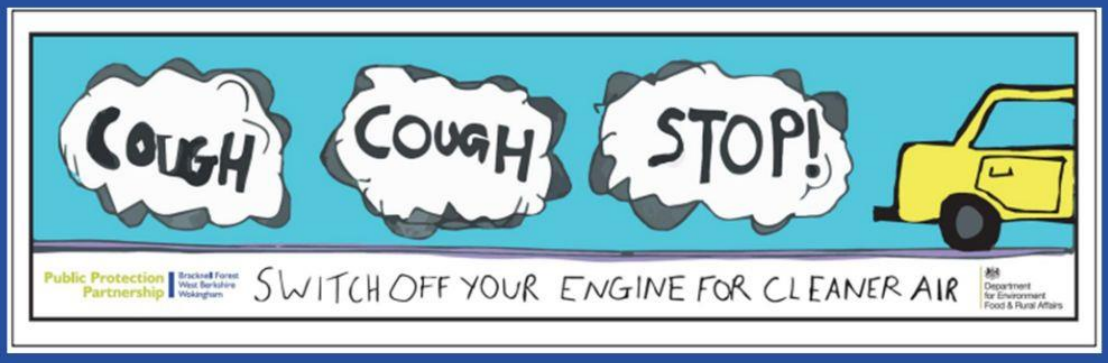
Department for Environment Food & Rural Affairs

Public Protection Partnership | Bracknell Forest West Berkshire Wokingham

The Public Protection Partnership Air Quality School Toolkit



Bracknell Forest Council

West Berkshire Council

Wokingham Borough Council

CONTENTS

1. INTRODUCTION

1.1. WHAT IS THE TOOLKIT FOR?

There is a growing amount of evidence that air pollution is harmful to our health[1]. It has been acknowledged that there are thousands of deaths within the United Kingdom that are linked to poor quality, which is something that affects everyone, not just those in big cities. Clean air is a basic human requirement of a healthy environment for everyone to be able to live in, work and bring up families. In turns poor air quality affects us all.

The most obvious aspect of air quality that affects us, is the impact on our health. Poor air quality affects humans in many ways, with the pollutant type controlling the types of impact. Poor air quality is also linked to:

- Asthma
- Heart disease
- Strokes
- Cancers
- Degrading of the environment we live in

The aim of the below toolkit is to:

- Provide a greater awareness of local air quality and how it affects the people in the area, particularly the school children in your classes.
- Highlight the actions we can take in our daily lives can have and the associated benefits on the air we breathe, which in turn has an impact on our health.
- To influence the students home environments, allowing for a wider population to be reached.

The below toolkit will look to answer the following questions:

- What is air quality?
- What can we do about air quality?
- How is air quality monitored?
- How can behaviour changes benefit the air quality around us?

[1] Chris Whitty, Chief Medical Officer (2022). Chief Medical Officer's Annual Report 2022: Air Pollution [online]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1124738/chief-medical-officers-annual-report-air-pollution-dec-2022.pdf [Accessed: May 2023].

1.2. WHAT ARE THE MAIN POLLUTANTS THAT CONTRIBUTE TO POOR AIR QUALITY?

In the region, the main pollutants to consider are nitrogen dioxide (NO_2) and particulate matter (PM). Particulate matter is classified depending on the size of the particles, with the two main variants being PM_{10} (a diameter of 10 micrometres or smaller) and $PM_{2.5}$ (a diameter of 2.5 micrometres or smaller). Of these, $PM_{2.5}$ is likely to have the biggest impact on human health and there is no known safe lower limit.

NO_2 is formed from combustion processes (such as cars, heating and industry) and exposure to increased levels of NO_2 can lead to the following impacts:

1. Breathing issues: NO_2 irritates the respiratory system, leading to coughing, wheezing, and difficulty breathing. It can also increase the risk of respiratory infections.
2. Asthma attacks: NO_2 can trigger asthma attacks and worsen symptoms in people with asthma.
3. Weakened immune system: NO_2 weakens the immune system, making it harder to fight respiratory infections.
4. Reduced lung function: Long-term exposure to NO_2 can lower lung function and contribute to chronic respiratory conditions.
5. Heart and blood pressure problems: NO_2 exposure is linked to an increased risk of heart attacks, stroke, and high blood pressure.

People who have underlying health conditions are more susceptible to having complications from both short- and long-term exposure to increased levels of NO_2.

As particulate matter refers to inhalable particles and are categorised by their size, it can contain a wide range of particles from many sources aside from those related to combustion. This can include agricultural related emissions, pollen, dust etc. Exposure to particulate matter can have the following health effects:

1. Respiratory problems: Inhaling particulate matter can irritate the respiratory system and cause or worsen symptoms such as coughing, wheezing, and shortness of breath. It can also lead to respiratory infections and aggravate conditions like asthma and bronchitis.
2. Decreased lung function: Prolonged exposure to particulate matter can reduce lung function and contribute to the development of chronic respiratory diseases.
3. Cardiovascular issues: Particulate matter can enter the bloodstream and trigger inflammation, increasing the risk of heart attacks, stroke, and other cardiovascular problems. It can also worsen existing heart conditions.
4. Premature death: Long-term exposure to high levels of particulate matter has been associated with an increased risk of premature death, particularly due to cardiovascular and respiratory diseases.
5. It is worth noting $PM_{2.5}$ can travel further within the body than PM_{10} and is through to be able to enter the brain. While some studies suggest that long-term exposure to $PM_{2.5}$ may contribute to the development of certain types of cancer, the evidence is still evolving, and more research is needed to establish a conclusive link.

ABOUT THE PUBLIC PROTECTION PARTNERSHIP & DEFRA

The Public Protection Partnership (PPP) is a shared service that seeks to deliver Environmental Health, Licensing and Trading Standards across Bracknell Forest Council (BFC), West Berkshire Council (WBC) and the Wokingham Borough Council (WoBC). Recently the PPP was awarded a grant from Defra for spreading awareness of air quality within schools and influencing the behaviours of the residents within the three local authority areas mentioned above.

Public Protection Partnership | Bracknell Forest West Berkshire

Department for Environment Food & Rural Affairs

2. IDLING & COMBATTING IDLING

The purpose of this section is to introduce the concept of idling to learners and to introduce methods to combat idling to the benefit of human health.

Expected learning outcomes:

- Understanding that idling worsens air quality; and
- Actions that can be taken to reduce idling.

2.1. WHAT IS IDLING?

Idling is one of the main sources of air pollution that can be avoidable and that we can do something about, especially around schools and town centres. In its simplest of terms, idling is the "*act of leaving your car engine on, while your car is unmoving and stationary*"[2]. Although idling is not against national legislation, when you're stopped at a light and turn off your engine, you can save fuel and reduce emissions.

- Research has shown that children are exposed to higher doses of pollution especially during school runs (when parents drop off their children and collect them from school)[3].
- Children can also be exposed to higher levels of pollution when they are in the school grounds and playgrounds of a school, especially if a school is near a busy road. Idling cars can cough out dirty, smelly fumes, which may be particularly prevalent around schools when parents drop off their children and collect them.

Idling is a negative activity in the sense that it increases the amount of exhaust fumes in the air. These fumes contain a number of harmful gases which we can not see for the most part and are bad for the environment as well as for our own health.

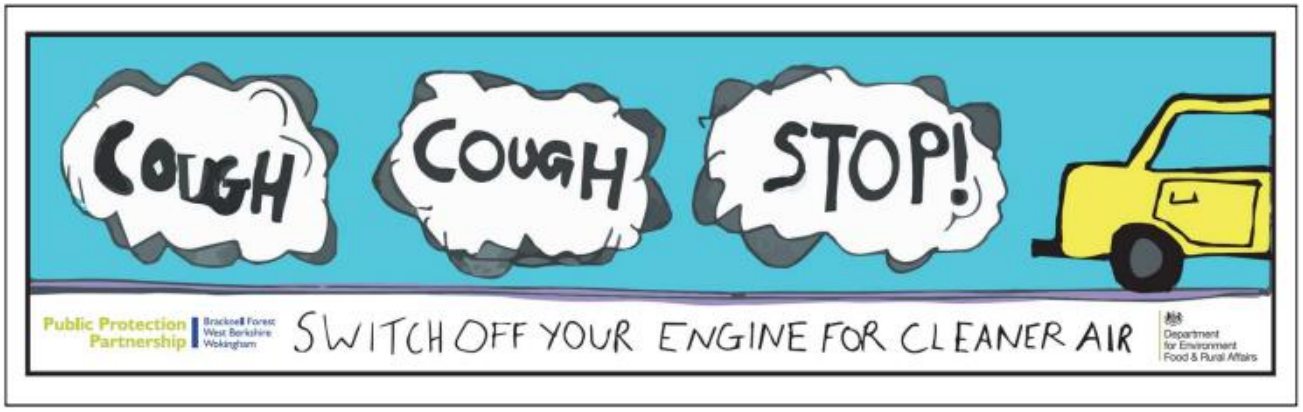
Food for thought: Children, especially young ones are more exposed to the emissions coming out of vehicles due to them being shorter and are closer to the harmful exhausts of vehicles.

Idling fact: A single idling car can release up to 150 balloons worth of harmful chemicals per minute. These chemicals and particulates can then be blown towards people, schools and houses and worsen the air quality. This is an easy way for children to be able to visualise how much fumes comes out of a car that idles.

Drivers are sometimes forced to idle in traffic, but in most situations, idling is not necessary. Idling is normally just a habit that drivers can break, especially when they realize how harmful it can be to health and the environment.

[2] Warrantydirect (2023). Why Should Engine Idling Be Avoided, Will You Be Fined For It And What Can You Do To Avoid It? [online]. Available from: https://www.warrantydirect.co.uk/blog/engine-idling.html [Accessed: May 2023].

[3] UNICEF (2023). The Toxic School Run: How Toxic Air is Putting Childrens Health in Danger [online]. Available from: https://www.unicef.org.uk/publications/the-toxic-school-run/ [Accessed: May 2023].



Source: Bracknell Forest Borough Council (2022). 2022 Air Quality Annual Status Report [online]. Available from: https://publicprotectionpartnership.org.uk/media/2623/bracknell-forest-council-asr-2022.pdf [Accessed: May 2023].

2.2. WHAT CAN BE DONE ABOUT IDLING?

There are several ways that idling can be combatted, suggestions have been made and divided into different categories based on who can influence idling:

BY TEACHERS:

- Organise an 'Anti-Idling campaign' which is especially focused on informing parents dropping off their children at school who will idle their cars when dropping the children off.
- Encourage students to walk, cycle or use a scooter to be able to get to school, in order to reduce the amount of people using their cars to drop their children off at school. Suggest that children can take part in local cycling proficiency courses so that they can learn how to cycle to school.
- Set the example to the children in your classes by saying you turn your car off and that you don't idle yourself.

BY CHILDREN:

- Encourage children to walk to school or ride your bike to school.
- Encourage children to ask parents and carers not to idle their car when they pick you up from school or drop you off from school.
- Encourage the children in your classes to ask their parents about idling and engage with their parents about idling as a way to remind them about idling.
- Walk on the far side of the pavement when walking along busy roads, so that you are further away from vehicles that are releasing emissions as they pass.

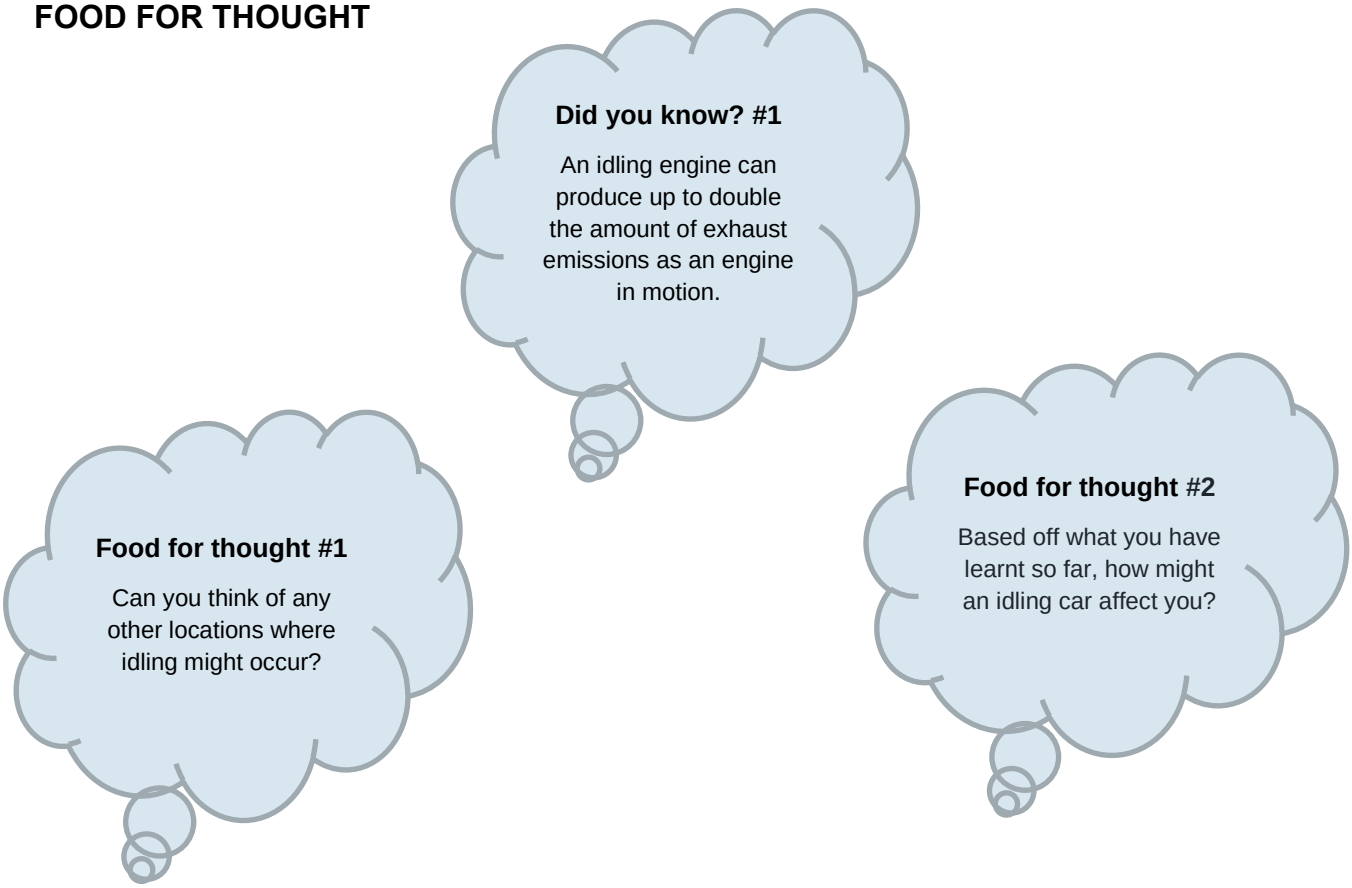
BY PARENTS AND CARERS:

- Suggest to the parents and carers that they can car share to and from school or to events to reduce the emissions created when travelling.
- Remind parents and carers about the benefits of walking/cycling to schools when dropping their children off, this can be done through newsletters of on the school websites.

- Remind parents and carers about the facilities that the school has such as cycle storage where children can safely store their bicycles.
- Encourage parents and carers to turn off their car engines when they are waiting to pick up their children from the school. This is the simplest way to stop idling around the school.

2.3. ACTIVITIES

FOOD FOR THOUGHT



IDLING SURVEYS

This is a type of survey that can be easily carried out by a group of students at your school in the mornings when parents and carers drop off their children or after school. This can be done by taking the following steps:

1. Ask for volunteers within your class to be able to get a team who will carry out the idling survey.
2. Print out an idling survey sheet which the students can use.
3. In the half an hour leading up to the start of the school day or after a school day, go with the survey team to the car park or pick up point of the school so that the survey may be undertaken. Use your watch or phone to time half an hour, which can be used as the time period for the survey to be carried out.
4. Help the survey team to tally up the vehicles that were recorded idling in the area vs. the total number of vehicles that passed by.

5. Ask the survey team to explain the results that they found during the surveys to the class and help to explain the results to the class.
6. This can be taken a step further, by asking the children in your class to create anti-idling posters which can be put up around the school to raise awareness about idling.

Example of what can be used as a Idling Survey:

Vehicle type	 Buses	 All other vehicles
Count Place a ✓ for each one present		
Are they idling? Place a ✓ for each one that is		

Total number of vehicles present		
Total that are idling		

Source: Green Schools. No Idling Toolkit for Schools. Available at: https://greenschoolsireland.org/wp-content/uploads/2018/10/Green-Schools-No-Idling-Toolkit-for-Schools.pdf [Accessed: May 2023].

DESIGNING OF ANTI-IDLING SIGNAGE & DRAWINGS

An easy fun activity that you can undertake with your classes and tell the children in your class that the best posters that get made, can be put up around the school parking lot. The instructions for this activity include:

1. Gather enough A3 pieces of paper or cardboard for the number of children in your class (plus a few spares).
2. Get together different coloured pencils and rulers and other stationary for the children to be able to use.
3. Once you have introduced the children in your class to the concept of idling, ask your children to design their own idling poster which shows the following:
    a. What they think are the sources of idling is.
    b. Ways to stop idling taking place.
    c. Why idling is bad.
    d. To include the school in the poster.
4. Tell them that the best posters within the class can be put up around the school car park and entrances which can help to raise awareness about idling for the school.

The below are a few examples that have been created by children within the PPP in 2020 as part of an anti-idling campaign:

Source: Bracknell Forest Borough Council (2021). 2021 Air Quality Annual Status Report [online]. Available from: 2021-air-quality-annual-status-report-bracknell-forest.pdf (publicprotectionpartnership.org.uk) [Accessed: May 2023].

Alternatively, you can suggest to your class to create drawings of what they think idling looks like, this could be really useful for younger children? An example of an idling vehicle cartoon can be seen below that can be used.

Source: Dreamstime (2023). *Black brush and ink artistic rough hand drawing of smoke coming from car exhaust into air. Environmental concept of carbon dioxide or CO2 pollution.* Available from: *https://www.dreamstime.com/black-brush-ink-artistic-rough-hand-drawing-smoke-coming-car-exhaust-air-environmental-concept-carbon-dioxide-image132920254 [Accessed: May 2023].*

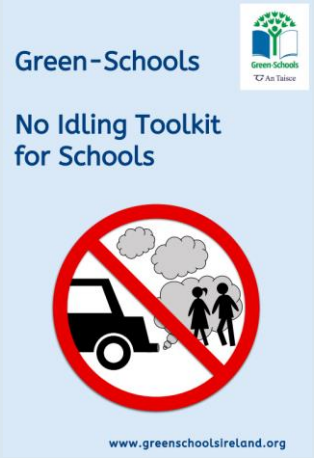
Examples of Existing Anti-Idling Signage

The local councils and the PPP have installed anti-idling signs where the locations have been identified as hotspots for idling around the council. These hotspots include around level crossings and schools in particular. An example of the types of idling signage put up in association with the PPP can be seen below:

- Can any of the children in your classes recognise them?

2.4. ADDITIONAL RESOURCES

Useful Reference	Description & Application
Vehicle Idling at Schools (YouTube Video): https://www.youtube.com/watch?v=FWDOC-QyHrM  Vehicle Idling at Schools: I Turn It Off	The video provides a simple explanation as to what idling is and what influence it has around schools. This can be played to the class when the topic of idling is introduced and will help children to visualise idling as a concept.

Ards and North Down Borough Council: No idling outside our School word search. https://www.ardsandnorthdown.gov.uk/downloads/A4_Word_Search.pdf 	This is a word search that can be printed out for the children in your class and can be handed out for them to complete at the end of the class about idling.
Green-Schools – No Idling Toolkit for Schools PowerPoint Presentation (greenschoolsireland.org) 	This is a comprehensive toolkit compiled by Green-Schools that provides a detailed set of graphics and information about idling and how to combat idling.
PPP Leaflet on Idling: https://publicprotectionpartnership.org.uk/media/2429/air-quality-anti-idling-trifold-leaflet.pdf 	This is a leaflet designed by the PPP that provides a number of facts about idling, the information of which can be incorporated into your class about idling.
Engine Idling – Why its so harmful and what's being done? (Article) https://www.rac.co.uk/drive/advice/emissions/idling/	The article provides some context as to why idling is harmful and what is being done about it, including fines for idling and anti-idling campaigns.

Engine idling - why it's so harmful and what's being done

2.5. LINKS TO CURRICULUM

Subject	Description
English	Speaking and listening; Reading - link reading to own experiences; retrieving and recording information
Science	Identify ways to combat negative impacts on environment; alternative methods for transport – green transport methods
Maths	Counting; identifying and estimating numbers
Geography	Use simple fieldwork to observe, study and explain the immediate environment.
Art	Use drawing, painting and sculpture.

3. MONITORING BEING UNDERTAKEN

The purpose of this section is to introduce to learners the types of monitoring that is undertaken by the local authorities and why it is undertaken.

Expected learning outcomes:

- Promote children's understanding of air quality monitoring is being undertaken around them.
- Promote children's understanding of why it is necessary to monitor air quality levels.

So how do we monitor air quality levels around us?

There are two distinct types of air pollution monitoring which can normally be undertaken, these being:

- Automatic and
- Non-automatic stations.

Automatic monitoring stations are used at a national and regional level while non-automatic monitoring takes place through the form of diffusion tube monitoring.

Diffusion tube monitoring is carried out by each local council within England as a legal requirement and obligation, where each local authority is required to produce an annual report for air quality.

It has become necessary to monitor air quality at a local and a regional level for the following reasons:

- To improve our understanding of air quality within a given area;
- What is influencing the air quality levels and
- Whether the air quality of a given area is improving or getting worse.

The measurements taken are crucial to being able to determine whether the legal objectives for air quality are being met.

- Should recorded concentrations for a specific area be seen to be exceeding the air quality objectives set out, measures and further steps will need to be taken by the different levels of governments to improve the air quality.

3.1. TYPES OF AIR POLLUTION MONITORING

DIFFUSION TUBE MONITORING

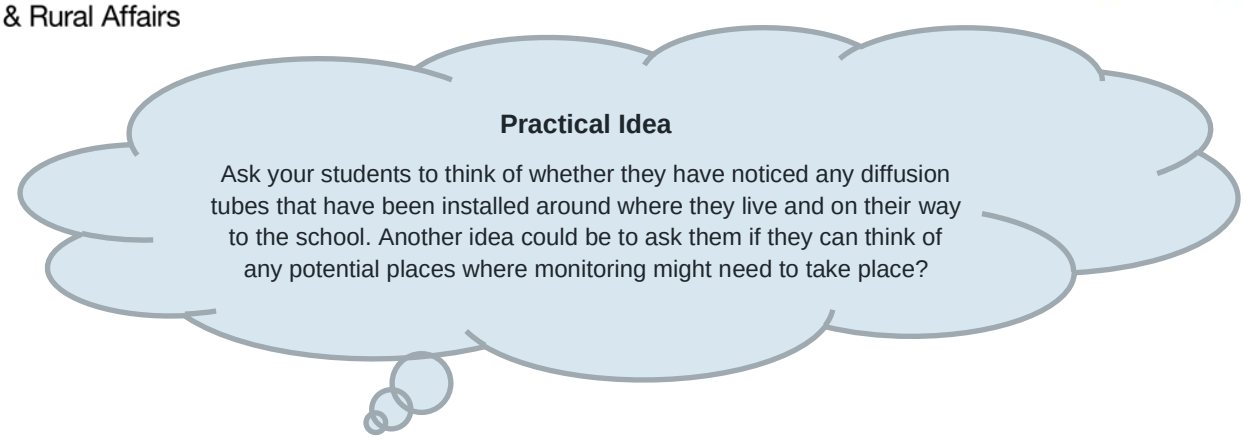
The use of diffusion tube monitoring is the main way that a local authority will set out to measure the nitrogen dioxide (NO_2) in the air along an identified set of roads. The tube itself has steel mesh within the top cap, this mesh is coated with a chemical compound and will be prepared according to a set methodology in a laboratory. When air passes over the mesh within the tube, nitrogen dioxide within the air reacts with the chemical on the mesh.

After about a month worth of monitoring, the diffusion tubes are collected by the local authority or environmental consultants and will be sent to a laboratory to be analysed. This analyse will involve determining how much the chemical composition within the mesh changed over the exposure period and are able to provide an average concentration for the period at the location that the diffusion tube

was exposed at. The diffusion tubes used are able to give an indicative concentration rather than being extremely precise in their design.

Diffusion tubes are handy for the following reasons:

- They are simple in design and are a fairly cheap way to monitor air quality.
- They are able to give an indication of longer-term average nitrogen dioxide concentrations.
- They can be installed where automatic monitoring stations are not feasible or are too expensive.
- To be able to collect a set of air quality concentrations to compare against the appropriate air quality strategy objectives and
- To monitor specific hot spot locations which are seen expected to have high levels of nitrogen dioxide concentrations and to see if strategies that have been put in place to manage air quality are helping to improve the situation.



PARTICULATE MATTER MONITORING

The PPP currently has three automatic monitoring units, one in each local authority area. These measure continuously to provide the nitrogen dioxide readings for the one-hour exposure and annual average exposures. The automatic monitoring station within Bracknell Forest is able to measure the daily and annual average particulate matter (PM_{10}) levels.

In order to get a more focussed set of particulate matter concentrations on schools and areas which are sensitive to high particulate matter levels, the PPP as part of the DEFRA grant, undertook steps to expand the air quality monitoring it undertakes to include $PM_{2.5}$ monitoring. The PPP utilised low cost PM monitors to monitor the concentration of fine PM (particularly $PM_{2.5}$) around a set of identified locations where the PM levels could be at a level above that set by the World Health Organisation and DEFRA. At the moment the local councils within the PPP do not monitor $PM_{2.5}$ within their boundaries and so are reliant on modelled data.

So what is the issue with this and why is it relevant?

- $PM_{2.5}$ is a much smaller pollutant than visible sizes of dust and so is able to reach much deeper into our lungs and body when we breathe.
- By the PPP undertaking this monitoring, the councils can get an indicative concentration of the fine PM levels around 42 schools within the three councils.
- By monitoring small PM levels around sensitive locations, the PPP and the local councils are able to identify where action needs to be taken to decrease the fine PM levels to the benefit of children and everyone else in the towns.

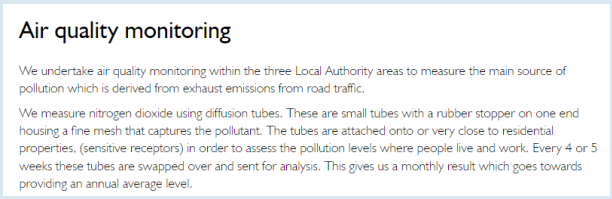
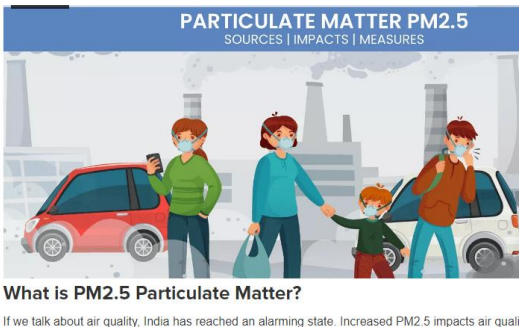
3.2. ACTIVITIES

LICHEN TREASURE HUNT

Lichen are living organisms that are able to provide an indication of how much nitrogen dioxide, which is an emission from the vehicles (that pass us on the roads), there is in the air. The worksheet that has been compiled (attached here) by SusTrans in coordination with the Bournemouth, Christchurch and Poole Council provides a very simple activity that can be carried out by primary school children.

If microscopes and hand lenses are available, it will add a further bit of detail to the children's experience of studying the lichen they are able to find.

3.3. ADDITIONAL RESOURCES

Useful Reference	Description & Application
PPP Air Quality Monitoring https://publicprotectionpartnership.org.uk/environmental-health/air-quality/air-quality-monitoring/  Air quality monitoring We undertake air quality monitoring within the three Local Authority areas to measure the main source of pollution which is derived from exhaust emissions from road traffic. We measure nitrogen dioxide using diffusion tubes. These are small tubes with a rubber stopper on one end housing a fine mesh that captures the pollutant. The tubes are attached onto or very close to residential properties, (sensitive receptors) in order to assess the pollution levels where people live and work. Every 4 or 5 weeks these tubes are swapped over and sent for analysis. This gives us a monthly result which goes towards providing an annual average level.	The website provides an explanation to what monitoring the PPP undertakes and the reasonings for the councils monitoring air quality levels. Within the website there are also links to the annual statement reports that each of the councils produce about the air quality levels within their boundaries.
Prana Air: What is $PM_{2.5}$ Particulate Matter https://www.pranaair.com/blog/particulate-matter-pm-2-5-sources-impacts-measures/  PARTICULATE MATTER PM2.5 SOURCES | IMPACTS | MEASURES What is PM2.5 Particulate Matter? If we talk about air quality, India has reached an alarming state. Increased PM2.5 impacts air quali	This article provides a clear explains what $PM_{2.5}$ and why it is relevant as a pollutant.
Love Clean Air: Diffusion Tubes https://lovecleanair.org/about-air-quality/how-pollutants-measured/diffusion-tubes/#.ZGXjIXbMKUk  Diffusion tubes Diffusion tubes are a cheap and easy way to measure nitrogen dioxide. They are supplied and analysed by laboratories. Councils use them to get an indication of air pollution levels across their borough by putting tubes in lots of different places. Residents and schools also use diffusion tubes for citizen science projects to measure their local air quality. Diffusion tubes are small plastic tubes with a cap at each end one of which is coloured. Under the coloured cap is a steel mesh disc which is coated with triethanolamine (TEA) a chemical that absorbs nitrogen dioxide. When gases pass over this mesh the chemical changes. This	This provides a clear explanation of what diffusion tubes are and why there are utilised for air quality monitoring.

3.4. LINKS TO CURRICULUM

Subject	Description
English	Speaking and listening; Reading - link reading to own experiences; Exploring
Science	Identify and understand methods that are used for environmental monitoring; working scientifically.
Geography	Use simple methods of reasoning to explain environmental issues.

4. LOCAL SOURCES OF AIR POLLUTION

The purpose of this section is to introduce learners to what the local sources of air pollution are that may affect them and those around the school.

Expected learning outcomes:

- Promote children's understanding of source of local air pollution.
- Promote children's understanding of what air quality is.

Ask the children in your class what they think are the biggest sources of pollution that will affect them in their everyday lives?

In the most basic sense of the phrase air quality is:

- the term that is used to describe how polluted the air we breathe is.

The earth is surrounded by an atmosphere, which is a layer of gases. When air pollution occurs, this harms the earth's atmosphere and causes problems for people. Pollution in the air can also get into the ground and water when it rains, harming plants and animals.

When the air quality is poor, it means that there are pollutants in the air that may be hazardous to people, animals and the plants in the area. Bad air quality can most easily affect those with lung (including those who have asthma) or heart conditions as well as children being particularly vulnerable to bad air.

Air pollution as indicated above is when gas, dust, smoke or even smells are introduced into the atmosphere. These then are harmful to us and contribute towards making the air dirty. The main local sources of air pollution are discussed in more detail in the sections to come.

4.1. VEHICLE EMISSIONS

Today when we think of air pollution we should think of **transport…**. In particular, cars. There are estimated to be over 23 million vehicles on the road in the UK. The exhausts from these vehicles can be particularly dangerous for children as their lungs are still developing. Vehicles produce nearly half of all nitrogen oxides as well as emitting large amounts of particulate matter into the atmosphere. Diesel powered engines produce the highest amount of emissions out of all vehicle types.

Did you know? The highest level of pollution are found alongside busy roads within towns and cities.

- When cars, vans or buses burn fuel in their engines to get from place to place, they are releasing dirty air into the atmosphere from the exhaust pipes of the car.

There has been a big move towards electric vehicles within the UK, to try to reduce the number of emissions that are released along road sides. The closer one is to a busy roadway, the higher the levels of pollution are.

4.2. PARTICULATE MATTER

What is particulate matter?

- In its simplest explanation, particulate matter is a term for a mixture of sold particles and liquid droplets found in the air.

The below image helps to illustrate the varying sizes of particulate matter and to show just how small they really are. There are two main fractions (sizes) of particulate matter that can be released into the air. These are PM_{10} and $PM_{2.5}$ where $PM_{2.5}$ is four times smaller than PM_{10}. Some particles such as dust, soot or smoke are large enough to be seen with our own eyes. While others are so small that they can only be seen by using a microscope.

The smaller a PM particle is, the further it can travel into the lungs and may even be transported through the bloodstream once it has entered the body. As PM may contain harmful toxins, it may pose a serious health risk to vulnerable groups of people including children.

Food for thought:

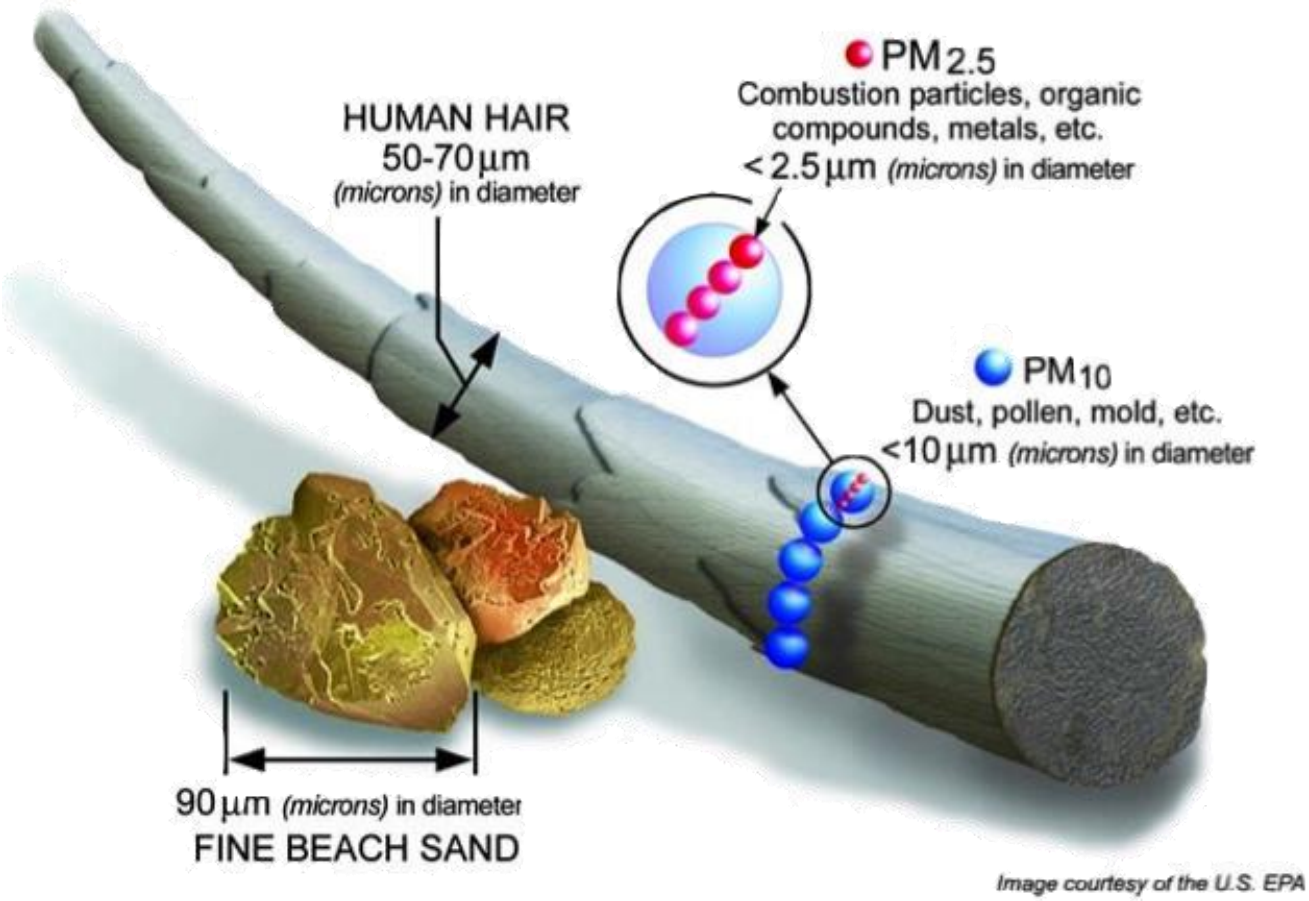
- *Annual emissions of PM_{10} has fallen by 79% since 1970*
- *Annual emissions of $PM_{2.5}$ has fallen by 85% since 1970*

Relevant Local sources of PM include:

- Dust
- Ash
- Pollen
- Vehicle exhaust fumes
- Wear from brake pads of cars and heavy-duty vehicles
- Aerosols

Practical Idea

Ask your students to rub their hair with their fingers and tell them to picture how thick one of their hairs are. Now tell them that their hair is 30 times larger than the largest fine particle that we are exposed to.



Source: United States Environmental Protection Agency (2023). *Particulate Matter (PM) Basics*. Available from: https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM [Accessed: May 2023].

4.3. DOMESTIC POLLUTANTS

A less obvious source of local air pollution is domestic pollutants which accounts for approximately 35% of $PM_{2.5}$ emissions within an urban area. Sources of this will include:

- Aerosols
- Paints and varnishes which give off emissions
- Cigarette smoke
- Gas cookers
- Cleaning products

Even though these are not obvious sources of air pollution, they still contribute to emissions that are released into the atmosphere, especially in a local context.

Logburners

The main pollutant that comes out of burning solid materials like wood is $PM_{2.5}$ which as we have already explored can be particularly dangerous as the small particles are able to penetrate deep into

our lungs. Emissions that have come from domestic wood burning have increased by around 35% in the last decade. So much so that domestic wood burning has become the single biggest sources of $PM_{2.5}$ in the UK and now even exceeds road traffic as a source of $PM_{2.5}$[4].

As indicated earlier in the toolkit, children are more vulnerable to long term exposure effects, with the same being true for long term exposure to $PM_{2.5}$, where children that are continually exposed to sources of $PM_{2.5}$ can be more likely to develop reduced lung function and even develop asthma.

4.4. BONFIRES & FIRES

The burning of bonfires which contains garden waste, plastics rubber and other material including wood in traditional fires produces smoke and other harmful gases contained within the smoke. This is especially true if the bonfire contains man-made goods as the noxious fumes released may contain a range of poisonous compounds.

The term bonfire has come from olden times where people used to burn animal bones, hence the term ‘bonfire’. Making bonfires and barbecues are not illegal… but we must have caution when creating them.

Children such as those in your classes won’t necessarily have control over whether a bonfire or a fire will get made by their parents… BUT children can help to influence the parents through:

- Suggesting that lighter fluids don’t need to be used when creating the fire.
- Extremely large fires don’t need to be made.
- Asking their parents whether fires create emissions that are bad for our health.

[4] Mayor of London (2023). *Guidance for Wood Burning in London* [online]. Available at: https://www.london.gov.uk/programmes-and-strategies/environment-and-climate-change/pollution-and-air-quality/guidance-wood-burning-london#:~:text=Stoves%20and%20fireplaces%3A&text=Ecodesign%20wood%20burning%20stoves%20produce,sale%2C%20produce%203%2C700%20times%20more. [Accessed: May 2023].

4.5. WAYS TO REDUCE POLLUTANTS

With all this being said about air quality and air pollution, there is a lot that we can do as individuals to help improve the air quality around us. What might the ways we can help to improve air quality look like?

FOR TEACHERS:

- Keep learning more about air quality and to stay informed, by using this toolkit you are already contributing to this.
- Initiate air quality projects in your school will help to raise peoples' awareness about the causes and impacts of air pollution.
- Spread the knowledge that you have gained as a teacher to those around you, this is a really important way of improving air quality and will help to make a big difference.
- Enter air quality specific projects to school science fairs.
- Try to increase the number of plants including trees in and around the school grounds, which will act as natural purifiers of the air.
- Champion an environmental team within the school, where you can look to get more cycling storage facilities installed within the school and try to make the school a green area.
- Take charge and lead initiatives within your school especially around clean air day which takes place on the 15th of June each year and world Earth day, which takes place on the 22nd of April.

FOR CHILDREN:

- The easiest way for children to be able to reduce the amount of air pollution they contribute, due to their limited control is to try walk to school or to cycle to school in the mornings and on the way home.
- Get children to try encourage their families to carpool to and from events as a way of reducing emissions from their family car.
- Try to get the children in your classes to encourage their families to use public transport more often.

Source: WizzPopBang (2019). Air Pollution: An Invisible Threat. Available at: https://www.whizzpopbang.com/blog/tag/air-pollution/ [Accessed May 2023].

FOR PARENTS AND CARERS:

- Encourage families to go to community bonfires on the 5th of November (Guy Fawkes Night), rather than lighting their own bonfires at home.
- Encourage families to avoid burning solid fuel (in the form of wood burners) when they make their fires at home especially during winter. One way to do this is in the form of a newsletter from the school as winter approaches when domestic fires are lit more often.

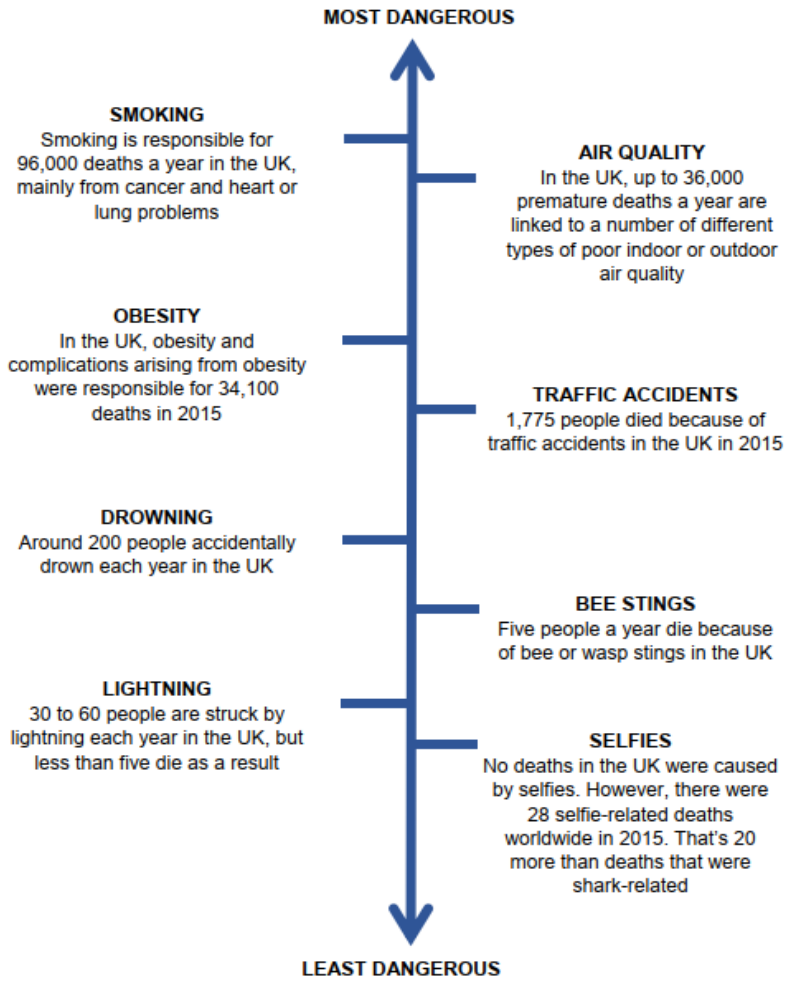
There are many more ways that you as an individual can help to improve air quality. It is important to remember that one person acting alone may have a limited impact but the more people acting together, will have a much larger influence. So it is important to try get as many people as possible to involved in attempts to improve air quality to the benefit of the children in the school itself.

4.6. ACTIVITIES

HIGHER OR LOWER

Tell your class that you are going to play a guessing game. Where the idea is to write the phrase “Air Quality” in the middle of the white board with a vertical line with big arrows above and below the line. Ask the class to raise their hands if they think each of the following hazards are more or less dangerous than poor air quality.

Order the students’ responses on the whiteboard, these can either be grouped or take the majority’s answers. Once you have all eight hazards mapped out you can reveal the real answers.



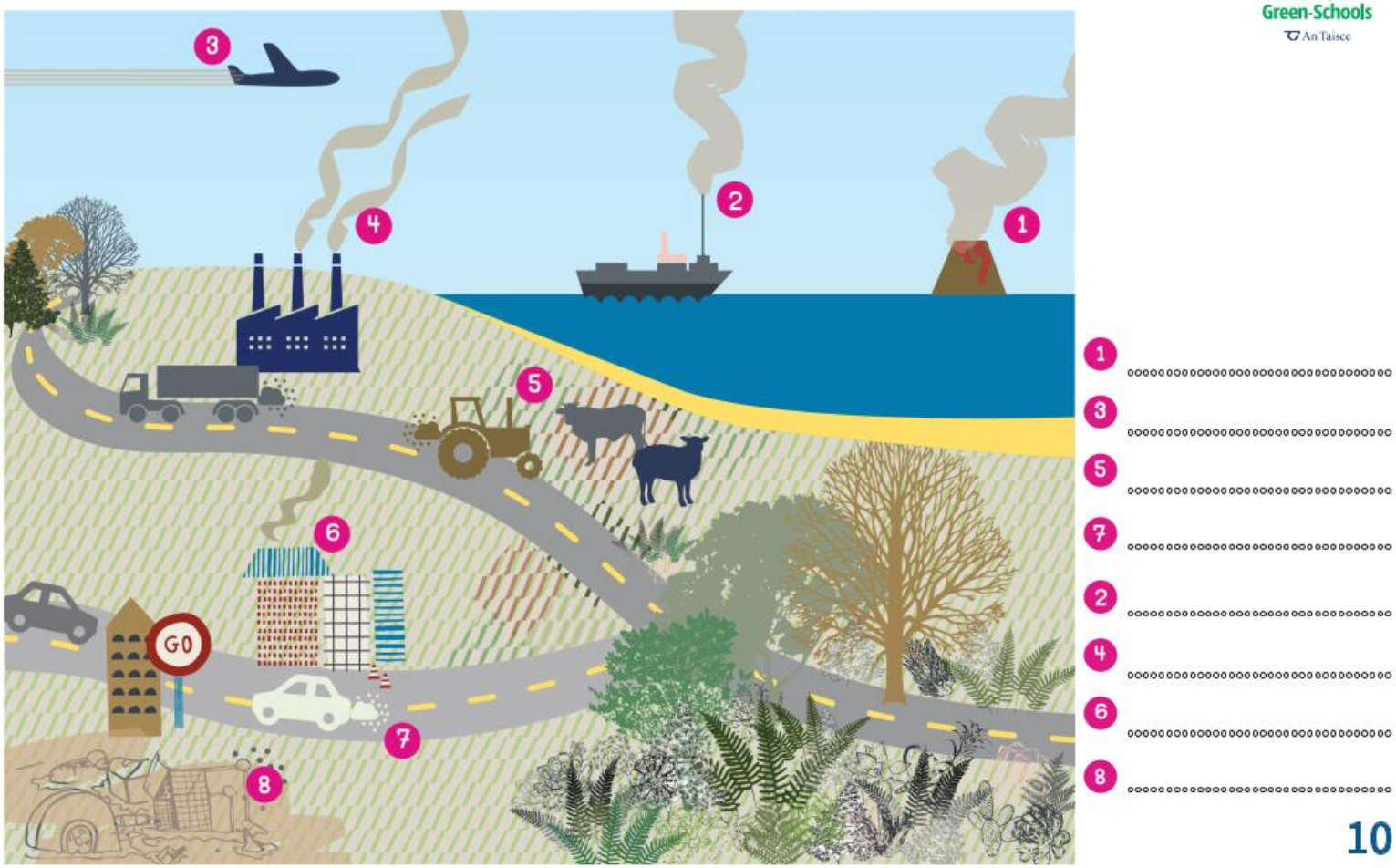
Activity Reflections:

- Did they get the right order?
- Did your class expect air quality so dangerous?
- Were there any surprises?
- Any other thoughts?

Source: London Sustainability Exchange (2023). How Dangerous is Air Pollution? Available from: https://cleanschoolair.files.wordpress.com/2020/11/primary-school-toolkit.pdf [Accessed May 2023].

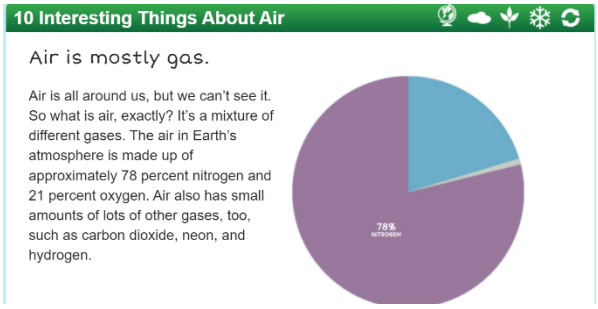
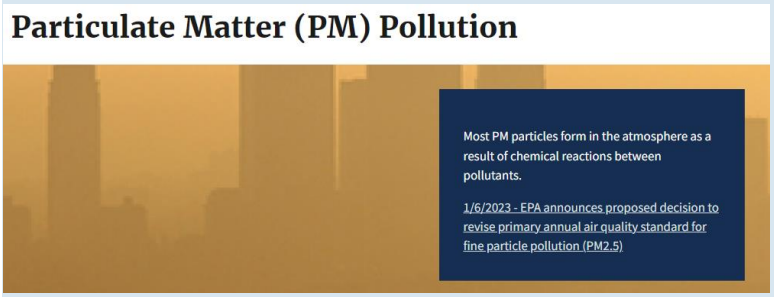
COMPLETE THE PICTURE

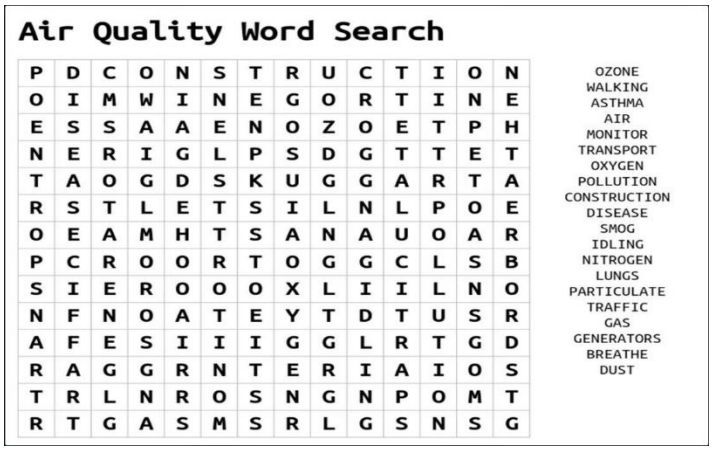
On the next page is a graphic which shows a number of different pollution sources, which contribute towards the air becoming polluted.

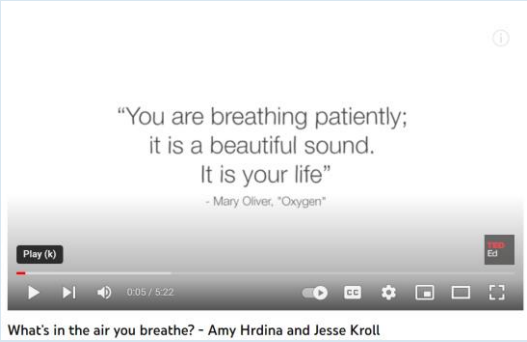


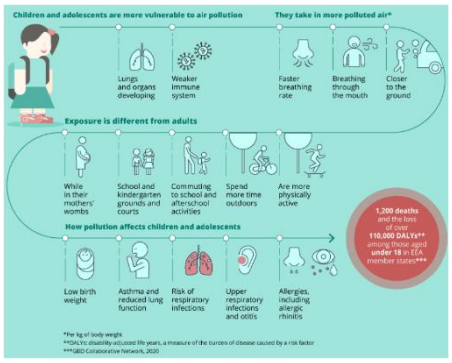
Source: Green Schools Travel (2019). Air Quality Toolkit – Junior. Available from: https://greenschoolsireland.org/new-air-quality-toolkits-launched/ [Accessed: May 2023]

4.7. ADDITIONAL RESOURCES:

Useful Reference	Description & Application
What causes air pollution? (YouTube video) https://www.youtube.com/watch?v=fephtrPt6wk&t=33s 	This is a useful video to explain the sources of air pollution in a simple way that can be incorporated into your class about air quality.
10 Interesting Things About Air: https://climatekids.nasa.gov/10-things-air/ 	The video provides ten interesting facts about air. This can be used after you have introduced what air is to your class.
Particulate Matter Pollution – An explanation from the EPA https://www.epa.gov/pm-pollution 	This is a link to the PM pollution website compiled by the Environmental Protection Agency of the United States. This can be used to gain an understanding of what the effects are from PM pollution and where it comes from. This can then be explained to the children in your classes.

Word Search that can be completed by children during a class: https://blog.cityairapp.com/post/6542418776552734 72/cityair-news-may-2021  **Air Quality Word Search** P D C O N S T R U C T I O N O I M W I N E G O R T I N E E S S A A E N O Z O E T P H N E R I G L P S D G T T E T T A O G D S K U G G A R T A R S T L E T S I L N L P O E O E A M H T S A N A U O A R P C R O O R T O G G C L S B S I E R O O O X L I I L N O N F N O A T E Y T D T U S R A F E S I I I G G L R T G D R A G G R N T E R I A I O S T R L N R O S N G N P O M T R T G A S M S R L G S N S G OZONE WALKING ASTHMA AIR MONITOR TRANSPORT OXYGEN POLLUTION CONSTRUCTION DISEASE SMOG IDLING NITROGEN LUNGS PARTICULATE TRAFFIC GAS GENERATORS BREATHE DUST	This is a simple word search that can be printed out and used at the end of a lesson where children can complete the word search as a fun activity.
Garden Bonfires – Environmental Protection UK https://www.environmental-protection.org.uk/wp-content/uploads/2016/03/garden-bonfires.pdf  **Garden bonfires** **Environmental Protection UK**	This is a document produced by the Environmental Protection UK organization which breaks down the influence of bonfires has and how it contributes to air pollution. This can then be used for your own understanding and then be able to break it down further for the children in your classes.
Pollutionwatch: how bad are bonfires for the environment? https://www.theguardian.com/environment/2021/sep/10/pollutionwatch-bonfires-environment  **Pollutionwatch: how bad are bonfires for the environment?** Councils always get complaints, but scientists have been busily burning leaves in a giant chamber to understand the problem Little is known about the air pollution bonfires cause. Photograph: James Osmond Photography/Alamy	This is a newspaper article that was published by the Guardian, that looks at how bad bonfires are for the environment and for our health. Which can be used as a extra piece of reading, where you can take the information out of it and explain it to your class.

What's in the air you breathe (YouTube Explanation): https://www.youtube.com/watch?v=xEodej_M7TI 	The video provides an overview and explanation of what is in the air we breathe clearly in a video format. This can be shown to the children in your class as a recap of what air is, after you have introduced the previous section.
Air Pollution for Kids: https://www.youtube.com/watch?v=Yjtgu2CxtEk 	The YouTube video breaks down and explains what air pollution is in a simple manner.
Clarity: A Deep Dive on the Health Impacts of Air Pollution https://www.clarity.io/blog/deep-dive-health-impacts-of-air-pollution 	This provides a deeper dive into the health effects of air pollution. Which can be used for your own understanding and then explained in simpler terms to the children in your classes.
Air Pollution and Children's Health	This provides a detailed and illustrative graphic explaining the health effects on children as a result of air pollution. Within the article, there is a lot of additional information on air pollution which can be extremely useful for your own understanding of air pollution.

Air pollution and children's health — European Environment Agency (europa.eu) 	

4.8. CURRICULUM LINKS

Subject	Description
English	Speaking and listening; Reading - link reading to own experiences.
Science	Identify ways to combat negative impacts on environment; alternative methods for transport – green transport methods; classify living things including micro-organisms and working scientifically.
Geography	Using geographic reasoning to be able to determine what types of activities take place in and around you; creating an awareness of the impact of activities