

AIR AWARE IPSWICH SCHOOL TOOLKIT



IPSWICH
BOROUGH COUNCIL

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SECTION 1

INTRODUCTION

Air pollution can have extremely negative impacts on health and well-being, leading to serious health problems. Every year thousands of people in the UK are known to die prematurely due to the effects of air pollution. Thousands more have to be admitted to hospital. These impacts are often most severely felt by vulnerable people such as children, older people and those with existing heart and lung conditions.



People living in areas near major roads - which are often in some of the most deprived parts of Ipswich - are exposed to particularly high levels of pollution.

WHAT ARE THE MAIN AIR POLLUTANTS IN IPSWICH?



To find what our air quality is like, we need to measure the concentration of pollutants (harmful gases and dust) in the air. Air quality is measured by monitoring stations across Ipswich.

In Ipswich, the pollutant of most concern is nitrogen dioxide (NO₂).

Nitrogen dioxide is a harmful gas produced by burning fossil fuels. Petrol and diesel fuels used in car engines are one of the biggest sources of NO₂, so levels are highest near roads. Other sources include burning of coal and gas in power stations to produce electricity and gas boilers used for heating.

NO₂ can make it harder to breathe and can damage people's lungs if they are exposed to it for a long time. NO₂ particularly affects children, and people who already have breathing problems such as asthma.

Ipswich currently has four Air Quality Management Areas (AQMAs) due to exceedances of the annual mean objective for nitrogen dioxide (NO₂) of 40 µg/m³.

Another pollutant of concern is Particulate Matter (PM). PM consists of microscopic materials suspended in water vapour or gases in the air. PM pollution can come from a range of sources, including road transport and domestic burning but it can also come from environmental sources such as forest fires and ocean spray. Atmospheric conditions can also cause pollution to travel long distances so some of the levels of particulate pollution within the Borough may not be attributable to sources within the town. It will be important for this to be addressed on a national level, nonetheless, the Council aspires to reduce levels of PM air pollution to as low as practicable.

WHAT IS BEING DONE BY THE LOCAL AUTHORITIES?

The Council has produced an Air Quality Action Plan and is involved in implementing the numerous measures within the plan to tackle air quality and reduce levels of pollution. We are working in partnership with Public Health, Suffolk County Council and the other Suffolk district councils to ensure these measures are prioritised and actioned.

The Council has been taking positive action towards reducing pollution levels in the town which has included:

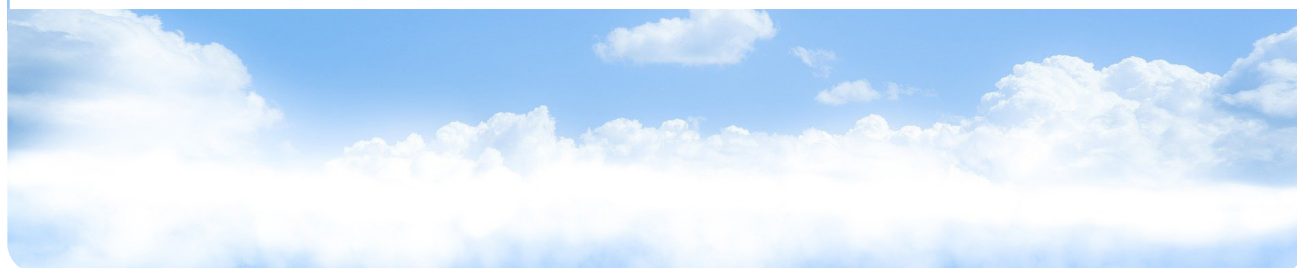
- Investing in a low emission fleet
- Investing in electric vehicle charging points in our car parks
- Jointly developing an anti-idling campaign with other Councils across Suffolk. Details of the Suffolk Idling Action Campaign and accompanying materials can be found [here](#).
- Participating in annual Clean Air Events to educate the public on the issue of air pollution.
- We have produced an air quality planning document to ensure that future development in the town does not impact on air quality.
- The Council believes schools and colleges can play an important role in educating our children and young people about air pollution. If interested schools would like an air quality officer to visit, they can contact environmental.health@ipswich.gov.uk for this to be arranged.

However there is still more to do in order to reduce the air pollution we all face every day and we all play a role in helping to tackle it.

WHAT IS THE AIR AWARE PROJECT AND WHAT ARE ITS AIMS?

The Air Aware project was created by Ipswich Borough Council with the aim of raising awareness of the main sources and health effects of air pollution emissions among the community.

It is expected that this initiative can contribute to the behavioural change that is needed to tackle air pollution. Every day decisions can have an impact on the air we breathe and we all have a role to play and we can all be part of the solution.



SECTION 2

THE AIR AWARE SCHOOLS TOOLKIT

This air quality toolkit provides science teachers with a series of interesting scientific activities to present to pupils, which are expected to promote understanding of the causes and impacts of air pollution, as well as tools to identify areas of poor air quality around the school.

It is expected that the use of this air quality toolkit will:

- Provide tools to identify areas of poor air quality around your school
- Promote pupil understanding of the causes and impacts of air pollution
- Give ideas for engaging staff, pupils and parents/carers in improving air quality
- Help to reduce children's exposure to air pollutants, within the school and through their travel.

This Air Aware Schools Toolkit has been adapted from:

- A similar initiative previously developed by the London Sustainability Exchange for schools around London area, and supported by Transport for London, the Mayor of London and Cleaner air for London.
- Oxford City Council's Schools Tackling Oxford's Air Pollution (STOP) toolkit. Oxford also adapted their toolkit from the initiative previously developed by the London Sustainability Exchange.
- Educational packages provided by Deliver Change Ltd.

It is expected that the citizen science activities presented in this toolkit will help raise awareness and assist in reducing children's exposure to air pollutants, within the school and through their travel within Ipswich.

WHAT IS CITIZEN SCIENCE?

Citizen science is a fun and interesting way of getting people involved in understanding and tackling environmental issues. By collecting scientific data we can better understand an issue like poor air quality.



HOW TO DELIVER THE AIR AWARE SCHOOL TOOLKIT?

This toolkit includes a number of different science activities and experiments for your school to carry out as part of an air quality project. These can be integrated into a lesson, or completed as part of an extracurricular activity with an environment club, Green Team or Eco-committee. The full programme could be extended across a year group, or even as a whole school initiative with different classes and year groups carrying out different activities as part of a themed term or year.

Citizen Science and air quality activities can be of particular benefit to school children, because of their links to the National Curriculum. The following programme of activities can be used together or individually to introduce issues of air pollution to children, and to better understand the causes of pollution and how to affect change.

HOW DOES THE AQ TOOLKIT LINK WITH THE NATIONAL CURRICULUM?

This Toolkit develops key concepts and skills which are fundamental to curriculum subjects, including:

- **Science:** planning and carrying out scientific investigations; gathering, analysing and evaluating evidence; generating and testing theories; and communicating scientific information.
- **PSHE/Citizenship:** recognising that individual choices and behaviour can affect issues and political and social institutions; researching, debating, talking and writing about their own and others' viewpoints on issues that affect themselves and society; and playing an active role as citizens, making real choices, participating in decision making and leading a healthier, safer lifestyle.
- **English:** developing skills of speaking, listening, reading and writing for a purpose, investigating, planning, predicting, debating, and communicating to the wider community in the context of an issue which is real, relevant and motivating.
- **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.
- **Computing:** developing research skills, preparing and interpreting information using computing, presenting information via desk-top publishing or multi-media presentations, sharing information via the internet.

TIMELINES

The timeline below illustrates how this toolkit can be used as part of a 12 week programme investigating air quality. This shows how it is possible to carry out the programme over the course of a single term, but some schools may find it beneficial to spread the activities over a full academic year.

This would also have the added benefit of continually reinforcing messages about air pollution and sustainable travel, encouraging more staff and parents to take up sustainable travel over time.

The Council is happy to contribute to this activity by ordering and providing diffusion tubes for activity B, as well as providing an air quality presentation for pupils. For example, an air quality officer could present at an assembly on a day and time to be agreed with the school.

Week	0	1	2	3	4	5	6	7	8	9	10	11	12
Lessons	Teacher Preparation	Introduce Air Quality & Plan an Investigation	Investigating Air Quality			Analysing Data			Action Planning	Taking Action		Evaluating Success	
Citizen Science Activities			Diffusion Tubes Put Out Collect			Analyse Results							
			Surface Wipes										
				Lichen Study									
Social Marketing Activities									Plays Assemblies Electing Air Quality Champions				
									Moth Pledges				
									Other Activities (Poster and Story competitions, Letters to MP etc.)				
Optional Surveys		Idling Survey Travel Questionnaire										2nd Survey	
												2nd Survey	
Evaluation												Evaluate Results	
Present Findings													Assembly

SECTION 3

STRUCTURE

PART 1:

INTRODUCING AIR QUALITY AND PLANNING AN INVESTIGATION

The following section introduces a six-part procedure, recommended to be followed by teachers for the implementation of the citizen science activities available in [section 4](#).

Objectives

Pupils will learn how to:

- Make predictions
- Ask scientific questions
- Plan how to answer their questions
- Decide what kind of evidence to collect
- Use large-scale maps
- Research and discuss topical issues.

National Curriculum links

- Science
- Geography
- PSHE/Citizenship
- English Speaking and Listening

Resources needed

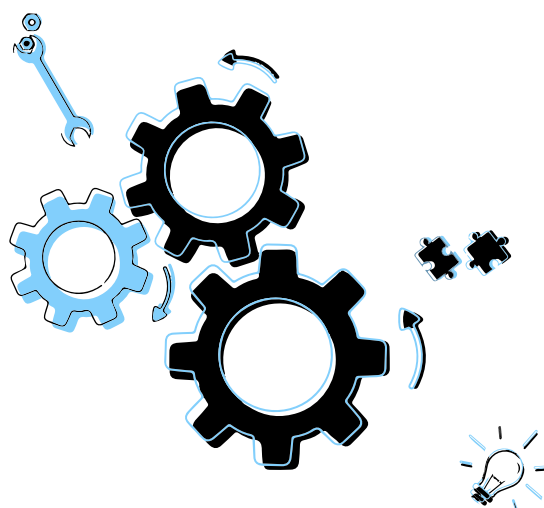
- Air pollution Lesson Sheet (below)
- A big large-scale map of the area around the school (e.g. projector showing a map with a radius of approximately 500m around your school)
- Copies of large scale A4 maps showing the same area around the school – one for each group of 4-5 pupils
- Red and green sticky dots for each group
- You will need to decide in advance which of the Citizen Science methods of data-gathering you will be using in the next session and, if necessary, order the equipment ([see “Section 4: Citizen Science Activities” below](#)).
- You may also wish to conduct an optional idling survey and undertake a travel questionnaire at this stage ([see “Section 4: Citizen Science Activities” below](#). A [template idling survey and travel questionnaire](#) are provided in this section with instructions. If you need any advice on School Travel Plans, contact: schooltravelplans@suffolk.gov.uk who can assist.)

Introduction

Tell the class that they will be investigating air quality. Explain what this means. Explore types of pollution, causes and health effects (Use air pollution lesson sheets below for support).

Ask pupils:

- How they think air quality might be different on a busy road and in a quiet area away from traffic
 - To turn their predictions into a scientific question that can be investigated
 - How they think they could find an answer to their question.
- Tell them some of the ways that air quality can be measured (relating them to their suggestions) and the method they will be using in the next session.



AIR POLLUTION LESSON SHEET

What is air pollution?

Air pollution is anything that causes the air to become contaminated with pollutants at levels harmful to our health or the environment.

What makes the air dirty?

Generally, air pollution comes from the burning of fossil fuels such as coal, oil, natural gas, petrol or diesel. This happens when we use energy supplies to do everyday activities, such as cooking or washing at home and traveling by cars.

The UK has suffered from air pollution since the beginning of the industrial revolution in the 18th century. Smoke and fog create "smog" which makes it really hard to breathe and see clearly. More than 4000 people died in London in the great London smog in 1952! Industrial processes and domestic heating were the main contributors to air pollution back then, and until the 1970s.

Air pollution today

Today, when we think about air pollution, we should think of transport, especially cars. Today there are about 23 million vehicles on the road in Britain, and 20 million of them are cars!. The fuel they use – petrol and diesel – cause bad gases to be ejected from the exhaust. These gases can be very dangerous for children.

Health Alert – how does air pollution affect you?

Air pollution is known to cause breathing problems, lung and heart diseases, such as asthma. Children are particularly at risk, as your bodies are less resilient and the pollutants have a more concentrated effect. Air pollution can:

- Affect your immune system, so that you can catch infections more easily
- Make you cough, splutter, wheeze, sneeze, dizzy and it can make your eyes itch
- Give you green snot, and more bogeys than your nostrils have space for
- Pollution can be blamed for an estimated 63 premature deaths (Age 25+) in Ipswich each year.

Most pollutants are much too small to see without a microscope, but they still get into our lungs and affect our health. The main nasty pollutants in the UK are NO₂ and PM:

NO₂ – Nitrogen dioxide: also contributes to acid rain, which damages trees and the stone of buildings. You can see the effect of NO₂ on a hot day in summer, when it combines with other chemicals to make the sky look heavy and brownish grey.

PM – Particulates: tiny particles of dust and soot that are released into the air. When you breathe them in, they settle in the lower parts of your lungs. There are natural sources of particulates. However, the biggest source is attributed to traffic. Lorries and diesel vehicles produce the most particulates in cities.

Everyone can help make our air cleaner!

Actions CHILDREN can take

Travel to school

- ✓ Walk, cycle or scooter to school! It is a good exercise and can reduce air pollution.
- ✓ Use public transport: take the bus or train instead of the car.
- ✓ If you have to travel to school by car, try car-sharing with other friends

No Idling

- ✓ If you have to be picked up by car, tell your parents not to leave the engine on while they wait for you. This is called “idling” and it is a big cause of air pollution around schools. Turning off the engine could reduce air pollution and also save your parents money.
- ✓ You can design signs and posters to tell people “no idling” around your school.

Spread the word!

- ✓ Discuss air quality issues with your teachers, friends and family.
- ✓ Make sure everyone you know is aware of the dangers of air pollution.

Actions PARENTS & TEACHERS can take

Promote sustainable travel

- ✓ Encourage your children and their friends to walk and cycle.
- ✓ Encourage friends and family to walk and cycle or car-share.
- ✓ Reduce the amount your family uses the car.
- ✓ Discuss air quality issues with your school, friends and family.

If you must drive

- ✓ Fully inflate car tyres so your car uses less petrol.
- ✓ Switch the engine off while waiting for your children after school.
- ✓ Ensure that you have your vehicle serviced at regular intervals.
- ✓ Try to use your car less frequently to reduce pollution, particularly for journeys under 2km.
- ✓ Don't start your engine until you are ready to travel. Turn the engine off if you are waiting or stuck in a traffic jam.
- ✓ Avoid rapid acceleration and heavy braking: they both increase fuel consumption and air pollution.
- ✓ Stay within the speed limit: you use 30% more fuel to travel the same distance at 70 mph instead of 50 mph.

Group activity

Ask pupils to work in groups of 4-5. (If time is limited you can do this as a class activity and miss out the feedback stage below).

Give each group a large-scale A4 map of the area around the school and some red and green stickers. Ask them to discuss in their groups where they think the air will be most polluted and why. They should mark these places on the map with a red dot.

They should then discuss where they think the air will be cleanest and mark these on the map with a green dot.

Class discussion

Ask one group to tell the class one of the places where they thought the air would be most polluted and why. Did the other groups agree? Mark this place with a red dot on a large map displayed at the front of the class. Then ask the next group to say a different place and repeat the process until all the most polluted places have been marked.

Now do the same with the least polluted places. Mark these with green dots.

As a class, choose 6-8 places near to the school for investigation during the next session. Make sure these include a range of sites e.g. busy and quiet roads, inside school grounds away from roads, next to traffic lights, at school gates, in car park (or identify sites as suggested in the instructions for the chosen method of data-gathering).

Give each site a name or number so that data can be easily referenced back to the map.



PART 2: INVESTIGATING AIR QUALITY

Objectives

Pupils will learn to:

- Collect scientific evidence
- Use scientific equipment
- Carry out fieldwork investigations
- Make a labelled field sketch.

National Curriculum links

- Science
- Geography



Resources needed:

- Activity sheets and worksheets for your chosen method of data-gathering (see [“Section 4: Citizen Science Activities”](#) below).

Class/group activity

- Carry out your chosen method of data-gathering as advised in the relevant Toolkit Resources – Diffusion tube study, surface wipes, lichen study
- Ask pupils to do a labelled field sketch of the place or places where they carry out their data gathering.

Some of the data-gathering methods will need two sessions – see instructions for each method.

PART 3: ANALYSING THE DATA



Objectives

Pupils will learn to:

- Draw conclusions from scientific data
- Recognise patterns
- Communicate data appropriately
- Recognise how people can improve or damage their environment
- Make informed choices
- Identify problems and suggest solutions.

National Curriculum links

- Science
- Geography
- PSHE/Citizenship
- English Speaking and Listening
- Computing

Resources needed

- Data gathered in previous session or analysis from lab (as appropriate);
- Equipment for chosen method of presenting data, e.g. plain and graph paper, computers;
- Scrap paper and pencils for group note-taking;
- Large sheet of paper.

Introduction

Present the data analysis to the class, or ask groups to present their data, depending on data-gathering method used in Part 2.

Class discussion

Discuss the results:

- What did pupils notice?
- In what kinds of places is the air most polluted?
- Did the evidence confirm or disprove their predictions?
- Did anything surprise them?
- What do they think happens when people breathe in air in the most polluted places?
- What could be done to reduce the amount of pollution in the air?
- What could they do to limit their exposure to air pollution?

The class should decide on the most appropriate way of presenting the data, e.g. displayed around their 'prediction' map, on a sketch map of the area, in a graph or spread sheet - this could then be done as a class, group or individual activity.

Group activity

In groups of 4 or 5, ask pupils to make a list of recommendations based on their findings. These could include:

- Long term (e.g. to reduce traffic, redesign engines to use less petrol, promote electric cars)
- Medium term (e.g. campaign to reduce idling outside school gates, develop a school travel plan)
- Short term (e.g. take a different route to school).

The groups should also think about who would be responsible for carrying out

each of their recommendations (e.g. government, car manufacturers, the school, parents, children).

Take feedback from the groups and write up a class list of recommendations on a large sheet of paper. This should be kept for the next session.

Extensions

1: Pupils could gather more evidence before finalising their recommendations, e.g:

- Carry out traffic surveys
- Survey and time engines left idling in particular places
- Interview passers-by for their opinions on the issue of air pollution.

2: Pupils could investigate air quality on the internet, e.g:

- Compare their data to air quality information for other parts of Ipswich at: https://www.airqualityengland.co.uk/local-authority/?la_id=165
- View a 5 minute video on air quality delivered by an air quality officer from Ipswich Borough Council: <https://www.youtube.com/watch?v=GPwNo9XDfHQ>

PART 4:

ACTION PLANNING

Objectives

Pupils will learn:

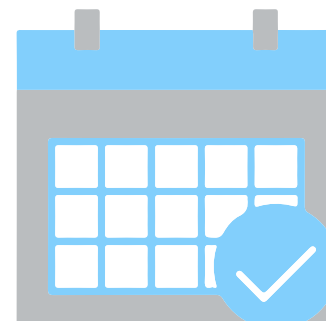
- How decisions and actions can affect the quality of people's lives
- Different ways in which people can improve their environment
- How to present a persuasive argument
- To make real choices and decisions.

National Curriculum links

- Geography
- PSHE/Citizenship
- English Speaking and Listening

Resources needed

- Class list of recommendations from previous session
- Scrap paper and pencils – one per group.



Introduction

Display the list of recommendations from the previous session and read them through together.

Group activity

Ask pupils to work in groups of 4 or 5. They should discuss the four points below and one person in each group should note down the group's decisions.

1: Decide on one recommendation that they would like to take action on.

2: Discuss what would be the best way to take action: for example:

- Influence someone in a position of power (e.g. by writing a letter or inviting them into school to respond to questions);
- Influence their parents or local people (e.g. by designing a leaflet, putting on a play, sharing their findings in the school newsletter);
- Take action as a school (e.g. by developing a school travel plan, a campaign, a walking bus);
- Inform other pupils (e.g. through an assembly presentation, designing posters, talking to them in the playground, publicising quieter walking or cycling routes).

3: Think about the most effective way to influence, inform or encourage others by:

- Deciding on the message they want to get across
- Deciding who they want to share their message with
- Thinking about what will appeal to this group of people (e.g. Should their message seem 'cool', fun, important, interesting ...? Would this audience respond best to facts, stories, pictures ...?).

4: Decide how they would know whether their action had been successful.

Class activity

- Ask each group to briefly present their ideas
- Collect in the notes made by each group. They will be needed for Part 5 and 6.

Either: Vote on which action the class would like to carry forward together.

Or: Each group could develop its own plan.

PART 5: TAKING ACTION

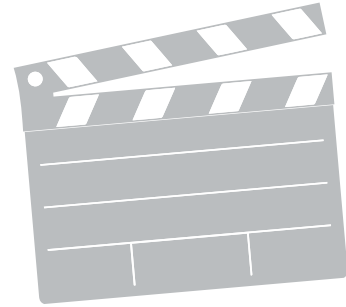
Objectives

Pupils will learn to:

- Explain their views on issues that affect them and others
- Communicate in ways appropriate to the task and audience
- Take responsibility for taking action to improve their health and environment.

National Curriculum links

- Science
- Geography
- PSHE/Citizenship
- English Speaking and Listening
- Computing



Resources needed

- Notes from Part 4
- Other resources will depend on the actions and methods pupils have chosen.

Individual, group and/ or class activity:

Write the letters, design the posters or leaflets, and decide how and where to distribute or display them, plan and deliver the presentation or campaign.

Pupils could research further information to inform their actions, e.g. about air pollution and its impacts or about safe and clean air walking or cycling routes.

PART 6: EVALUATING SUCCESS

Objectives

Pupils will learn to:

- Evaluate the effectiveness of their chosen actions
- Identify what they need to do next to achieve their aims.

National Curriculum links

- Science
- PSHE/Citizenship

Resources needed

- Notes from Part 4
- Other equipment will depend on the activities taken but may include another set of the air quality measuring equipment used in Part 2.

Class activity

After the actions have been implemented, discuss with the class:

- If they think their actions have achieved their aims
- How do they know?
- How they could find evidence that their actions worked.

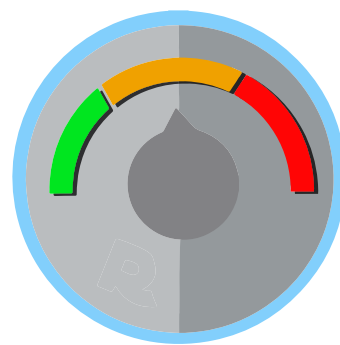
Return to the suggestions the groups made in Part 4 and look at the ideas there.

The best way to evaluate success will depend on the action taken. They might include:

- Re-measuring air quality outside the school gate after a campaign against idling cars
- Surveying modes or routes of travel to school after implementing a school travel plan, using a hands up survey
- Considering the kinds of responses they had from parents or the local community to an article or leaflet

Once they have evaluated the effectiveness of their actions they should:

- Decide how to publicise results to the target audience (e.g. via an assembly)
- Plan the next steps



SECTION 4

CITIZEN SCIENCE ACTIVITIES

Citizen Science Activities offer different methods of enabling pupils to see tangible indicators of air pollution. These vary in complexity, from activities which need no investment and little planning, to those which require more specialised equipment and span a period of weeks.

In this chapter we describe the following citizen science activities:

- a) Lichen Bio-Indicator Study
- b) Diffusion Tube Samples
- c) Surface Wipe Analysis
- d) Running Campaigns in School, including:
 - Plays
 - Assemblies
 - Electing Air Quality Champions
 - Anti-Idling Campaigns
 - Peppered moth pledge.

We recommend you use as many of these activities as time allows to reinforce learning and spark action!

The importance of citizen science is in the investigation, and in understanding the factors that contribute to your local air quality.

Once you have received the results for the particular tests you have chosen to carry out, it's time to consider how you want to best use this information in your school. The results can be analysed as closely as you feel useful to best identify sources and levels of air pollution, or can simply be used as a platform to communicate the concerns of air quality to others in your community.

For example, you may wish to consider the following:

- Create a large simplified road map of the school, and mark on it the areas of high/low pollution
- Create posters to display the test results, and the impacts this may have on the health of the school community

A) LICHEN BIO-INDICATOR STUDY

Suitable for Years: 4-6

Duration of Activity: 1 -1.5 hours (plus travel if offsite)

What is it?

Lichen monitoring is an easy way to observe the level of air pollution in your surrounding area, simply by identifying types of lichens that are present. This provides a basic idea of the extent of air pollution in your surrounding area, by identifying the presence of lichens which are sensitive to nitrogen and those which flourish in environments with high nitrogen level.

How to use it:

See the lichen identification guide and monitoring sheets for information on how to conduct your study. Lichen monitoring can be carried out as part of a lesson activity in and directly around the school or as an activity by those walking to and from school. This will help to identify levels of air pollution not just at the school site itself, but also along the primary travel routes to and from the school. As some lichens change colour in the rain, this activity is ideally carried out when the weather is dry.

Costs of activity:

This activity solely requires observation and monitoring, and should incur no additional costs. Rulers and magnifying glasses are useful tools for this activity. You could also take a map and a camera, so that you can mark the areas you've studied and take photos of the lichen you find.

Resources Included:

Lichen Identification Guide

Lichen Monitoring Sheet

The Open Air Laboratories (OPAL) network: Lichen and air survey, guide and quiz:

<https://www.opalexplornature.org/airsurvey>

<https://www.opalexplornature.org/lichenquiz>

Lichen Identification Guide

Resources from OPAL <https://www.imperial.ac.uk/opal/surveys/airsurvey/>

Lichen bioindicators

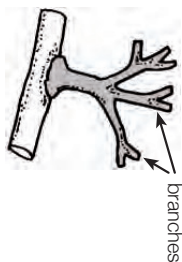
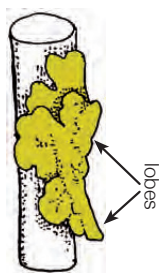
Why lichens? Lichens that are highly sensitive to air quality have been used to detect sources of pollution. In the past, when the air in many places was highly polluted by sulphur dioxide, few lichens could survive, creating lichen deserts around many industrial and urban areas. Lichens are now returning to towns and cities in the UK, and they can still provide a great deal of information about air quality.

Nitrogen-sensitive lichens are outlined in **blue**

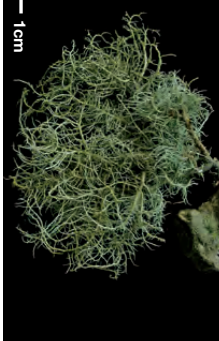
Intermediate lichens can be found in clean and polluted conditions and are outlined in grey

Nitrogen-loving lichens are outlined in **red**

Important lichen terms



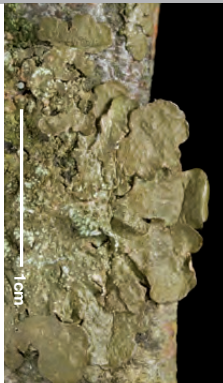
1. *Usnea*



- grey-green all round
- branches thread-like



4. *Melanelia*



- dull brown lobes, closely attached to the bark
- paler areas show when surface is rubbed



2. *Evernia*



- grey-green on top, white below
- lobes flattened, strap-like



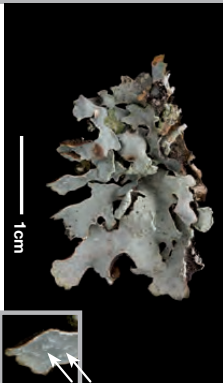
3. *Hypogymnia*



- lobes greyish on top, pale brown below
- lobes puffed up and hollow
- lobe ends often become powdery



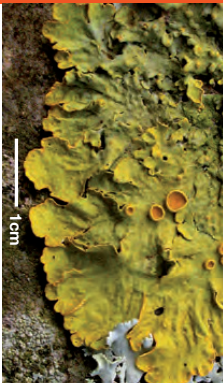
6. *Parmelia*



- lobes grey on top, dark brown below
- lobes thin, loosely attached to the bark
- pattern of white lines on the surface



7. *Leafy Xanthoria*



- lobes yellow/orange to greenish yellow
- lobes broad, spreading
- a few orange fruiting bodies present



8. *Cushion Xanthoria*



- lobes yellow to green-grey
- lobes small and clustered
- many orange fruiting bodies present



9. *Physcia*



- lobes grey on top, whitish below
- lobe ends raised up becoming powdery
- black-tipped whiskers on the lobe edges



Lichen Monitoring Sheet

School: _____ Date: _____ Time: _____

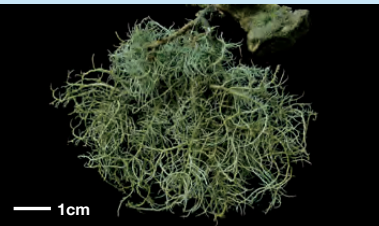

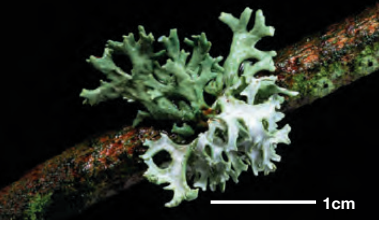



Location: _____ Weather: _____

Names of champions/participants: _____

A lichen is made up of two organisms living together: a fungus and an alga. Lichens usually attach themselves to trees, but they can also be found on other surfaces. So what kind of air do they like?

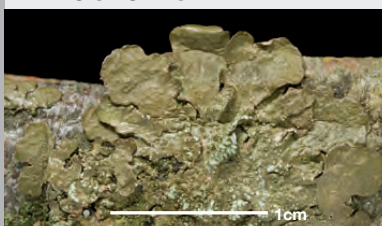
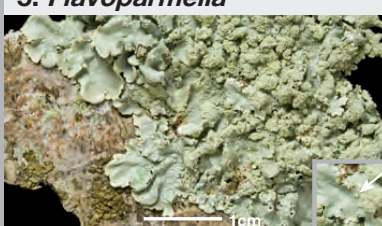
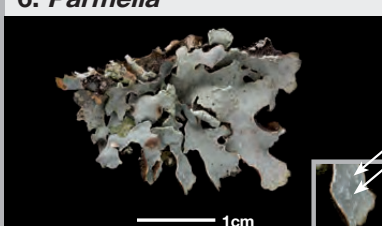
- Nitrogen-sensitive lichens only live in clean air
- Nitrogen-loving lichens can live in dirty air
- Some Lichens are not affected by air quality and can live anywhere!

You can work out if the air is polluted by looking at the types of lichen growing. Different lichen species display different shapes and colours. These pictures and magnifying glasses will help you identify them.

The Clean Team: Nitrogen-sensitive		
Can you find these lichens?	How much area does it cover? (A) small: less than ¼ A4 sheet (B) medium: ¼ up to one A4 sheet (C) large: more than one A4 sheet	How many trees with this lichen did you see?
1. <i>Usnea</i>  Nitrogen-sensitive <ul style="list-style-type: none"> • grey-green all round • branches thread-like 	<p>I have other names: "Tree Moss" and "Beard Moss"</p>	
2. <i>Evernia</i>  Nitrogen-sensitive <ul style="list-style-type: none"> • grey-green on top, white below • lobes flattened, strap-like 	<p>You can call me "Oak Moss"! I can be used to make perfumes</p>	
3. <i>Hypogymnia</i>  Nitrogen-sensitive <ul style="list-style-type: none"> • lobes greyish on top, pale brown below • lobes puffed up and hollow • lobe ends often become powdery 	<p>My nickname is "Tube Lichen"!</p>	

Air quality makes no difference to us. We're happy anywhere.

The Grow-Anywhere Gang: Intermediate

Can you find these lichens?	How much area does it cover? (A) small: less than ¼ A4 sheet (B) medium: ¼ up to one A4 sheet (C) large: more than one A4 sheet	How many trees with this lichen did you see?
<p>4. <i>Melanelixia</i></p>  <ul style="list-style-type: none"> dull brown lobes, closely attached to the bark paler areas show when surface is rubbed 	<p>Some people also call me "Camouflage Lichen"</p>	
<p>5. <i>Flavoparmelia</i></p>  <ul style="list-style-type: none"> broad, apple-green lobes wrinkled surface on which powdery spots may develop 	<p>I am found in the woodland but becoming common in towns!</p>	
<p>6. <i>Parmelia</i></p>  <ul style="list-style-type: none"> lobes grey on top, dark brown below lobes thin, loosely attached to the bark pattern of white lines on the surface 	<p>I am pretty hardy! Bird droppings do not kill me!</p>	

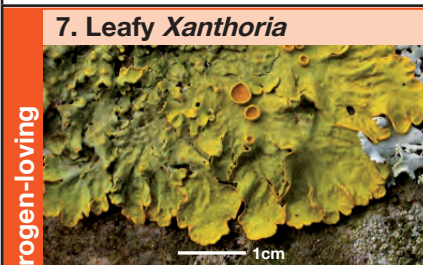
We love dirty air!

The Pollution Gang: Nitrogen Loving

Can you find these lichens?

How much area does it cover?
(A) small: less than $\frac{1}{4}$ A4 sheet
(B) medium: $\frac{1}{4}$ up to one A4 sheet
(C) large: more than one A4 sheet

How many trees with this lichen did you see?



Nitrogen-loving

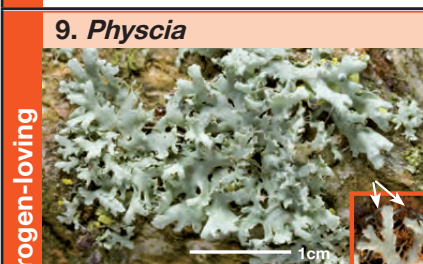
- lobes yellow/orange to greenish yellow
- lobes broad, spreading
- a few orange fruiting bodies present

We have different colours from orange to green!



Nitrogen-loving

- lobes yellow to green-grey
- lobes small and clustered
- many orange fruiting bodies present



Nitrogen-loving

- lobes grey on top, whitish below
- lobe ends raised up becoming powdery
- black-tipped whiskers on the lobe edges

I am popular in big cities and major roads.

B) DIFFUSION TUBE SAMPLES

Suitable for Years: 3-6

Duration of Activity: Depends on the number of participants. A teacher and two pupils working together may take up to two hours to deploy 12 tubes across 12 different sites. After two weeks, collecting tubes may take one hour.

What is it?

Diffusion tubes are primarily used to measure the levels of harmful nitrogen dioxide in the air, by use of a specialised sampling tube. These provide an accurate measurement of levels of certain types of air pollution.

How to use it:

Tubes should be left outdoors on the school site for about two weeks. Children should follow the instructions included in the resources section on how to collect samples, which should then be returned to the supplier for analysis and report. Information can then be used to map out nitrogen dioxide levels around your school. Children will benefit from learning scientific sampling techniques, such as taking data samples along a transect, mapping and analysis of data.

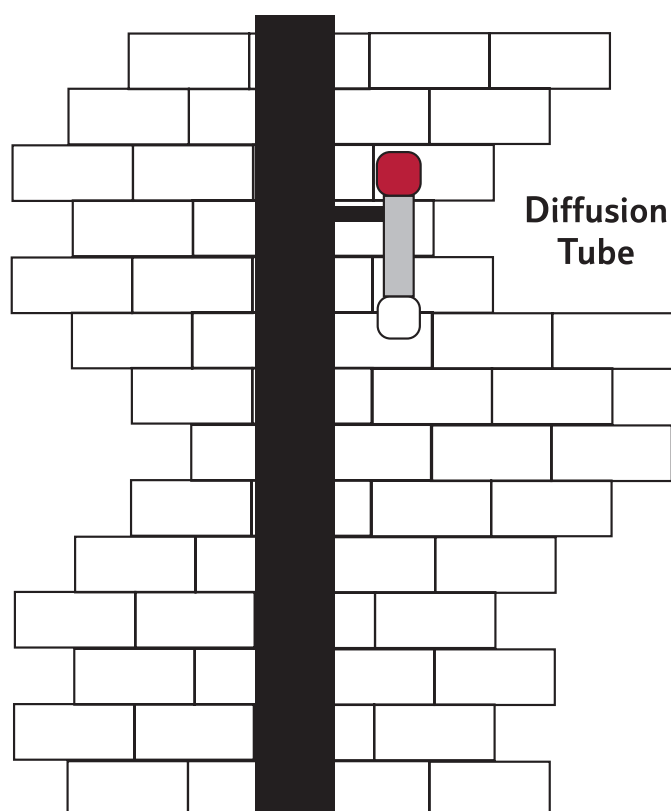
Costs of activity:

Please contact Ipswich Borough Councils air quality officer* via **environmental.health@ipswich.gov.uk** to inform them of when you intend to do this activity, so that diffusion tubes can be ordered.

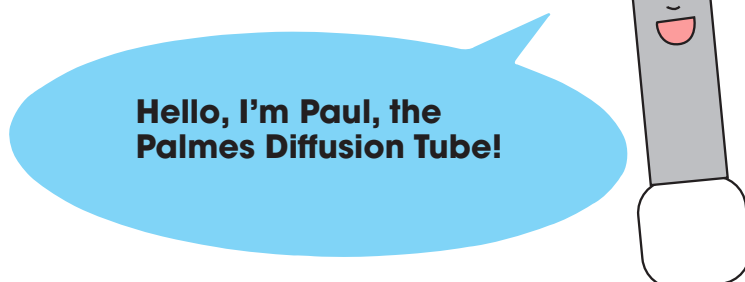
* Activity costs are supported by Ipswich Borough Council only for the schools that are utilising the Air Aware Ipswich Schools Toolkit.

Resources Included:

Diffusion Tube Factsheet
Diffusion Tube Sampling Instructions
Diffusion Tube Record Form



Diffusion Tube Factsheet



About me:

I measure how much of different types of gases there are in the air, but my favourite thing to do is to measure Nitrogen Dioxide (NO_2). If there is a lot of Nitrogen Dioxide in the air it usually means that the air is very polluted. A lot of this pollution is caused by cars, as Nitrogen Dioxide is one of the gases that come out of cars.

How I work:

I have a special steel mesh which is coated in a special chemical, which is hidden under my colour cap (it may be red, grey, or other colours!). When gases pass over this mesh the chemical changes slightly. This chemical change tells us how much Nitrogen Dioxide there is in the air.

How to use me:

The first thing to do is to take off the white plastic cap at the bottom of my tube. After that I need to be left outside, with my black mount stuck to a wall, for about two weeks. I need to have my colour cap pointing towards the sky; otherwise I will fill up with water if it rains. After two weeks I will have measured the gases in the air, the lab will analyse me and tell you if the amount of Nitrogen Dioxide is safe or dangerous to your health.

Top Tips:

You need to be careful where you put me as I can't measure gases well if I'm in a windy spot.

Don't put me in a doorway or hole in a wall because I won't be able to reach the air.

It's a good idea to write down what the weather is like when I'm outside because this can affect how much Nitrogen Dioxide I can reach.

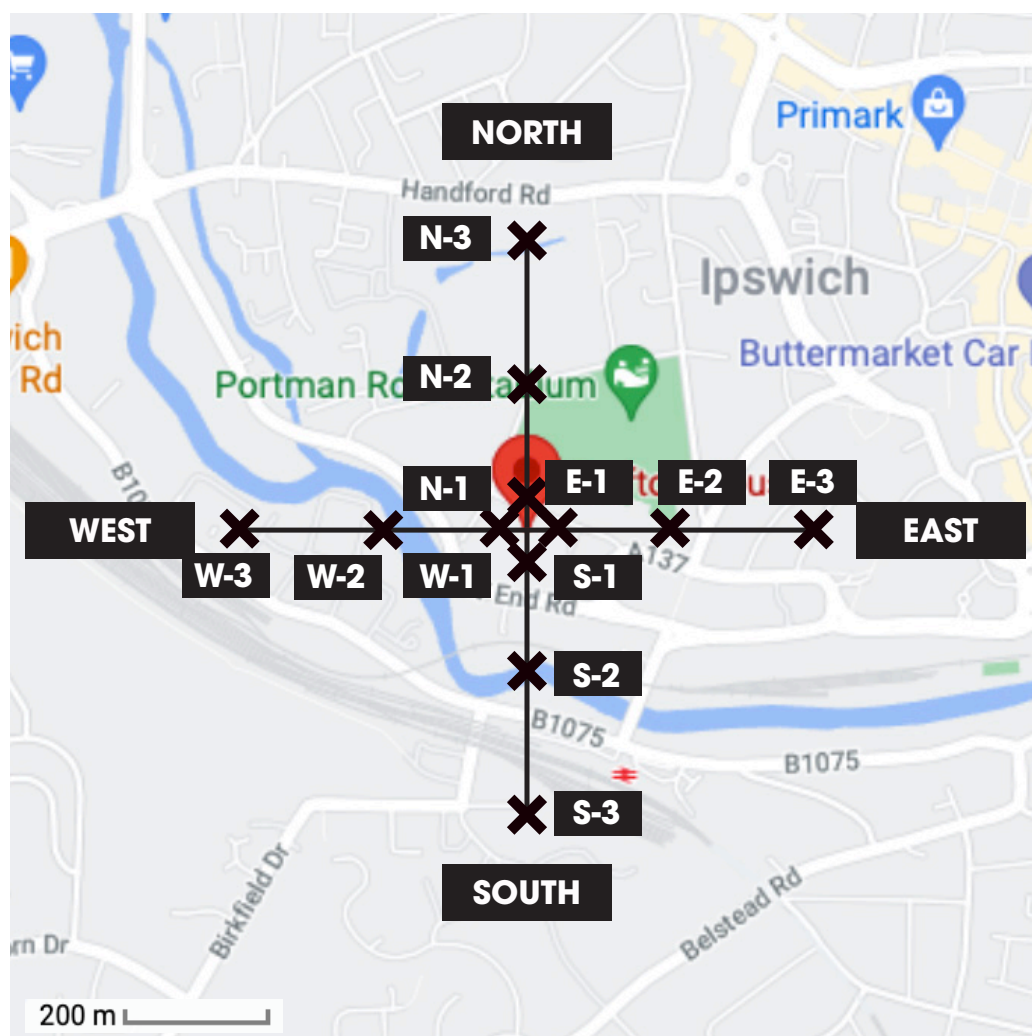
Diffusion Tube Sampling Instructions

What you will need:

- 13 Diffusion tubes (12 sampling tubes and 1 control tube)
- 13 black plastic diffusion tube mounts
- 4 record forms
- Map of your school neighbourhood. The map should have your school in the middle and cover 400m toward North, South, East and West.
- Ruler
- Pencil
- Re-sealable plastic bag
- Permanent marker pen to label tubes

Where to put your tubes:

Take your map and, using your ruler, draw four lines pointing North, South, East and West. These sampling lines should cross over with your school in the middle, just like the picture below. Looking at the scale at the bottom of the map you can see these lines cover 400m on the ground.



Diffusion Tube Instructions page 2

On each of your lines draw three crosses. The first cross will be in your school building or the street next to your school. The next two crosses are 200m and 400m away from your school. These crosses show you where you will need to put your diffusion tubes.

- 1:** On each line, number the crosses 1, 2 and 3 with number 1 closest to your school, number 2 in the middle (200 away from your school), and number 3 the furthest (400m away from your school).
- 2:** Write your name, today's date and the name of your school at the top of your sampling sheet. Write your name and the name of your sampling line (North, South, East or West) on your plastic bag. When you collect your tubes in two/three weeks' time, you will put them into this bag.
- 3:** Circle the name of your sampling line (North, South, East or West) at the top of your sampling record sheet.
- 4:** Take three of your tubes and a waterproof marker pen. Write the name of your sampling line (N,S,E or W) and the tube number 1, 2 and 3 on their \ colour caps. These will be your "sampling tubes". On your record sheet write the six digit ID number found on each tube, in the box that has the same number as the colour lid.
- 5:** Take your map, sampling sheet, and diffusion tubes and walk north to cross 1 on your sampling line.
- 6:** When you get to your first site, look for a good place to put your diffusion tubes. Remember! Your site needs to be:
 - a:** Not covered by trees, bushes or other plants
 - b:** On an open wall

You might be able to minimise the risk of the tubes going missing by trying to site them in locations that you know (i.e. neighbours' walls, other schools etc), or by placing them up to 3 meters high.

- 7:** When you have picked a good place to put your tubes, measure between 2-3 meters from the ground and mark a point on the wall. This is where you will put your first diffusion tube!

The picture shows the first sampling tube and the control tube in place on the school ground.

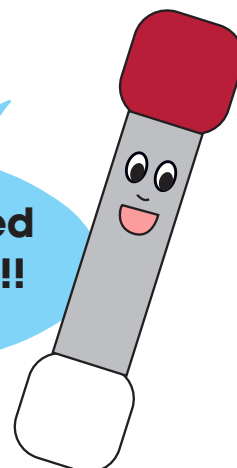


Diffusion Tube Instructions page 3

Putting your tubes up

- 8:** Take your tubes and put them into black plastic wall mounts. Peel the tape off the back of the mounts and stick them onto the wall.
- 9:** Write what time it is on your sampling sheet under "time cap removed", and then remove the white plastic cap on the bottom of the sampling tube with N-1 written on it. Put the white plastic cap in your plastic bag.
- 10:** When you have done this spend 5 minutes making some notes about the area around your sampling site in the box labelled 'Site Characteristics'.
 - a:** Are you near a main road?
 - b:** Are there any trees nearby?
 - c:** Is there a crossing near your tubes?
 - d:** Is there a car-park nearby?
 - e:** Write as much as you can because this will help you work out why pollution levels might be different later on.
- 11:** Go to your next sampling point and repeat steps 8 to 11 with your tube labelled 'N-2', making notes in the boxes for 'Sample Site 2'.
- 12:** Move onto your third and final sampling point and repeat steps 8 to 11 with the tube labelled 'N-3', writing your notes in the boxes for 'Sample Site 3'.
- 13:** Repeat the process for the three other directions (East South and West).
- 14:** Prepare the control tube, and put it up in the same way as the other tubes. Locate it somewhere in the school site, such as in your classroom or next to another tube in the school grounds. Do not remove either cap from the control tube.
- 15:** Check that you've done everything correctly and give your sampling sheet and map back to your teacher. Everyone's information is very important so we need to make sure it has all been collected the same way.

**Well done! You have started
your pollution monitoring!!!**



Diffusion Tube Instructions page 4

Collecting your tubes

- 16:** After two weeks, go back to where you placed your tubes.
- 17:** When you get to your first sampling site check that your open sampling tube is still there. Have they been damaged at all? Has anything in the area changed? Write down anything that you think is interesting in the box on your sampling sheet labelled 'Tube condition'.
- 18:** Remove the open diffusion tube from where you stuck it, and put the white plastic lid back on the sampling tube, and place it back into the bag. Check the date and time and write this in the 'date and time cap replaced' box for this tube on your sampling sheet.
- 19:** Walk along to your next sampling site and repeat steps 16 to 18.
- 20:** Next, move to your last sampling site and repeat steps 16 to 18.
- 21:** Repeat for each sampling line (North, South, East and West), until all tubes are collected.
- 22:** When you get back to school, work out how many hours each of your tubes was outside for. Your teacher can help you with this. Write the \ number of hours the tubes at each sampling site were outside in the box 'Hours tubes outside for'.
- 23:** Once at school, take down your sealed control tube and check that it \ doesn't have any cracks. If it does, make sure that you write these down in the 'Tube conditions' box on your sampling sheet. Then, put your sealed control tube into your plastic bag.
- 24:** Make sure you check over all of your notes with your teacher and get them to check that everything is correct! We don't want any little mistakes to mess up your results!
- 25:** Once you have collected all the tubes, and made sure all the plastic lids were correctly inserted, preventing the exposure of the tube's interior to air, you are ready to send the tubes to the lab for analysis. Please discuss this step with the Air Quality officer. They will be able to give you the address where to send the tubes to.

Congratulations! You are all finished!

Now you just have to wait to get your results back and look over them with your class.



Diffusion Tube Record Form

Name: _____ **School:** _____ **Date:** _____

North Line				
Sampling Tube N-1	Tube ID Number	Date & Time Cap Removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics (building/road works/traffic diversions)		Tube condition (Dirt? Insects? Fallen?) Has anything changed in the area?	
Sampling Tube N-2	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
Sampling Tube N-3	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
South Line				
Sampling Tube S-1	Tube ID Number	Date & Time Cap Removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics (building/road works/traffic diversions)		Tube condition (Dirt? Insects? Fallen?) Has anything changed in the area?	
Sampling Tube S-2	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
Sampling Tube S-3	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	

East Line				
Sampling Tube E-1	Tube ID Number	Date & Time Cap Removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics (building/road works/traffic diversions)		Tube condition (Dirt? Insects? Fallen?) Has anything changed in the area?	
Sampling Tube E-2	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
Sampling Tube E-3	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
West Line				
Sampling Tube W-1	Tube ID Number	Date & Time Cap Removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics (building/road works/traffic diversions)		Tube condition (Dirt? Insects? Fallen?) Has anything changed in the area?	
Sampling Tube W-2	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
Sampling Tube W-3	Tube ID Number	Date and Time cap removed	Date and Time cap replaced and tube collected	Hours Tube outside for
	Site characteristics		Tube condition	
Control Tube	Tube ID Number	Site characteristics		Tube condition

C) SURFACE WIPE ANALYSIS

Suitable for Years: 3-6

Duration of Activity: 1 Hour

What is it?

Surface wipe analysis is a cost-effective and easy way to identify levels of particulate matter, specifically in relation to their concentrations at different heights and locations.

How to use it:

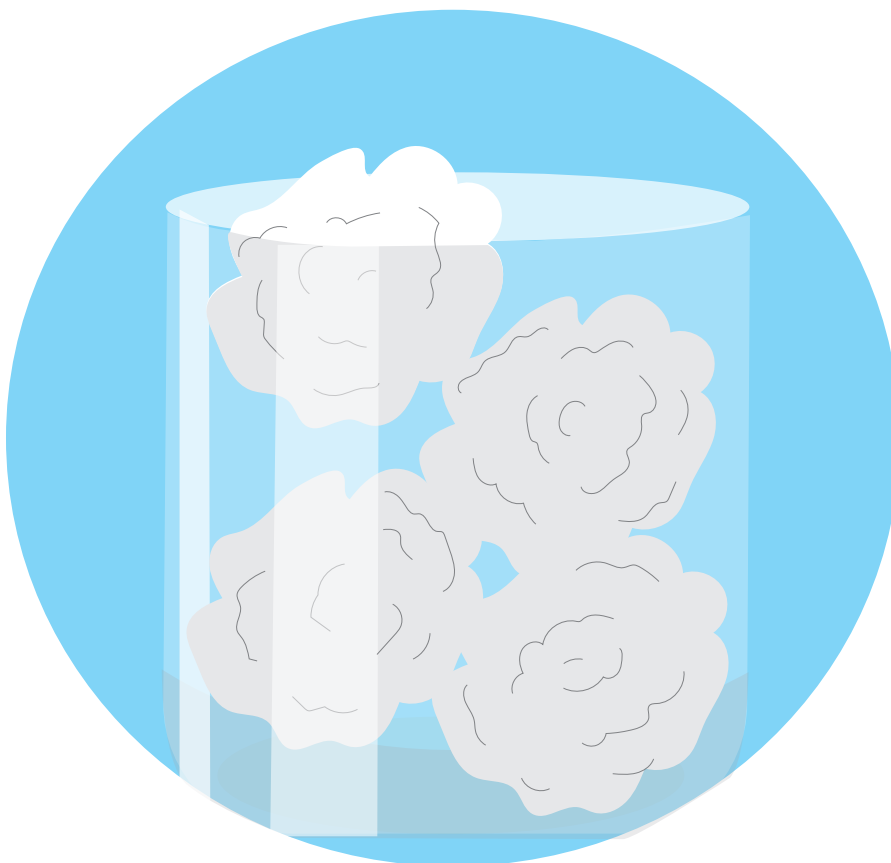
Surface wipe analysis uses a piece of sticky tape or moist cotton wool ball to sample the particulate matter that is deposited on surfaces. You can use this technique to sample the deposition of particulate matter on surfaces in different locations, or at different heights. You can sample a range of surfaces using this technique including, leaves on trees, poles, walls or doors around school. Your sample provides an immediate visual indication of levels of pollution. It is also useful to explore how levels of pollution may vary depending on height and distance from roads. Greater concentrations of particulate matter at lower levels pose a greater risk to children.

Costs of activity:

Costs for this activity are minimal, requiring only cotton balls or sticky tape, to wipe surfaces.

Resources Included:

Surface Wipe Instructions
Surface Wipe Record Form



Surface Wipe Instructions

What is it?

Surface wipe analysis is an easy way to measure how much particulate matter there is at different locations and different heights.

How to use it:

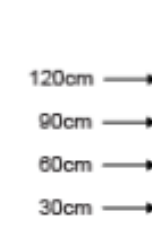
Surface wipe analysis uses a piece of sticky tape or a moist cotton wool ball to sample the particulate matter on surfaces. You can sample lots of surfaces using surface wipe analysis including leaves on trees, poles, walls or doors around school. Your sample will show you how much pollution there is straight away. It is also useful to explore how levels of pollution may be different at different heights and different distances from roads. If there is a lot of pollution at low heights this could be dangerous to children.

What do you need?

- 1:** 2cm wide clear sticky tape or cotton wool balls
- 2:** A tape measure at least 120 cm long

Sampling steps:


- 1:** Find the surfaces you want to measure (tip: avoid wet surfaces). We suggest three different surfaces: a door inside school, a wall outside school, and a pole of street/traffic sign.
- 2:** Use the tape measure to identify four spots at different heights: 120cm, 90cm, 60cm and 30cm.
- 3:** For sticky tape - cut the clear tape into 10cm strips. Press the sticky side of the tape firmly onto the surface, leave for 10 seconds and then remove it. For cotton wool - dampen a cotton wool ball in a little water and wipe over a small area (about 10cm by 2cm)
- 4:** Dirt and pollutants from the surface will have stuck to the tape or ball. Paste the tape or ball on the record sheet.
- 5:** Repeat the steps above, and then compare the levels of pollution at different heights from the same surface.
- 6:** Mark the pollution level from 1 to 4: 1 for the dirtiest sample and four for the cleanest sample. Could you tell if lower or higher heights are more polluted?
- 7:** Repeat steps 1 to 6 for two other surfaces. Can you tell which surface is more polluted?



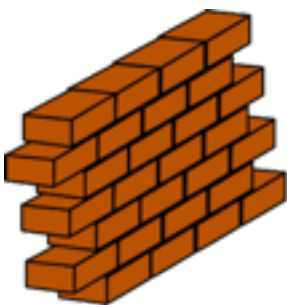
Surface Wipe Record Form

School: _____ **Date:** _____ **Weather:** _____
Participants: _____


Paste your tape or cotton wool samples below. Can you see the differences between them? Try to compare the samples and mark their levels of pollution: 1 for the dirtiest sample, 4 is the cleanest sample.

Location 1: Door inside school			
Surface Details	Height	Paste your samples here!	Level 1 to 4
	120cm		
	90cm		
	60cm		
	30cm		

Surface Wipe Record Form

Location 2: Wall outside school			
Surface Details	Height	Paste your samples here!	Level 1 to 4
	120cm		
	90cm		
	60cm		
	30cm		

Surface Wipe Record Form

Location 3: Pole of street/traffic sign			
Surface Details	Height	Paste your samples here!	Level 1 to 4
	120cm		
	90cm		
	60cm		
	30cm		

D) RUNNING CAMPAIGNS IN SCHOOL

There are a number of social marketing activities, designed to increase engagement and awareness of issues surrounding air quality which have proved successful in schools. Examples include:

Plays - these have been successful in several schools to promote green issues and sustainable transport in an easily accessible way to all ages. This can be especially useful to engage parents and increase awareness amongst them of their children's and school's endeavours. This has also been used as a successful method for fundraising, charging a nominal admission fee to parents and the community to attend.

Assemblies – these can be delivered by a class or teachers to easily explain to the school community the efforts and activities designed to investigate and improve air quality. Some school events, such as cultural day, coffee mornings, and parents evening, are good opportunities to approach parents and raise their awareness of air quality. Ipswich Borough Council have produced a 5-minute video on air quality that can be played an assembly: <https://www.youtube.com/watch?v=GPwNo9XDfHQ>

Electing Air Quality Champions – pupils, teachers, parents and school governors can make up an Air Quality team, who will drive forward activities designed to investigate and improve air quality around school. The pupil members of air quality team should be gender-balanced and across different classes.

Idling Surveys/ Travel Questionnaires/ Anti-idling Events – surveys used in conjunction with School Travel Plans to investigate levels of idling cars outside of school, as well as most common methods of travel currently being used in schools. Your school may wish to log all the activities being carried out with Modeshift STARS, where your school can receive a nationally recognised accreditation for your hard work. Suffolk County Council can set your school up on Modeshift STARS by emailing: **schooltravelplans@suffolk.gov.uk**

Ipswich Borough Council have previously teamed up with Road Safety Officers from Suffolk County Council and run a series of anti-idling events at schools across the Borough as part of the **Suffolk Idling Action Campaign**. Our approach is to invite drivers to join our campaign and switch off their engines when parked. When approached in a friendly way, the majority of drivers switch off when asked, and many pledge to give up the idling habit for good.



If your school would like officers help you deliver an anti-idling event, please get in touch: **environmental.health@ipswich.gov.uk**

Your school may also wish to set up a Junior Road Safety Officer scheme if you do not already have one. Suffolk County Councils Road Safety officers can deliver road safety talks within your school and Bikeability training. More information can be found on the Suffolk Roadsafes website: <https://suffolkroadsafe.com/>

Resources Included:

Idling Survey Instructions
Idling Survey Record Form
Travel questionnaire

Peppered Moth Pledges - the Peppered Moth is a good case study that teaches students about air quality and air pollution. Story-telling or competitions about peppered moth can be used in conjunction with School Travel Plans to commit to more sustainable forms of travel into school.

Resources Included:

Peppered Moth Activity Sheet
Peppered Moth Pledges Sheet



Idling Survey Instructions

Is car idling contributing to air pollution around your school?

What is idling?

When people leave their car engine running while they have stopped, this is called 'idling'. A car is 'idling' if it has been left running for over one minute after stopping or parking.

Idling can cause pollution around school when parents pick up or drop off children. Their cars cough out dirty, smelly fumes. Yuck!

How do we monitor idling?

To work out if idling is causing pollution around your school, you can count the number of parents' cars outside your school that are idling.

It's best to count parents cars idling during the busy time in the morning before school starts and again in the afternoon when school ends. For example, if your school starts at 9:00 and ends at 3:30, you should do the survey from 8:30 - 9:00am and 3:15 - 3:45pm, because parents may come earlier to drop off or wait for their children.

Choose to do your idling survey on a day when most pupils leave school around the same time. Your teacher will send you, in groups, to a location beside the road near your school where parents drop off their children.

Instructions

Fill out the form on the next page with your name, the date, and your location. You will be counting cars in two 15 minute blocks. Follow the steps below so we can compare everyone's results later on.

- 1:** In a group of three, choose who you will be:
 - **Champion 1 Observer:** spot and identify parents' cars
 - **Champion 2 Timer:** time how long parents' cars are left idling
 - **Champion 3 Recorder:** record the number of cars idling and not idling
- 2:** What is the time? Write the time in the column 'Start Time' (e.g. 8:30am). What time should you stop counting cars? The Timer should make sure that you stop counting cars after 15 minutes.
- 3:** The Observer looks for parents' cars that are idling and not idling and tells the Timer.
- 4:** The Timer uses a stop watch to time if cars have been idling for at least one minute.
- 5:** The Recorder puts one dash in the column 'Number of cars idling' every time the Observer and the Timer find an idling car, and one dash in the column 'Number of cars not idling' every time the Observer spots a parked car that is not idling.

- 6:** At the end of 15 minutes, the Timer tells the Observer to stop counting and the Recorder writes the finish time in the column 'End Time' (e.g. 8:45 am). Add up the number of cars idling and not idling and record this in the 'total' column.
- 7:** After a 1 minute break, you can swap jobs. Repeat steps 1-6 and record your findings in the second row.
- 8:** When you finish counting cars for the second time, add up all the cars idling and put this number in the 'total, column on the bottom row. Add up all the cars not idling and put this number in the 'total' column on the bottom row.
- 9:** Repeat steps 1-8 again in the afternoon.
- 10:** At the end of the day, give your record form to your teacher. Do you think idling is a problem at your school? If yes, what can you do about it?



Idling Survey Record Form

School: _____ **Date:** _____
Location/Street: _____ **Supervisor:** _____
Observer: _____ **Timer:** _____ **Recorder:** _____

Morning AM

Session	Start Time	End Time	Number of cars idling	Total	Number of cars not idling	Total
Morning Session 1						
Morning Session 2						
Total number of:			Cars idling:		Cars not idling:	

Afternoon PM

Session	Start Time	End Time	Number of cars idling	Total	Number of cars not idling	Total
Afternoon Session 1						
Afternoon Session 2						
Total number of:			Cars idling:		Cars not idling:	

Travel Questionnaire

Date of survey:

Survey Type (Student, Staff Individual, Staff Collective):

Name of your class (or All of School):

Year Group (or All of School):

Number of pupils absent today:

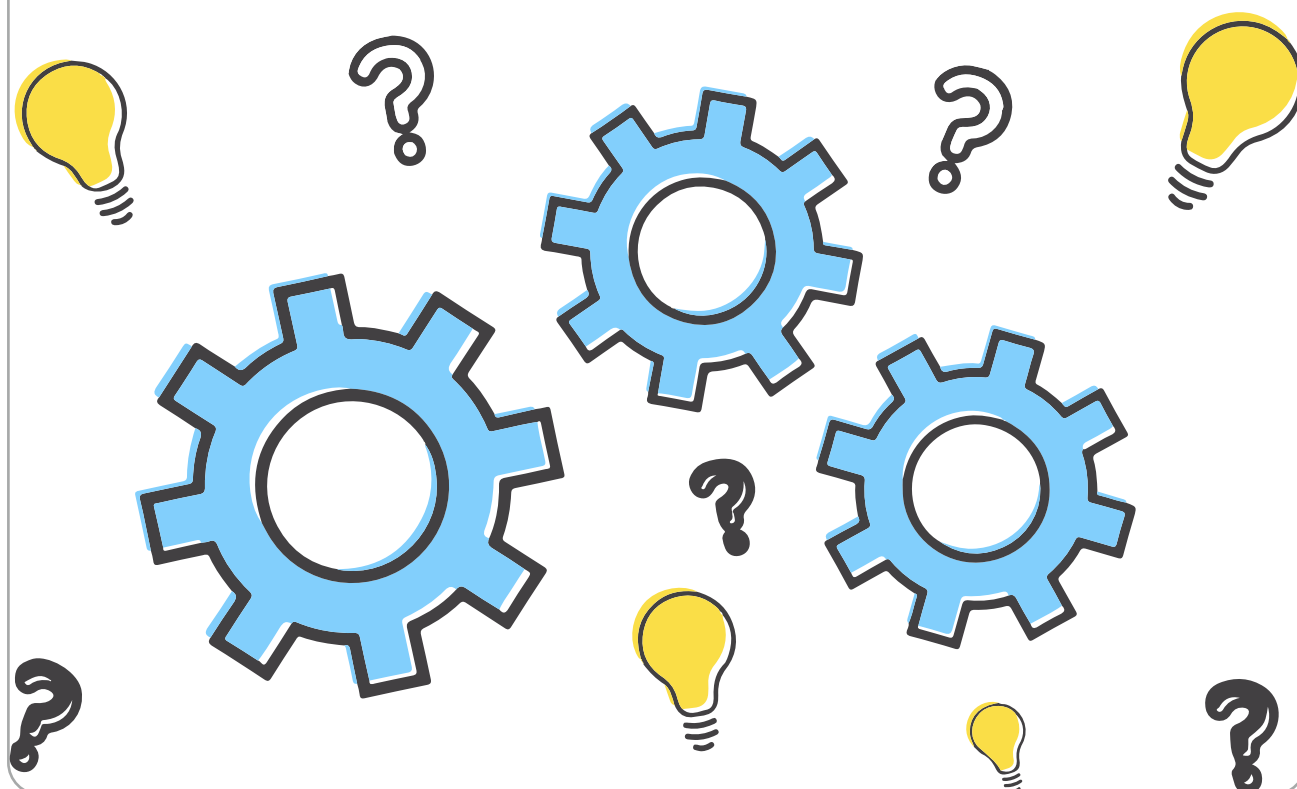
How do you usually travel to school?

Method of travel	Number
Walk	
Cycle	
Scooting/Skating	
Public Bus	
School Bus	
Park & Stride (park at least 5mins away then walk the remainder of the journey) / Walk	
Train	
Car Share	
Car	
Motorbike/Scooter	
Totals:	

How would you most like to travel to school?

Method of travel	Number
Walk	
Cycle	
Scooting/Skating	
Public Bus	
School Bus	
Park & Stride (park at least 5mins away then walk the remainder of the journey) / Walk	
Train	
Car Share	
Car	
Motorbike/Scooter	
Unknown	
Totals:	

Any other comments:



Peppered Moth Activity Sheet

Air pollution affects not only people but also plants and animals. The Peppered Moth is a good example that students can learn air quality and air pollution!



The Peppered Moth

The Peppered Moth is widespread in Britain and Ireland and is frequently found in back gardens. It is one of the best known examples of evolution by natural selection, Darwin's great discovery, and is often referred to as 'Darwin's moth'.

The Peppered Moth and Air Pollution

Peppered Moths are normally white with black speckles across the wings, giving it its name. Originally, the peppered moths wing colours camouflaged them against the light-coloured trees and lichens that they rested on.

However, in the nineteenth century, during the Industrial Revolution in England, widespread pollution killed off lichens and blackened urban tree trunks and walls. Therefore the normal, pale, speckled forms of the Peppered Moth were no longer camouflaged from predators on the soot-blackened trees. Black Peppered Moths thrived in these situations and the normal pale form became rare. Over successive generations, the black moths came to outnumber the pale forms in our towns and cities. In the mid-twentieth century controls were introduced to reduce air pollution and as the air quality improved tree trunks became cleaner and lichen growth increased. As pollution has been greatly reduced, the balance swung back the other way.

Peppered Moth Activities

Fill out the form on the next page with your name, the date, and your location. You will be counting cars in two 15 minute blocks. Follow the steps below so we can compare everyone's results later on.

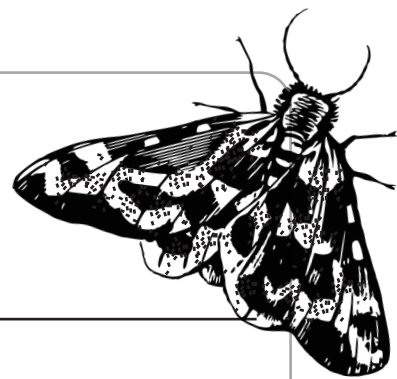
Key Message: White peppered moths indicate less pollution, better air quality. The peppered moth story: Tell students about the story, including the relationship between the moth and air quality, its evolution in UK history.

Observation: Ask pupils if they have seen moths before? Are they peppered moths? What colour are they? Encourage pupils to observe moths in school, gardens, parks, and other places they visit.

Moth competition: It can be an activity to promote sustainable travel. Get your class to draw and cut out a big black moth. Each member of the class can make an air quality pledge e.g. to walk or cycle to school, each morning the class can put a white dot on the black moth if they have done their pledge until covered in white dots. It can be competition between classes in your school, or between groups in one class.

More information about peppered moths: <http://www.mothscount.org/>

Peppered Moth Pledge Sheet



My name is: _____

My pledge to improve air quality is: _____

My name is: _____

My pledge to improve air quality is: _____

My name is: _____

My pledge to improve air quality is: _____

My name is: _____

My pledge to improve air quality is: _____

My name is: _____

My pledge to improve air quality is: _____

My name is: _____

My pledge to improve air quality is: _____



APPENDIX 1: HELPFUL LINKS AND FURTHER RESOURCES

- **DEFRA UK-AIR:** Air Quality Forecasts, current pollution levels and related news and information
<http://uk-air.defra.gov.uk/>
- **Ipswich Borough Council:** Further information on air pollution in Ipswich. Includes details on the Suffolk Idling Action campaign.
<https://www.ipswich.gov.uk/airqualitymanagement>
- **Global Action Plan:** Coordinators of National Clean Air Day. Providers of the Clean Air for Schools Framework, a free, online tool designed to help every school create a tailored clean air action plan to tackle air pollution in and around the school
<https://www.globalactionplan.org.uk/home>
- **Living Streets:** The UK charity for everyday walking. Organisers of the National Walk to School campaign
<https://www.livingstreets.org.uk/>
- **Sustrans:** UK walking and cycling charity and custodian of the National Cycle Network. Organisers of the Big Pedal, the UK's largest inter-school cycling, walking, wheeling and scooting challenge
<https://bigpedal.org.uk/>
- **Modeshift STARS:** Accreditation framework for school travel plans
<https://www.modeshiftstars.org/education/>
- **Suffolk County Council school travel plans:** Information on how school travel plans promote active, safe and sustainable travel to school, plus help and guidance on creating them
<https://www.suffolk.gov.uk/planning-waste-and-environment/planning-and-development-advice/travel-plans/school-travel-plans/>
- **Suffolk Roadsafe:** Advice and guidance on road safety:
<https://suffolkroadsafe.com/>