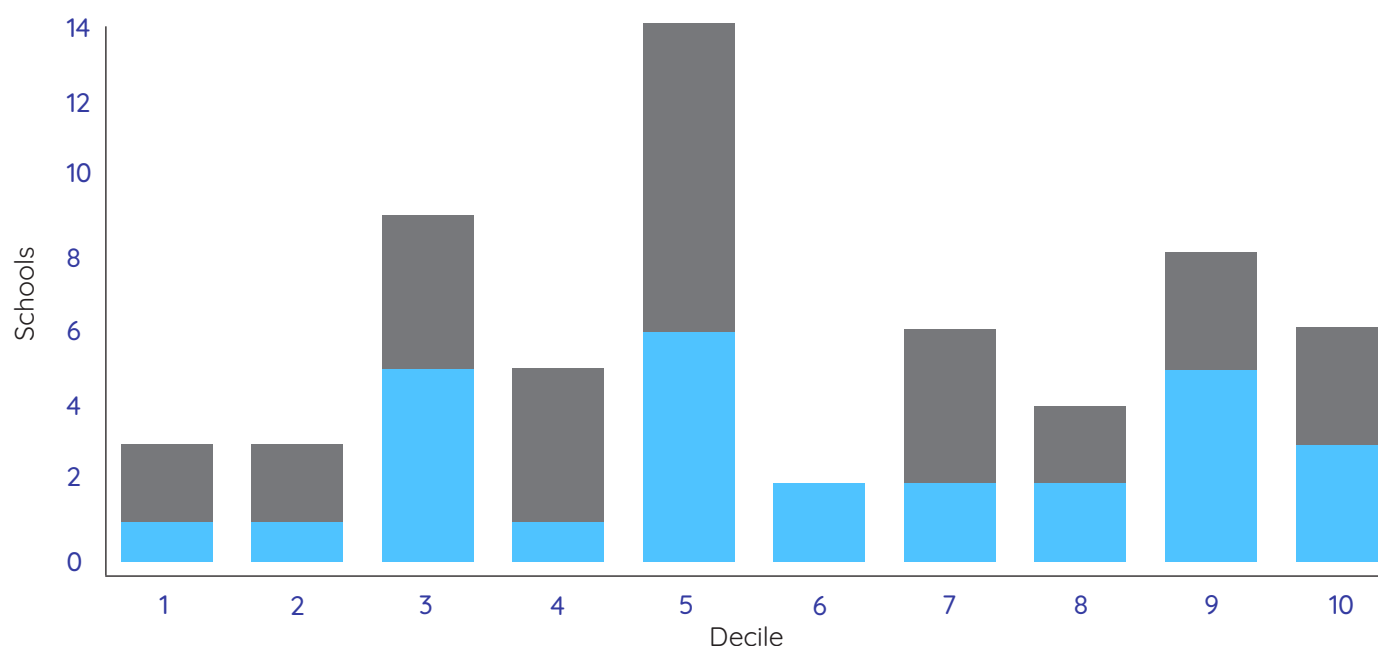


Figure 45: CALM schools plotted against index of multiple deprivation

5. Evaluation of Programme Success

5.4 Summary of Progress Against Aims

As outlined in section 5.3, two targets within KPI001 and KPI002 were surpassed. We directly engaged nearly 7,000 pupils in air quality awareness activities and, although this is slightly below the 8,000 pupils target, this is balanced by the number of pupils engaged in air quality knowledge activities, which far exceeded our target of 1,400 by engaging with 2,071 pupils. Overall, roughly 23% of the engaged pupils attended more in-depth CALM workshops, as opposed to awareness sessions e.g. assemblies, compared to the original target of 15%.

A total of eight secondary schools were engaged out of the target of nine. Although this came in under target, it was considered a success given the significant engagement challenges outlined in section 5.2. We also exceeded the target number of 16 primary schools, engaging a total of 20 schools. This represents half of all primary schools in RBC's area. Eight secondary schools were involved in the programme, including two independent schools and two outside RBC boundaries that had a high percentage of Reading's pupils attending. This is just under the desired target but with multiple sessions delivered to various age groups within those schools.

The programme directly engaged with 2,104 parents out of the target of 3,000 but indirectly engaged with over 15,000 and this is largely a result of the very successful school gate engagement campaign. This gives a total of approximately 17,000 engaged adults, or 24,000 if two adults were able to access CALM materials received by the children. Taking into account the Census estimates of Reading's population of 178,196, the fact that 20% of the population are couples with dependent children and an additional 10.9% are lone parents, this gives the programme an accessible adult population of just under 55,000 people¹³. The programme has therefore reached 31% of accessible recipients in Reading (or approximately 44% based on the assumption that more than one adult was able to access CALM materials received by the children at home).

In terms of improving children's knowledge of air pollution, the programme delivered clear, measurable outcomes. Pre- and post-assessments revealed an average knowledge increase of 28% among primary school children and 9% among secondary school pupils. This demonstrates the effectiveness of the educational content and resources, including interactive presentations, videos, and expert-led sessions.

A core objective was to encourage behavioural change to support cleaner air in and around schools. This was realised through pupil-led action planning activities in 13 schools (8 primary and 5 secondary), where children identified specific solutions and communicated their proposals. Behaviour change was further supported by direct engagement with over 860 parents and carers at school gates, as well as interactions with more than 4,000 members of the public at various community events.

The programme also extended awareness beyond the classroom into homes and the wider community. Children shared what they learned with their families, leading to discussions and, in some cases, suggesting household changes such as increased active travel or reduced car idling. An estimated 17,000-24,000 adults were reached through a combination of take-home materials, community events, and public visibility campaigns.

In terms of providing tools and resources for continued learning, the programme delivered a comprehensive package of legacy materials. These included lesson plans, CALM booklets, data sheets, and educational videos, all of which remain freely available on the RBC Design Nature websites. Additionally, a dedicated Key Stage 2 lesson plan, developed in collaboration with the UoR and a local teacher, is now hosted permanently on the UoR's climate education platform.

Although air quality is not explicitly part of the national curriculum, CALM successfully integrated air quality education into key subject areas including science, geography, maths, citizenship, and environmental science. This cross-curricular approach ensured relevance across key stages.

¹³ ONS (2021). "Office for National Statistics. 2021 Census Profile for areas in England and Wales: Reading Local Authority in South East ". Retrieved 04/08/2025, from <https://www.nomisweb.co.uk/reports/localarea?compare=E06000038>.

5. Evaluation of Programme Success

The programme placed strong emphasis on equity and inclusion, and it was delivered in schools representing Reading's diverse communities where 46.5% of the population identifies as being from a Black or Minority Ethnic background. All programme activities were designed to be accessible and adaptable, ensuring pupils from different socio-economic backgrounds could engage meaningfully and equally.

Another key success was the development of communication skills among pupils. Through action planning workshops and presentations, children were given the opportunity to share their ideas, build confidence in public speaking, and take part in discussions on environmental change.

Finally, CALM aimed to promote participation in wider environmental initiatives, and this was well embedded in delivery. All schools involved in the programme either had an existing Eco or Environmental Club or used their involvement with CALM as a starting point to establish one.

In conclusion, CALM has delivered a high-impact, inclusive, and sustainable environmental education programme. Overall engagement (adults and children) is estimated to be over 26,000 people (or nearly 33,000 if two adults at home engaged with the CALM materials). The programme not only met its original objectives but also laid a foundation for long-term engagement with air quality and climate education across schools, households, and the wider Reading community.

6. Programme Legacy and Future of CALM

6.1 Outcomes

Following the successful creation and delivery of the CALM programme, there has been great interest from schools to provide continuing support from September 2025. More than 70% would like to retain the AirGradient indoor and outdoor monitors that have been loaned to them for the duration of the programme, and some have expressed the desire to work with other schools in the Reading area.

As a result, a series of legacy materials has been prepared to support ongoing air quality education in RBC following the completion of the CALM programme. Feedback was collated from CALM schools to inform the legacy resource package, as presented in Table 7. Based on this feedback, it was proposed to create a CALM community of practice, discussed further in 6.3.

Table 7: Examples of Feedback received from CALM schools

Type of School	Staff Member	Feedback
St Anne's RC Primary School	Headteacher	The CALM programme has had a good impact on both the children and the school. I've noticed that the children have become much more aware of their environment, especially in terms of air quality and how it affects their concentration and wellbeing. One of the best aspects has been how the children took ownership of monitoring the CO₂ levels. They enjoyed checking the monitors and thinking about how to improve ventilation by opening windows or doors when needed. This helped them feel responsible and involved, and it sparked lots of good conversations about caring for the environment and each other. This links beautifully with our Catholic Social Teaching principles, particularly stewardship of God's creation and promoting the common good. By taking care of their shared environment, the children are learning how their actions can benefit everyone and protect the world around them. If there was anything to improve, it might be to provide another mid-year assembly. Overall, it has been a valuable programme that empowered the children to act responsibly and live out their faith through care for creation and respect for the wellbeing of others.
The Abbey	Teacher (Sustainability Lead)	The Air pollution monitors have allowed the Eco Council to look at the data and it has started the discussion on what we can do as a school to improve air pollution. When I asked the Eco Council should we keep the monitor they were really keen to do so. The below quote from one of the pupils on Eco council highlights their thoughts: "The air pollution monitor has been an amazing tool. It has helped me educate the school in assembly on how big a problem air pollution is and how it can affect our health. When people were shown real data of the high levels of air pollution at our school, it made them realise how very real air pollution is. In the future, we would like to continue to give pupils frequent updates on how the air pollution around the Abbey changes as the year progresses."

6. Programme Legacy and Future of CALM

Type of School	Staff Member	Feedback
Emmer Green Primary School	Teacher	We have really enjoyed taking part as a class. The children have become much more aware of the air quality around them, and this has generated some really important discussions around the importance of our world and the environment. It has in no doubt increased children's awareness and educated those who were not aware. It has been a visual reminder to improve the air circulation in the classroom. Children have actively responded to the change in light colour; opening windows etc. I would hope that our classroom discussions made their way home to be shared with families so that changes could be made there too. This is potentially one area that could be looked at - increasing family participation. More walking to school, less BBQs etc. As I am already actively in support of cleaner ways of living, this was a programme that I loved being a part of and would like to continue.

6.2 Outcomes

The following materials will be made available at the end of the CALM programme to continue the legacy of the programme.

6.2.1 Legacy Video

An additional marketing video, highlighting the impact of the programme and showcasing an outdoor activity with a primary school, has been created in partnership with Nicely Done Studios (CALM:ER - July 2025). The video contains a call to action at the end, encouraging schools to sign up for the CALM community of practice discussed in section 6.3. It is hoped that the marketing video will encourage uptake of similar programmes in other local authorities and continue to inspire air quality related behavioural change in the coming years. The marketing video will remain on YouTube and on RBC's website following completion of the CALM programme.

6.2.2 Council Webpage

The RBC CALM webpage (CALM webpage) has been updated to include the legacy video and retain key resources including:

- CALM booklet
- Animation videos
- Case studies
- Assembly presentation slides
- Lesson plan slides
- Activities to do at school or at home
- Call to action 'link' for schools to remain involved (see 6.2.3)

All these resources will be available to anyone accessing the council webpage and will allow teachers to run similar air quality sessions in the future.

A CALM lesson plan has also been created by UoR's Institute of Education for Key Stage 2 and has been uploaded to the UoR webpage (<https://lessonplans.reading.ac.uk/lesson-plans>). This lesson plan is free for teachers for download and involves a monitoring exercise and data analysis to be undertaken over 2 sessions.

6. Programme Legacy and Future of CALM

6.2.3 Call to action

The call to action from the legacy video and the link on the council webpage will take users to a dedicated page on the Design Nature website. This page will:

- Be vibrant & responsive
- Have downloadable 'open source' resources
- Provide a 'safe environment' that supports the facilitation of ongoing the conversation of the community
- Be community led – 'community of practice'
- Include 'pupil voice'
- Be updated regularly & grown organically

These resources will be available to teachers who want to continue working with the CALM programme and will be managed by Design Nature. The page will act as a forum to allow teachers to discuss air quality lesson plans and sessions following feedback received from The Abbey.

6.2.4 Air Quality Action Plans & Promises

It is hoped that the 13 schools who completed an air quality action planning session will take their plans forward and achieve behavioural change. Several schools have already implemented their air quality actions to date, which have included air quality planting and an anti-idling campaign.

In recent CALM sessions, adults and children have also been encouraged to submit an 'air quality promise' which will act as a pledge for an air quality action they hope to implement. It is envisaged that the air quality action plans and air quality promises will drive behavioural change in RBC for years to come.

6.3 Community of Practice

Based on feedback received from teachers, the CALM team are planning to continue to work with a smaller number of schools (both primary & secondary), facilitate ongoing conversation and build a community of practice during the Autumn Term and until the end of December 2025 – with limited ongoing support thereafter. The following approaches are proposed at this stage.

6.3.1 Primary School Approach

The most engaged primary schools will be invited to participate in the community of practice. INSET days and after school sessions will be utilised to run 'train the trainer' session for teachers (assemblies and workshops) which will provide lesson plans and advice on leading air quality sessions. Teachers will be encouraged to share 'stories' of successes and challenges on the online forum to share lessons learned and continually improve the delivery of air quality sessions.

6.3.2 Secondary School Approach

For secondary schools, it is proposed to work with teachers and pupils from all schools already engaged in the CALM programme. The CALM team will explore the possibility of one school hosting an after-school workshop session to set up and create the community of practice. Teachers will be encouraged to share 'stories' of successes and challenges on the online forum to share lessons learned and continually improve the delivery of air quality sessions.

6. Programme Legacy and Future of CALM

6.4 Future Air Quality Initiatives

As discussed in section 1.4, the CALM programme linked to several of the RBC AQAP measures. The most relevant measure is RDAQ28 which relates to school awareness events. The CALM programme has demonstrated a strong appetite amongst RBC children for further air quality initiatives, such as school streets and active travel schemes, which will continue to be promoted and improved through RBC's Transport Plan. It is envisaged that additional schools will join the RBC School Streets programme following engagement with CALM.

In addition, the CALM programme relates to a future AQAP measure – RDAQ31: Increase $PM_{2.5}$ Monitoring to Help understanding of Levels and Sources in Reading. RBC will soon commence operation of a $PM_{2.5}$ automatic monitoring station in order to investigate the impact of $PM_{2.5}$ and other pollutants on health at a hyper local level. The data and insights from the $PM_{2.5}$ monitoring will be used to inform future air quality measures and initiatives. RBC will continue to disseminate information about the harm of particulate matter to human health to RBC residents to minimise air pollution exposure and increase air quality awareness among the community.

7. Conclusions

The Clean Air Living Matters: Exploring Reading (CALM or CALM:ER) programme has successfully achieved its objective: to raise awareness, increase knowledge, and promote behavioural change around air quality among schoolchildren, their families, and the wider community in Reading.

Delivered over a two-year period and funded by the DEFRA Air Quality Grant, the programme made substantial progress across all key performance indicators (KPIs), exceeding many of its original targets while leaving a lasting educational and environmental legacy.

A main success of the programme is highlighted by the inclusive engagement, having directly reached over 9,000 children, over 2,000 through practical knowledge sessions and nearly 7,000 through awareness activities. This demonstrates the programme's strong presence in schools across RBC. Importantly, the programme was targeting schools in areas with diverse socio-economic backgrounds, including those with high levels of deprivation and schools with a high proportion of pupils from Black and Minority Ethnic communities. The inclusive and adaptable design of all activities ensured that no child was disadvantaged due to their background or school context.

The programme also made significant progress in terms of community and parental engagement, a challenging but critical component. Through face-to-face conversations at school gates and participation in community events, over 860 parents and carers were directly engaged, and the estimated total reach extended to over 17,000-24,000 adults through indirect channels such as CALM materials shared at home and public events. This outreach helped to stimulate important conversations about air quality at home, contributing to behaviour changes such as reduced car idling and more frequent active travel.

Knowledge acquisition was measured through pre- and post-assessments, revealing an average knowledge increase of 28% among primary school pupils and 9% among secondary school pupils. These improvements demonstrate that the educational components were well-structured, accessible, and impactful. Pupils actively engaged with resources such as interactive presentations, videos, practical monitoring activities, and were able to confidently apply this knowledge during action planning and discussions.

Beyond knowledge gains, the programme succeeded in supporting behavioural change. Action planning activities were completed in 8 primary schools and 5 secondary schools, where pupils developed and presented proposals to improve air quality in their schools and wider communities. These activities supported the development of pupils' communication skills and encouraged them to take ownership of environmental issues. Teachers also highlighted confidence in pupils when discussing air quality topics, further underlining the programme's positive influence.

CALM also made a strong contribution to curriculum integration. Although air quality is not currently a standalone topic within the national curriculum, the programme's materials aligned well with subjects such as science, geography, mathematics, and citizenship. The development of a dedicated Key Stage 2 lesson plan, in collaboration with the UoR and a local teacher, has further embedded air quality education into mainstream learning and will remain accessible as part of the UoR's climate education resources. Additionally, the availability of materials on the RBC and Design Nature websites ensures that the programme's legacy will continue beyond the programme's official end.

A notable achievement was the extensive deployment of air quality sensors, including 45 AirGradient Open Air monitors, 45 indoor AirGradient ONE sensors, and 30 Atmotube PROs. These devices supported both data collection and air quality investigations, making environmental data accessible. By involving pupils in real-time monitoring, the programme made the science of air quality relatable and actionable.

7. Conclusions

Finally, the CALM team made sure equal access to environmental education across schools in Reading was available. The programme's delivery strategy and outcomes reflect a clear commitment to social equity, reaching children and families who may otherwise have limited access to such initiatives.

The CALM programme ended within the budget of £387,020, with a final cost of £353,113.50. Based on the programme's total community reach of 26,000 – 33,000 people, as discussed in section 5.3, the cost of the programme was estimated to be approximately £10.70 – £13.60 per resident. This is considered strong value for money given the long-term educational and behavioural change outcomes of the programme.

In conclusion, the CALM programme has delivered a high-impact, comprehensive approach to air quality education, engagement, and action. It not only met and exceeded key targets but also created a model for meaningful, community-focused environmental education that is scalable and sustainable. By combining scientific understanding, behavioural change, community outreach, and long-term resource development, CALM has put in place a strong foundation for ongoing efforts to improve air quality and build environmentally responsible communities in Reading and beyond.

01 Case Study



Case Study 01 Geoffrey Field Junior School 24th January 2024

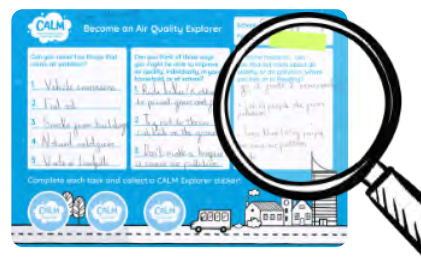


The inaugural **CALM** delivery session saw Mark, Erica, and Ian, from Design Nature, joined by Marta from the University of Reading, to give an assembly for around 360 KS2 pupils...inviting them to become **Air Quality Explorers**.



The session was fun and interactive and enabled the pupils to get curious, and find out more about, air quality (AQ), air pollution and the air that we breathe.

Following the session, each pupil was encouraged to take home a **CALM activity sheet** with further questions for them to answer and a wordsearch for them to complete alongside the opportunity to earn 'stickers' for returned sheets.

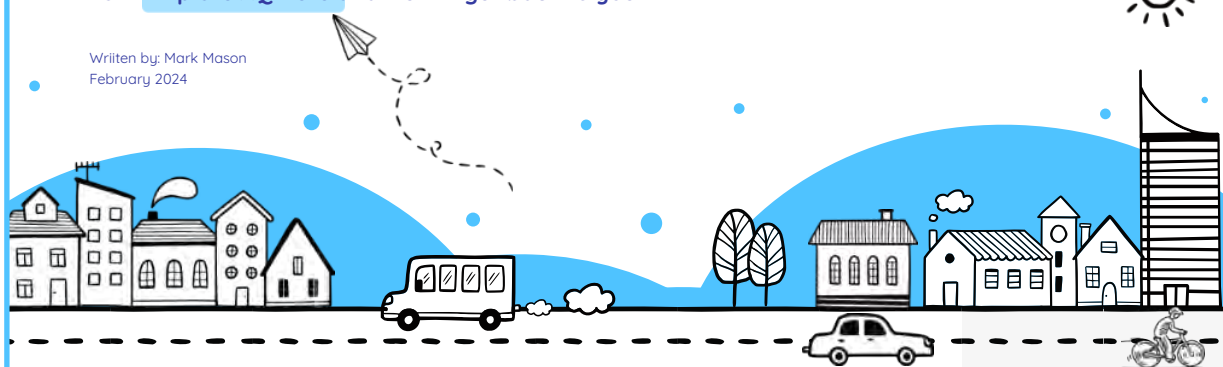


Overall, a successful session with lots of positive interaction and feedback...a very good way to kickstart the delivery of the CALM programme with Reading schools. We have left the school with indoor and outdoor AQ sensors, and a dashboard, to use for further exploration, allowing them to record and evaluate their own data.

“Thank you so much for your lovely assembly this morning. I really appreciated you coming in. Lots of staff and the children really enjoyed it.”

If you would like your primary school (or know of one which would) to be involved in the CALM programme, and access the ‘free’ resources, please complete our short enquiry form [Explore AQ Here](#) and we will get back to you.

Written by: Mark Mason
February 2024



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02 Case Study



Case Study 02 Reading School 31st January 2024



Mark from Design Nature was joined by Marta from the University of Reading, and Jonny from Stantec, to deliver an enrichment session to 25 Y9 GCSE Geography students. During this hands-on session, we invited the students to become 'Air Quality Mappers' enabling them to explore air quality (AQ) and air pollution further.



Following a short programme introduction in the classroom, we split the students into groups of five and facilitated an outdoor AQ mapping exercise, where the students were given handheld AQ sensors, dedicated smartphones, and spreadsheet, to measure and record AQ data for themselves.

Returning to the classroom, the students were able to compare the data that had been recorded in different locations across the school grounds. This allowed them to make informed assumptions about their findings, discuss the outcomes as a group, and offer suggestions for improvement.



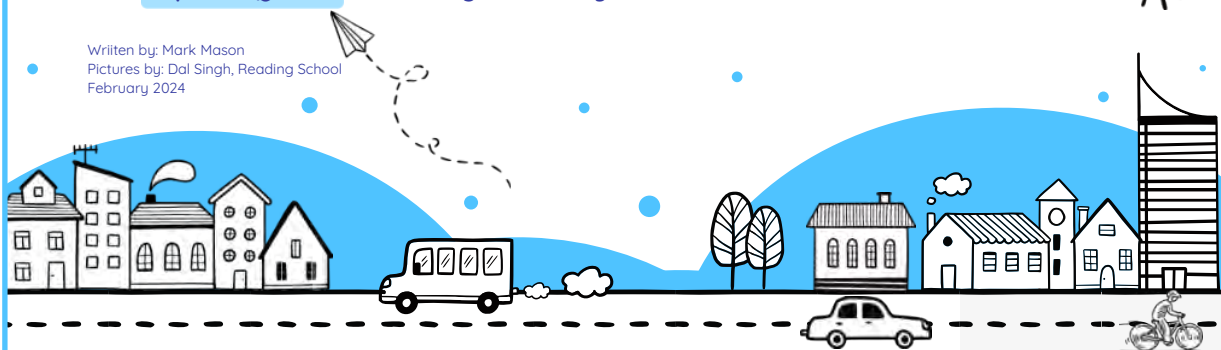
The session went extremely well, and much was learned by all parties. We have left the school with indoor and outdoor AQ sensors, and a dashboard, to use for further exploration, allowing them to record and evaluate their own data.

**"I just wanted to thank you for running the session yesterday with the Year 9's.
It was excellent and the students really enjoyed it."**

If you would like your secondary school (or know of one which would) to be involved in the CALM programme, and access the 'free' resources, please complete our short enquiry form [Explore AQ Here](#) and we will get back to you.



Written by: Mark Mason
Pictures by: Dal Singh, Reading School
February 2024



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03 Case Study



Reading Schools Collaborate for Clean Air Day 2024



The CALM:ER (Clean Air Living Matters: Exploring Reading) programme celebrated [Clean Air Day](#), on the 20th of June 2024, by organising a workshop that over 60 students attended, from four secondary schools across the wider Reading area: [Blessed Hugh Farringdon](#), [Little Heath School](#), [The Abbey](#), and [St Joseph's College](#).

The workshop was also part of the [Reading Climate Festival 2024](#).

CALM is a collaboration between [Design Nature](#), [University of Reading](#), [Stantec](#), and [Reading Borough Council](#) and through funding awarded from [Defra](#).



[Watch the overview video here.](#)

Outline of the day

Led by [Mark Mason](#), from Design Nature, and [Marta O'Brien](#), from the University of Reading, the 4-hour session was delivered to encourage curiosity, creativity, teamwork and collaboration. Working in groups, the students had the opportunity to explore air quality in different ways and follow the effective Design Nature approach of Cultivate | Collaborate | Innovate.

Cultivate

Inspirational Green Careers 'Lightning Talk' from recent university graduates (and [STEM Ambassadors](#)), in-house air quality experts, [William Storey](#) and [Jonny Dodkins](#), sharing their valuable insights and real world experiences at [Stantec](#).

Learning in the Lab, with Reading University air quality researcher and scientist [Marta O'Brien](#), with interactive experiments exemplifying some of the everyday things that can impact our indoor air quality.



Stantec air quality consultants William and Jonny, share their career journey.



Indoor air quality experiments with University of Reading Air Quality Researcher and scientist Marta O'Brien, Supported by Mark Mason of Design Nature.



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07 Case Study

Civitas Academy – AQ Journey

April 2024 to July 2025



Over a 15-month period, the CALM team collaborated with Civitas Academy in Reading (Great Knollys Street) to deliver a comprehensive set of **five activities** that enabled the pupils and staff to become ‘**Air Quality Explorers**’.

Fundamentally, this allowed us to explore together to discover and understand:

- What is air quality?
- What is air pollution?
- What can you (we) do about it?

01 Assembly – April 2024



[Click here for full case study](#)



[Download Case studies](#)

05 Case Study



Civitas Academy

Civitas Academy - CSII
9th January 2025
University of Reading



CALM team members **Marta O'Brien**, from the University of Reading, and **Mark Mason** from Design Nature, were joined by approximately 50 Y5 pupils from Civitas Academy for an exploration of indoor Air Quality. The session was held in the Environmental Science laboratory at the university.

Building on previous acGviGes with Civitas Academy, pupils were encouraged to engage in hands-on experiments that recreated various forms of indoor air polluGon. They also analysed data they had collected in their classrooms over several weeks, boosGng their understanding through pracGcal acGviGes.

Expertly led by **Marta**, the pupils took part in experiments that demonstrated how everyday acGviGes such as cooking with natural gas and burning wood for heaGng can impact indoor air quality. The children used handheld devices to measure the level of pollutants in the air, that replicated air polluGon on a small scale in a safe way, and discussed how pollutants can impact our health.

"Learning by doing is one of the most effecAve ways to engage pupils at this age."

"By prioriAing environmental educaAon today, we are making a vital investment in the future of our planet - something the world urgently needs."

Following the experiments, **Mark** discussed the air quality data that had been collected from the classrooms and helped the pupils and staff analyse the various findings.

"Sharing visual data and graphs highlighted the ParAulate MaGer 'spikes' which appeared several Aes during Halloween, Bonfire Night(s), and Diwali, on both the indoor sensors in the classrooms at the school. CALM's observaAons are a posiAve example of demonstraAng the impact that outdoor air polluAon can have on our indoor air quality."

"Y5 had a great Ane at the University of Reading today in one of their environmental science laboratories. We learnt lots with Marta and Mark compleAing experiments around air quality as part of their CALM:ER (Clean Air Living MaGers: Exploring Reading) studies." 🙌👏👏👏 (Civitas Academy on X)

If you would like your school (or know of one which would) to be involved in the CALM programme, please complete our short enquiry form on the website (click QR code below).

Writ en by: Mark Mason
Pictures by: Civitas Academy & University of Reading
March 2025



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06 Case Study



EP Collier - Case Study 4th December 2024 5th & 6th February 2025



CALM team members **Mark Mason** from Design Nature, **Marta O'Brien** and undergraduate students from the University of Reading, visited EP Collier School in Reading to deliver a KS2 assembly in December.

In the New Year, CALM ran an exercise where 120 Y5 and Y6 pupils collected indoor air quality data, over several weeks, in their classrooms.

Returning to school at the beginning of February the CALM team worked with the pupils to analyse the data and boosted their understanding by facilitating practical activities and ideas generally.

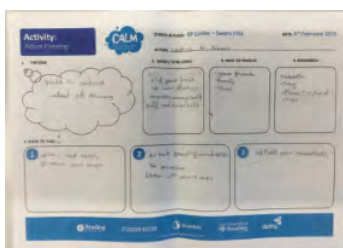
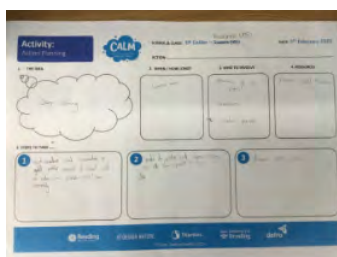
The outcome has led to the creation of four 'Action Plans' that the school will look to implement. Two examples below.



Stop Idling

This is a great idea. Consider running it as a 'pilot' in your class first, before rolling out across the school. Look at what other schools and councils have done on anti-idling.

CALM could support you, at the school gates, when talking to parents and provide handheld monitors to measure Air Quality at drop off and pick up times.

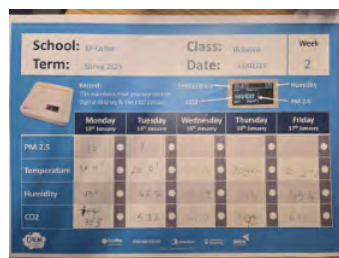
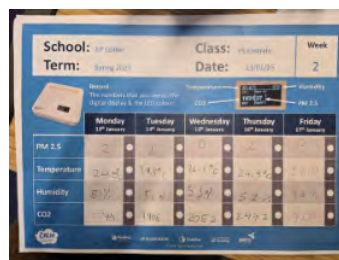


Walk to School

This is a great idea. Consider a class led activity where many of you walk or cycle to school on the same day or week.

Think about 'drop off zones' for those still using cars for half the journey.

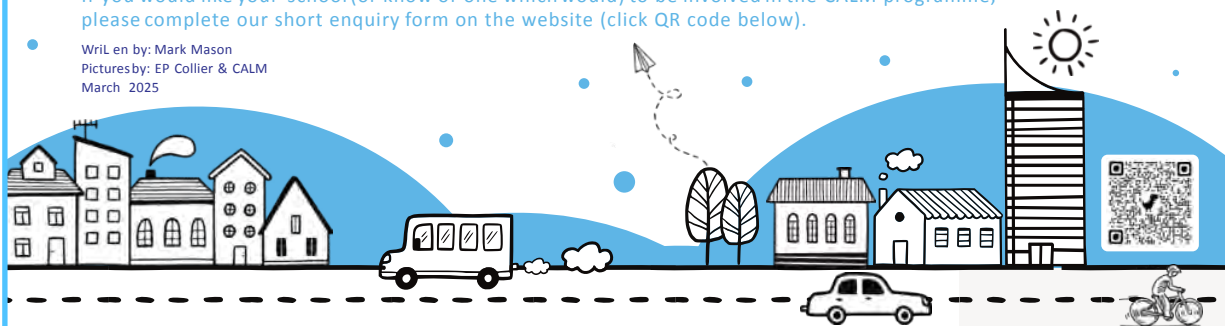
Can you involve the CALM team and use handheld air quality monitors to measure AQ on the route?



"It was a privilege being part of something big like the CALM project. I was delighted to see how Mark and his team were able to engage as many children as possible, and their parents, with the project. They had fun learning about the challenges we face for a purified air and how to overcome them. Having the children involved meant that they have ownership in shaping their future. Thank you, team!" **S. Ahmed, Y6 Lead**

If you would like your school (or know of one which would) to be involved in the CALM programme, please complete our short enquiry form on the website (click QR code below).

Written by: Mark Mason
Pictures by: EP Collier & CALM
March 2025



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