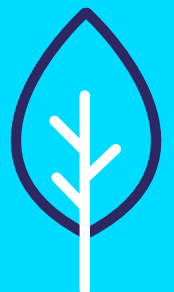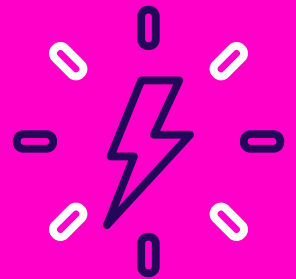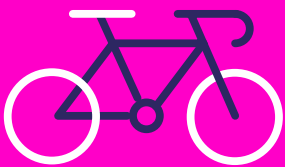**BRITISH COUNCIL**

Schools Connect

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Sustainable cities: clean air

Exploring and tackling air pollution

Sustainable cities and communities: Clean air

Exploring and tackling air pollution through critical thinking and problem solving, and creative collaboration

WHAT YOU WILL FIND HERE

This is a template course to support the development of pupils' core skills such as critical thinking and problem solving, and creative collaboration, while learning about key issues that affect communities around the world.

The course explores the United Nations' Global Goals for Sustainable Development – specifically Goal 11 on Sustainable Cities and Communities, and Target 11.6 on air pollution.

Course materials can be used with or without an overseas partner school, and tips are provided on how best to use the included resources.

*Weisweiler lignite-fired power plant in Germany
(Axel Hartmann, Flickr)*

OVERVIEW

Fossil fuels such as coal, oil, natural gas, petrol and diesel are continuously burned across the globe to generate electricity, heat buildings, drive industry and power combustion engines in various forms of transport, from cars and trucks, to tractors and ocean liners.

As these fossil fuels are burned, they release a complex mixture of solid and liquid particles that are suspended in the air, as well as harmful gases.

Although these particles are mostly invisible to the human eye, their levels in many cities around the world can cause a range of detrimental effects to human health. Air pollution is known to cause respiratory problems, including asthma, and lung and heart diseases, and it can affect human immune systems, especially in children, making us more susceptible to infectious diseases such as pneumonia and influenza.

The World Health Organization (WHO) estimates that outdoor or ambient air pollution causes 4.2 million premature deaths worldwide per year, while 91 per cent of the world's population live in places where WHO air quality guideline levels are not being achieved. In towns and cities around the world, the level of pollutants such as nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter – dust and soot carried on the air – are at dangerous levels.

At national and global levels, governments aim to provide sustainable solutions through legislation and by setting targets. However, citizens and communities, acting at the individual and local levels, are vital in bringing about change.

To see how learning about air pollution through school partnerships can help to raise awareness of the issues, watch this video: https://youtu.be/mGh7Ei_p_X0

Traffic in Nairobi (FIA Foundation/Georgina Goodwin)

LEARNING OBJECTIVES AND CURRICULUM ALIGNMENT

This course is designed to support the development of both knowledge and skills.

Knowledge – focusing on the United Nations' Global Goals for Sustainable Development and, specifically, the causes, consequences and potential solutions for the problem of air pollution.

Skills – core skills such as critical thinking and problem solving, research and investigation, and creative collaboration.

Teachers are encouraged to identify opportunities within their school's curriculum to integrate these knowledge and skills, whether that's through English, Citizenship, Geography, Science, Maths or other subject areas.

Suggested learning objectives:

Critical thinking and problem solving – pupils will develop a good understanding of how pollutants enter the air, the extent of the problem of air pollution and different approaches to tackling the issue.

Creative collaboration – pupils will work in groups on a choice of mini-projects to raise awareness of the problem of air pollution. They will use innovation and problem solving to find a solution. This will involve sharing ideas, selecting useful information, drafting and designing a solution and, lastly, presenting their solution.

PLANNING THE COURSE AND COLLABORATING WITH COLLEAGUES

The following questions can be used to guide you through the planning process and when collaborating with teachers at your school and in partner schools.

1. What do you want your pupils to learn?

2. How will they best learn the information?

3. How will you know what they have learned?

4. What resources do you need?

5. What did pupils learn?

6. What other reflections do you have?

The included learning materials can be adapted to your local learning context and to the specific needs of your pupils. Some learning activities can be left out in order to enable deeper learning through other activities.

AGE RANGE

This course has been designed for ages seven to 11.

TIME

The course equates to five to ten lessons, at one hour per lesson.

Temporary street changes in Bogota, Colombia, make more space for pedestrians (FIA Foundation/NACTO)

LESSON 1

Breaking news: vehicles banned from outside all schools worldwide

Pupils will:

- reflect on the positive and negative impacts of a proposal

- have the opportunity to think more deeply and openly about an issue

- consider an issue within the context of their own lives and how they may be contributing to the problem or even attempting to address it on a daily basis

- think creatively about alternatives

- build, share and reflect on thoughts and feelings about an issue

- collaborate with peers.

STEP 1

1. Introduce the hypothetical statement: 'vehicles banned from outside all schools worldwide.' In pairs, ask pupils to share their initial thoughts with their partner for a minute.

Teacher background information: there are increasing instances of this being actioned on streets around our schools (look at www.livingstreets.org.uk/get-involved/campaign-with-us/safer-routes-to-school). You may wish to share this website once you have completed Step 1 to allow pupils to explore the case studies highlighted. However, in the first instance, this statement is designed to be a stimulus to promote enquiry, creativity and multi-faceted thinking.

An alternative hypothetical statement could be: 'the government has announced that all vehicles in [insert country name] will be electric in one year.' While this goal is in place in the UK, the latest proposal is for it to be implemented by 2035, so, here, the discussion will be largely driven by the extremely tight time constraint of implementing it within one year!

Another alternative statement could be: 'all public transport to be made free.' A case study for this scenario is the French city of Dunkirk (see www. france24.com/en/20190831-france-dunkirk-free-transportation-bus-success-climate-cities). It has also been introduced in Luxembourg (see www.theguardian. com/world/2020/feb/28/luxembourg-public-transport-free-nationwide-congestion).

In all three instances, the aim is to drive pupils' thinking towards the issue of air quality in towns, cities and, in particular, in and around schools. The Every Child's Right to Breathe case study, which focuses on London, can provide you with additional background information to lead and direct any discussions that might arise.

2. Introduce de Bono's Thinking Hats to the pupils as six different ways of thinking about an issue (see slides two to seven in the PowerPoint presentation). These are perhaps best presented using the six headings: Feelings, Facts, Cautions, Benefits, Process and Creativity. Each of these represents a way of structuring our thoughts about the chosen hypothetical statement.

Teacher background information: this video (up to 3:30 minutes) and this video provide a comprehensive overview of the learning strategy and how the metaphorical hats represent different ways of thinking.

a) Split the class into six or more groups (with four to six pupils per group), and hand each group an overview for one of the hats from the PowerPoint presentation. Ask them to consider the statement from the perspective of the hat they have been given, and to collectively note down their thoughts on a large sheet of paper. Ensure that all the pens used on any one sheet are the same colour.

Teacher tip: when allocating the hats, note that the Feelings, Cautions, Benefits and Creativity hats are easier to work with.

b) After seven to eight minutes, ask the groups to swap sheets, so that they are now considering the issue through a different hat. Groups should now add their thoughts to their new sheets, to build on what was recorded by the previous group. Before they start, ensure that they are using a different coloured pen to the previous group, so that there is a way to distinguish what was recorded by the two groups. This makes it possible to discuss the learning process, as well as the content, as the second group will need to think more deeply or laterally to add to the obvious jottings of the first group.

Ideas for collaborating with your partner school

The Thinking Hats and home learning activities offer good opportunities for collaboration, and to understand the similarities and differences between your local contexts.

Thinking Hats activity: to gain a different perspective, share copies of the completed Thinking Hats sheets between schools. Ask pupils to pick out the similarities and differences between the hats.

Home learning activity: create a shared word cloud or poster for each of the four categories. You could use a different provocation to the one used in class, to stimulate broader/deeper thoughts about the issue of air quality.

c) Groups can either swap again to get a new sheet or return to their original sheet to prepare and present a summary of the thinking from that hat to the class. Once all groups have fed back, there may be the opportunity for follow-up activities, such as:

- a discussion/debate around an element of the thinking
- research to gather information
- a survey to create and analyse data
- conversations around weighting and the importance of cautions/benefits
- discussions about perspective (what is positive for some may be negative for others).

STEP 2

1. Set pupils the home learning task to gather an adult's thoughts on the statement they explored in the classroom. They should ask an adult to record their thoughts on four sticky notes (or four squares of paper) with the headers: For, Against, Feelings and Alternatives. These should be returned to class and used as part of a class display. Pupils could also fill in four sticky notes to add to the display.

This task will promote discussion between pupils and a significant adult in their lives on an important issue, starting a dialogue that will hopefully continue throughout the topic.

Pupils in Delhi raise awareness about the importance of clean air (Richard Stanley/FIA Foundation)

LESSON 2

Air pollution: what do we see, think and wonder

Pupils will:

- build connections between their lives, the environment and sustainability

- reflect on what they already know about the causes and effects of air pollution

- have the opportunity to think more deeply and openly by expressing what they wonder about issues

- think about the issues within the context of their own lives, and how they may be contributing to the problem or even attempting to address it on a daily basis

- develop observation and inference skills

- work collaboratively to make decisions.

Child Health Initiative ambassador Zoleka Mandela highlights the importance of the Global Goals for Sustainable Development (FIA Foundation)

STEP 1

1. Ask the pupils: 'why do you think we were thinking about banning vehicles from the streets around schools?' Discuss possible answers, highlighting themes such as health, environment, safety and sustainability. What are their experiences of trying to get to school?

2. Display an image of high levels of air pollution (for example, smog) and place a second version on display paper on a wall. Ask pupils to create a 'See, Think, Wonder' wall display, by filling out what they see, think and wonder about the image on three different coloured sticky notes, or squares of paper, and sticking them around the image.

3. Hold a class discussion, where the pupils spend time exploring the sticky notes and creating a summary for each of the see, think and wonder categories.

STEP 2

1. Introduce the United Nations' Global Goals for Sustainable Development on slide eight of the PowerPoint presentation (or visit www.globalgoals.org for more detail). In pairs or small groups, ask pupils to find out more and to pick out any that might relate to air quality. As a class, discuss the interconnected nature of the world, and note that air quality could easily be discussed as part of a study of a number of the Global Goals, including 3, 4, 7, 9, 11, 12 and 13.

2. Ask the pupils about the things we do that might contribute to air pollution either directly or indirectly?

   Then ask them to play 3-5-7.
   - 3 – ask them to work in pairs and to list **three** things they (their community or even society at large) could 'do less', 'do differently' or 'do better' to help reduce air pollution.
   - 5 – join two to four pairs together and ask them to collaboratively combine, rephrase and rethink their lists to create **five** different ideas.
   - 7 – as a whole class, work together to expand the list to **seven** different ideas.

Example images for the layers of inference activity (available on slides ten to 13 of the PowerPoint presentation)

Clockwise from the top left: air pollution in Taiwan (Flickr/CSL Media); clearing undergrowth in China (Flickr/Nick Hogarth/ CFOR); the view from the Konkan Railway in Maharashtra (Flickr/sandeepachetan.travel.com); a road in Costa Rica (FIA Foundation/Richard Stanley)

3. Explain that over the next few lessons/weeks the focus will be to learn about the causes and effects of air pollution, as well as how the issue might be tackled on a local and global scale.

STEP 3

Prepare an assortment of four to six images depicting air pollution (see example images on slides ten to 13 of the PowerPoint presentation). Try to include some images of your local area or of cities in your country. Also include rural images, where the pollution may be invisible, or linked to agricultural activity).

1. Divide the class into groups of four to six pupils and provide each group with a different image as a stimulus to complete a layers of inference activity. Ask the groups to organise their thoughts about the image using the following four questions.

   • What does this source definitely tell me/us?

   • What can I infer; what guesses can I make?

   • What doesn't the source tell me?

   • What questions do I need to ask?

Example layers of inference diagram (available on slide 14 of the PowerPoint presentation)

The pupils can answer these questions by recording their thoughts within a set of concentric rectangles on a large (A2) sheet of paper (see slide 14 of the PowerPoint presentation), or on four separate sheets if preferred.

2. Share the thoughts of each group, and guide the pupils in offering precise observations and well-reasoned inferences, alongside interesting investigative questions. Look at some of the other images that have been prepared.

Reflect on this

Voice, Choice, Action

Who is responsible for air pollution? Is it governments, industry or people?

Who is responsible for improving air pollution levels? Is it governments, industry or people?

Is the responsibility shared equally? Should it be?

Are all expectations and actions equal? Should they be?

**Ideas for collaborating with your partner school**

You can collate and share the thinking from the 'See, Think, Wonder' activity, and try creating a live video link between your classrooms to hold the class discussion.

To help create a shared understanding and build links between your partner schools, you could ask pupils to take images from around your school to share with your partner. They could then carry out the 'See, Think, Wonder' activity about their partner school, and share their wonders with each other.

Once the groups have completed the 3-5-7 challenge, you can ask each group to present their thoughts, either on paper or by recording a short video/audio clip to share. This could be framed as a persuasive piece that encourages pupils in other schools to adopt a stance to help reduce air pollution.

After completing the layers of inference activity, you could use the same images across partner schools to encourage pupils to brainstorm: 'what questions do I need to ask?'
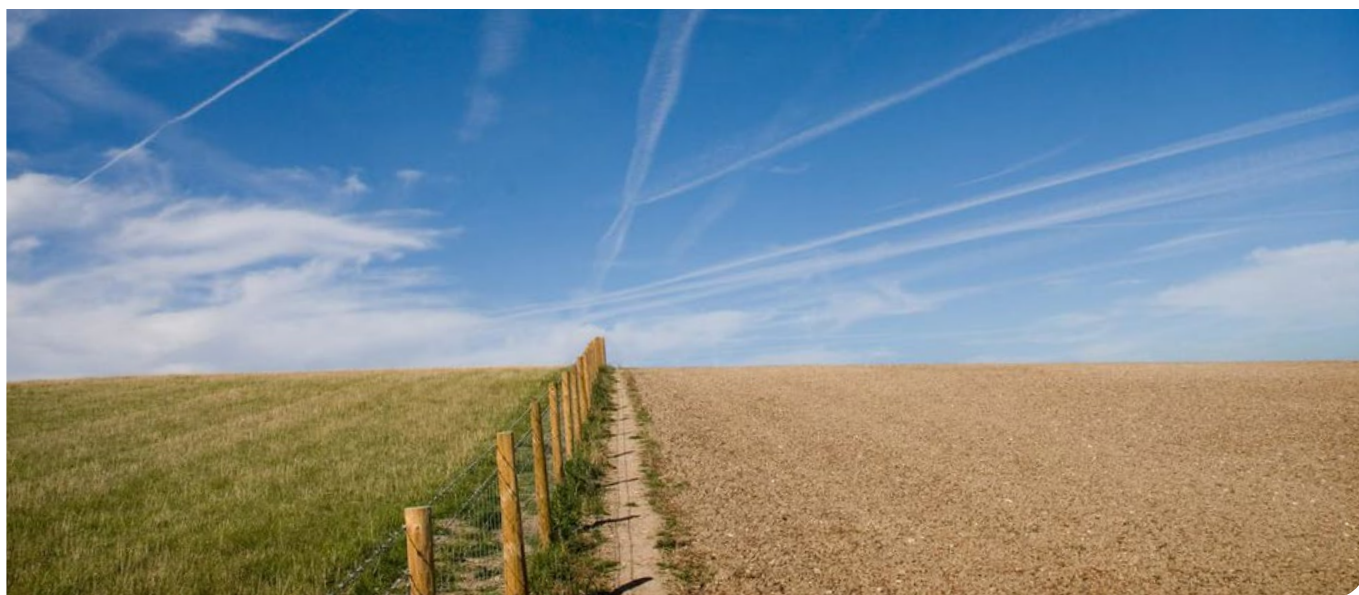
Sources of air pollution in rural areas – vapour trails (Flickr/ Angus)

Lessons 3 and 4

Let's investigate air pollution

Pupils will:

- collaboratively develop questions

- consider the processes of cause and effect

- learn and employ an enquiry process

- develop independent research, skimming and scanning and note-taking skills

- build and reflect on communication skills

- reflect on information gathered and sort this by relevance and impact

- learn about the types and causes of air pollution.

Although listed as two lessons, which may or may not be consecutive, the following activities involve independent research and may require three to four hours in total.

Lesson 3

STEP 1

1. Ask the pupils to work in groups of two to four to complete the question generator matrix (available on slide 15 of the PowerPoint presentation) using the images from Lesson 2 as their stimulus.

Vehicle congestion in Nairobi, Kenya (FIA Foundation/ Georgina Goodwin)

	is	did	was	could	If
What					
Where					
Who					
When					
How					
Why					

Example question generator matrix (available on slide 15 of the PowerPoint presentation)

a) The aim is for the groups to create as many different and relevant questions as possible about air quality and pollution within the grid, using the sentence stems to help them. For example, a 'what is …' question will populate the top-left cell.

b) However, the grid should in no way inhibit or restrict question development, and so, before starting, the pupils should be informed that they do not have to create a question for every cell. Instead, they can add more than one question per cell. Neither do they need to use the guide words as sentence starters. In fact, for some questions this will be virtually impossible (for example, 'when if …'). Instead they can ask a question such as: 'when might air quality improve if measures are taken now?' And, most importantly, pupils should ensure that the questions are all different, and not just reworded versions of questions already asked.

2. Ask the pupils to copy each question onto a sticky note (or square of paper) as a group.

3. Then ask them to sort and stick their questions onto big sheets of paper with the following headings.

- Types of air pollution
- Sources of air pollution
- The effects of air pollution
- The location of air pollution.

STEP 2

1. Introduce the Geographical Association enquiry process on slide 16 of the PowerPoint presentation, outlining each stage from the diagram and explaining the importance of an organised process to get the best results.
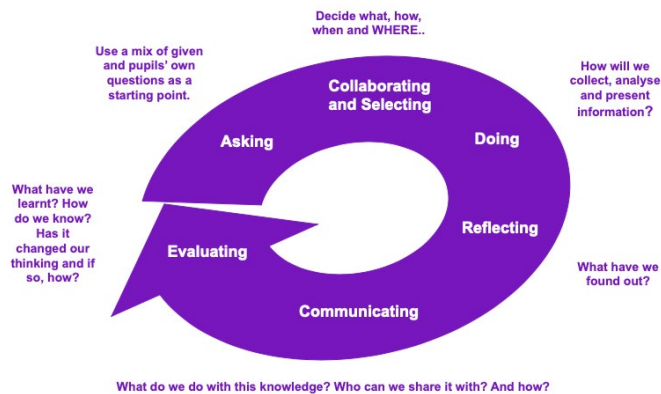
Geographical Association enquiry process (available on slide 16 of the PowerPoint presentation)

2. Explain that the groups will now use this model to investigate the issue of air quality.

a) Asking/collaborating and selecting: divide the class into eight groups, with two groups each working with one of the sets of sticky notes created in Step 1.3.

Teacher note: you will need to get the pupils to quickly make copies of any sets of questions being used by two groups.

Provide the groups with some time to sort their set of questions so they remove duplicate questions, whilst combining and rewording others. Next, ask the group to rank the questions based on which ones they think will provide the most useful/interesting information.

b) Doing: ask each group to decide where they will look/who they will ask for the information, and then to go and collect it. Discuss how to locate relevant and interesting information; focus on facts, figures and emotive case studies.

Teacher note: the groups may need time to carry out this research, and this may take another lesson period. Also note that, at this stage, some pupils might ask whether they can measure air pollution in their local area, which is great and will be covered in a later lesson.

c) Reflecting: ask the pupils to discuss, as a group, what they have found out, how best to share the information and who should know.

Lesson 4

d) Communicating: ask each group to share with the class, in order to build a big picture of what air pollution is and what its effects are. Ask them what else they would like to know (nudge them towards the scale of pollution, where it is occurring and whether it is affecting them).

e) Evaluation: this will begin in Step 3, but will continue as more study is conducted across subsequent lessons.

STEP 3

1. Introduce the idea that, at the end of the course, pupils are going to invite their local community (this could be other year/grade groups, parents or the broader local community – and even local dignitaries) to come into school to think about air pollution: its causes, effects and what we can all do to help.

Consider what information that has been uncovered so far will need to be included in this community awareness event and what will still need to be investigated. Think in terms of purpose and audience (i.e., how best to get the information across).

Helpful websites:

- www.globalactionplan.org.uk/clean-air-hub/clean-air-information
- www.blf.org.uk/support-for-you/air-pollution/what-is-it
- www.airweshare.co.uk/the-issue?gclid=EAIalQobChMI-Y2PmaSU5wlVSrDtCh1XKQdOEAAYBCAAEgKhafD_BwE
- https://eschooltoday.com/pollution/air-pollution/common-examples-of-air-pollutants.html
- www.britannica.com/science/air-pollution
- https://breathelife2030.org
- www.childhealthinitiative.org/this-is-my-street
- www.trueinitiative.org

2. In preparation for the community awareness event, and as part of written language lessons, give pupils the opportunity to write to local politicians, community leaders or village elders, as well as world leaders, to voice their views on the issue of air quality. You could make use of the Child Health Initiative's This is My Street pack (available from www.childhealthinitiative.org/toolkit/connecting-classrooms) to get started. The content of the letters should be rooted in their enquiry and research, and pupils may wish to include invitations to visit the school on the day of the community awareness event.

Ideas for collaborating with your partner school

Ask each group to decide the questions they would most like to find the answer to. Maybe they could compile a top five. Then swap question generators across schools and ask the paired groups to highlight the questions they would most like to find the answer to. Ask pupils to think about why there might be differences across the schools.

The enquiry process is a fantastic opportunity to share, by:

- asking – when considering the questions to be investigated, these could be divided up across the schools

- doing – sources of information, such as high-quality website addresses and book titles could be shared, and where there isn't mutual access, pupils with access can summarise and share information

- communicating – information can be shared with
  a wider audience within the schools

- evaluating – ask whether the issue is the same in
  the different locations, and what the differences are.

When considering Step 3, ask whether the same information needs to be shared in separate locations.

Reflect on this

The world is constantly changing, but the pace of this change is never equal across the globe. Consider the following example questions.

- Are the levels of pollution the same now as in the past?

- Where and when did anthropogenic (i.e., resulting from human activity) air pollution begin?

- How do the effects of pollution differ today from the past?

- How fair is air pollution?

A school class look at a map of air pollution levels in London (FIA Foundation)

Lessons 5 and 6

Is there air pollution near our school?

Pupils will:

- investigate the Air Quality Index

- compare air pollution levels at a range of scales

- predict and map local air quality

- use air quality indicator species to plot air quality

- measure air quality and investigate where hotspots might be

- construct graphs and maps to show distribution

- recognise correlations and annotate data with possible causation.

Lesson 5

STEP 1

Air pollution consists of a range of different elements – one of the main ones being particulate matter. Some particulate matter occurs naturally in the atmosphere, from sources such as volcanoes, forest fires, dust storms and sea spray, and there is little or nothing humans can do to change these levels. However, some particulate matter in the atmosphere is a result of human (or anthropogenic) activity, which we do have the power to lessen, and we should be altering our individual and collective behaviours to do so.

Particulate matter comes in a range of sizes, from almost invisible ($PM_{2.5}$), to larger, visible particles (PM_{10}), as shown in this infographic and outlined on the United States Environmental Protection Agency website.

The WHO Air Quality Guidelines recommend that for ambient (outdoor) air, the annual average concentration of PM_{10} should be less than 20 micrograms per metre cubed for any given day, and just ten micrograms per metre cubed for $PM_{2.5}$.

Governments have set different rules to try to limit air pollution – for example, the UK is presently aligned with European Union guidelines, which set the levels at 50 and 25 micrograms respectively. Whichever guidelines you follow, there is an agreement that high particulate matter levels are harmful to humans, with smaller particles offering a higher level of threat.

1. Introduce the idea of particulate matter in the atmosphere to pupils, explaining that some is natural and some results from human activity.

2. Look up the particulate matter level in your city or town, for today, this week, this month or this year. Are these measures within the guidelines?

3. How about other towns and cities in your country? Are they within the guidelines? Try some cities in other countries around the world. How do they fare?

STEP 2

1. In most towns and cities, vehicles are one of the major sources of air pollution, particularly at street level. Using roadside testing, the TRUE emissions initiative has measured real-world pollution from vehicles. You can use their TRUE rating tool to look up your family's vehicle, or ones that you see driving near your school, to see the rating they have been given by independent experts.

2. In the UK, 'the simple rule is that the lower the traffic levels, the less pollution will be present in the air. Air pollution monitoring experiments have shown that exposure to pollution can be cut by 20 per cent or even 50 per cent just by using side streets rather than walking along busy roads. The percentage just depends on how busy the main road is that is swapped for a quiet route.' (Guide to the 15 clean air plan actions, from www.cleanairday.org.uk)

In many cities globally, as well as some rural areas, significant air pollution is also caused by the burning of solid fuels, waste and land management, as well as industry. Consider whether this is likely to be true for your area, and what the relative impact of different measures would be. Remember, while walking near busy streets, children are physically closer to vehicle exhausts, and so may have higher exposure to pollution than in other areas.

Diffusion tubes can be used for measuring nitrogen dioxide levels around schools (FIA Foundation)

3. Take your pupils for a walk around the school grounds, and think about where air pollution levels might be higher or lower, remembering that pollution is often invisible. This might be informed by proximity to major road junctions, large scale boilers or industrial emissions, or whether you can see dark residues on buildings or windows. Trees and hedges can also block air pollution, and prevailing wind direction can play a role (more information on how to assess sources of pollution in schools is available from the Mayor of London's Air Quality Audits). Annotate a map of the school grounds with reasons for why this might be – you can use emojis to represent higher/middle/lower levels of local pollution.

Ideas for collaborating with your partner school

Lessons 5 and 6 offer highly relevant and engaging opportunities to share data and information across partner schools.

- Investigate the similarities and differences between your school locations using the World Air Map.

- Between schools, share data about how everyone gets to school over a couple of weeks. Some pupils could take photos of their journey and share these. A slideshow with voiceover would bring this to life. They could then use these photos to spot similarities and differences in the journeys.

- Share and compare the data gathered during Step 3 at the different locations.

4. Provide pupils with a printed large-scale map of the area around the school (you can source this from Google Maps or Digimap) and ask them to use sticker dots to indicate spots where they think air pollution might be relatively low (green dots) and others where it might be relatively high (red dots). Try asking different groups to consider different times of day.

Lesson 6

STEP 3

Carry out some practical citizens science by measuring pollution levels in and around your school. Below are some suggested experiments that pupils could carry out.

1. Conduct a lichen study using Open Air Laboratories' study as a guide.

2. Make pollution catchers for around the school to monitor particulate matter.

3. Conduct a surface wipe analysis (see pages 27, 69 and 70 of the Greater London Authority's Clean Air 4 Primary Schools Toolkit) on the streets around the school to monitor particulate matter.

4. Use 'ozone badges' to monitor levels (see pages 26, 67 and 68 of the Clean Air 4 Primary Schools Toolkit).

5. Use diffusion tubes to measure the amount of nitrogen dioxide in some key locations (see pages 24, 56, 57 and 61 of the Clean Air 4 Primary Schools Toolkit).

6. Carry out a car idling Survey (you could use the survey in this Green-Schools Ireland No Idling Toolkit for Schools, and also use this template to inform and support Lessons 11 and 12).

STEP 4

1. Create maps/graphs to represent the air quality in specific locations, highlighting any hotspots and annotating why they might be where they are.

2. Reflect on why hotspots might be located where they are, and whether this is constant or time related. If they are time related, see when they are at their worst, and decide what actions could be taken to minimise them.

Children cycling in India (Flickr/Anoop Kumar)

Lessons 7 and 8

Investigating our respiratory system

Pupils will:

- learn about the benefits of active travel and staying physically active

- carry out a scientific investigation, making predictions, fair measurements and organised recordings

- create appropriate graphs to communicate and allow analysis of data

- work collaboratively to explain and reason what effects air pollution might have on people who are exercising

- reflect on actions that might help reduce air pollution

- map their routes to school and other destinations close to their homes, and plot walking routes with potentially lower levels of air pollution.

Lesson 7

WHO recommends that children aged five to 17 should take part in at least 60 minutes of moderate to vigorous intensity physical activity every day.

STEP 1

1. Estimate how much physical activity you do each day. Where do you do this? Does this include the journey to and from school?

STEP 2

1. Arrange pupils in groups of two to four, and ask each group to use a range of methods for measuring resting pulse rate, such as finger clips and data loggers, fingers and a stopwatch, and a pulse monitor (app, watch). Test both the radial pulse (wrist) and carotid pulse (neck).

2. Reflect on any differences between the readings. Consider the quality and reliability of the data for each method. Choose a method and stick to that throughout the activity to keep the observations fair.

3. Ask pupils to simulate a walk and cycle (jog) to school and predict changes between resting, walking and jogging. Use reasoning to suggest why this might be the case.

4. Measure pulse rates either during or after the three activities and record.

5. Repeat at two-minute intervals until the resting pulse rate has resumed. How long did it take? It is important to sit calmly between readings. Take the opportunity to discuss what is happening in their bodies.

Lesson 8

6. Create a line graph (electronic or on paper) with three separate lines represent resting, walking and cycling (jogging), and annotate any trends, such as 'my heart rate increased here because …', 'it took my heart rate X minutes to return to resting rate' and 'X in the other group took Y minutes because …'

1. Watch this video (older pupils could watch this video) on how air pollution affects the human body. Long-term exposure to polluted air can have permanent health effects, including making people more susceptible to illness and disease. Many of these effects may not become apparent for many years, but the air children breathe today can have a significant impact on their health in later life. Use the infographic on slide 17 of the PowerPoint presentation if Internet access is limited, or as a summary.

Teacher background information: this report from unicef and this report from the Royal College of Physicians provide detailed information on the impact of air pollution.

2. Ask pupils to decide if this is going to have more impact if someone is resting, walking or running.

3. Watch this video on ways we can help to reduce emissions. The infographic on slide 18 of the PowerPoint presentation can be used if Internet access is limited. Use these resources to stimulate a class discussion about how emissions might be reduced and whether pupils could take any action.
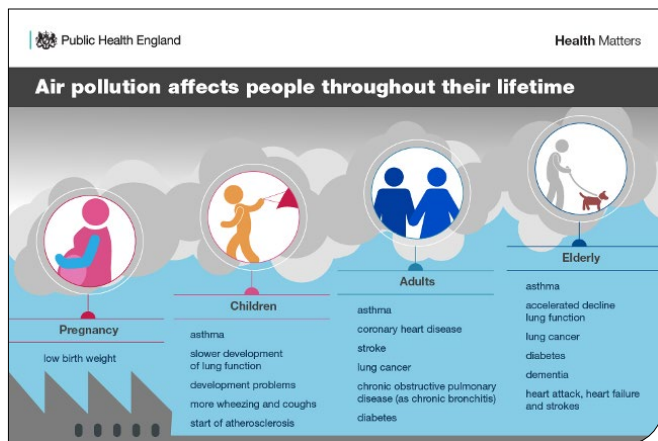
Infographic (available on slide 17 of the PowerPoint presentation; a printable version can be found at www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution)

Infographic (available on slide 18 of the PowerPoint presentation; a printable version can be found at www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution)

An obvious way to help lower pollution levels is to avoid using cars for short trips, for example to school or the local shops. However, walking or cycling on or next to busy roads is likely to increase how much we are exposed to polluted air.

1. Using maps that show both the school and their homes, ask pupils to annotate their quickest route to school by a) foot, b) bike and c) public transport.

2. Now ask them to add some 'safer' routes to school in terms of pollution and, perhaps, traffic volume. (It is imperative to note that there are other safety considerations, and that these conversations need to be had with pupils. Some schools use 'walking buses' to get pupils to school, and it might be that your school is in the position to take a lead in initiating such community-based solutions.) You should encourage the pupils to think about safety in terms of pedestrian crossing points, speed limits, cycle lanes, etc.

3. Ask pupils to think about other short trips they make using a motorised vehicle, and whether they could walk/cycle/use public transport for those trips in the future. If so, which routes would they take? If they do not regularly use motorised transport for short trips, ask them to consider how they could plan walking routes for regular journeys that minimise exposure to air pollution, and whether any infrastructure improvements are needed for this.

Mapping routes to school and barriers or opportunities for improvements in Kenya (FIA Foundation/Richard Stanley)

Further steps:

Physical activity is one part of staying healthy. Some other ideas about ways to boost your resilience to the impacts of air pollution are available at www.fiafoundation.org/media/461291/cleaner-air-4-schools-extra-appendix-2.pdf

Ideas for collaborating with your partner school

Collate and share the heart rate data across your schools. Using a larger data set will help decrease the potential for error. By combining all of the resting, walking and cycling (jogging) data across the different schools, an average for each activity can be created and the range between resting and cycling can be confirmed.

Plan safer walking routes for pupils in your partner school to and from key locations, such as the shops, library, park, cinema, and their school. Share these and get feedback, highlighting the importance of local knowledge. For example, a side road may be a very busy shortcut or it might be tough to cross a road at a certain point.

Reflect on this

Who is my town or city for?

Increasingly, it is being voiced that the streets of the world have been designed for cars to move around most effectively.

Imagine you have been asked to redesign the streets in your town or city from scratch.

Who would you design it for?

What other considerations would you have, for example, speed limits, footpaths and cycle lanes?

Looking at this information from the Child Health Initiative might help.

Air pollution over Ulaanbaatar (Flickr/S K Yoon (CC BY-NC-ND-2.0))

LESSON 9

Is air pollution a global issue?

Pupils will:

- consider how we respond to media (on an emotional level)

- explore vocabulary associated with good and bad feelings

- find out about death rates across the world linked to air pollution

- consider air quality at a global level

- reflect on whether causation is the same worldwide and, if not, what the differences might be.

STEP 1

1. If Internet allows, watch this video. Now re-watch the video and ask pupils to write down words that the video makes them see, think and feel. Organise the words into two lists: positives and negatives. What is the overall impression of India?

2. Watch this slideshow and ask pupils to create a word list. Is a similar impression formed? Highlight the danger of just using a single story/source of information and consider purpose, intent, agenda and audience.

3. What are the causes of air pollution in India? Are they the same as the UK? Ask pupils to read this BBC article which contains some great infographics and information. More able students can read this Financial Times article.

STEP 2

1. The effect of air quality on health is different around the world. Using the map on slide 19 of the PowerPoint presentation, ask pupils to find five countries that have low rates and five that have high rates.
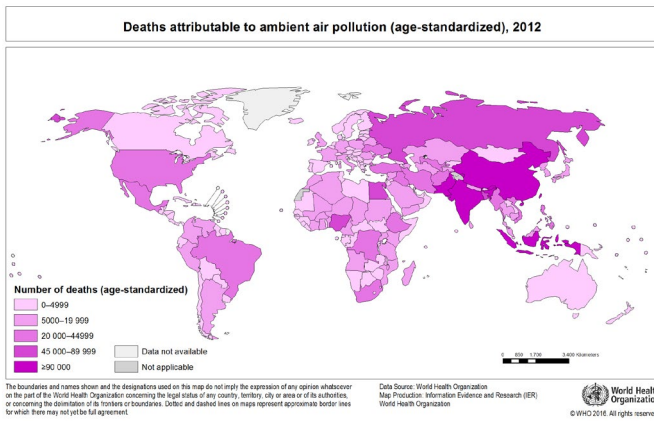
Map (available on slide 19 of the PowerPoint Presentation; a printable version can be found at http://gamapserver. who.int/mapLibrary/Files/Maps/Global_aap_deaths_age_ standardized_2012.png?ua=1)
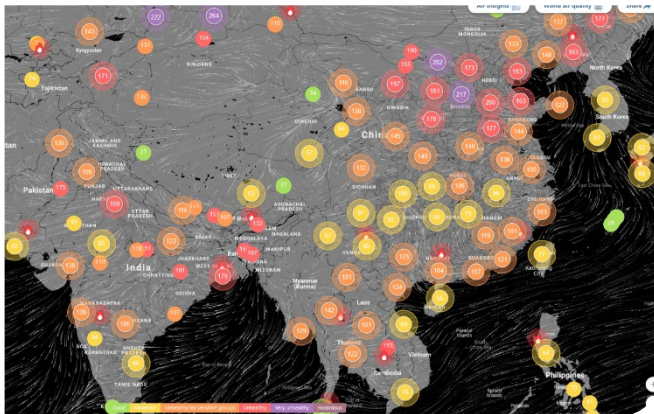
Screenshot of the IQAir online map

2. Provide the pupils with some key locations across the world, and, using these WHO and IQAir online maps, compare and contrast air quality levels. Can the highest/lowest levels in each continent be found, mapped and graphed? Are the continents similar?

3. Using the air visual map, locate the current top ten hotspots. Which continents are they on? How do they compare to their local city?

4. Look at the IQAir air quality and pollution city ranking table, dated 21 January 2020, on slide 20 of the PowerPoint presentation. Ask your pupils to find the cities listed in an atlas. Which continents are they on? Ask them to read the opening few paragraphs of this WHO report to see what it is like in Ulaanbaatar, Mongolia or Delhi. Would it make a big difference if all cars were banned from the city, region or country? Ask them to explain their answers. Access the live air quality and pollution city ranking table to see what it is like in those locations today? Are any or all of the cities from the table still in the top ten? What might that suggest (seasonality)?

Air quality and pollution city ranking

21 January 2020, 10:34

Major city		US AQI
1	Ulaanbaatar, Mongolia	291
2	Delhi, India	237
3	Hanoi, Vietnam	185
4	Mumbai, India	182
5	Kathmandu, Nepal	176
6	Wuhan, China	168
7	Hangzhou, China	168
8	Bishkek, Kyrgyzstan	166
9	Chengdu, China	166
10	Belgrade, Serbia	159

IQAir air quality and pollution city ranking table, dated 21 January 2020 (available on slide 20 of the PowerPoint presentation)

Ideas for collaborating with your partner school

No matter where you live, it can be relatively easy to create bias and paint a picture that only shows one side of life.

Images such as a single piece of litter in an extensive area, a solitary cracked window amongst hundreds in a building complex, or the dark corner of a generally light and airy classroom, can easily skew perceptions.

Ask pupils to take pictures or write descriptions of their favourite and least favourite spots around school. Share these with your partner school and discuss the question: 'if the only images we'd been sent were the favourite/least favourite spots, what would we think?'

Reflect on this

Air pollution ignores political boundaries and often spreads across entire regions because of the policies and practices of one state.

Imagine that you live in an area with world-leading clean air policies, but still suffer from poor air quality due to things a neighbour or visitor does. How do you feel? What might you do about it?

Charging an electric car (Flickr/Paul Krueger (CC BY-NC 2.0))

LESSON 10

Could we, should we, must we?

Pupils will:

- be given an opportunity to share their ideas, thoughts and opinions

- reflect on whether something is a fact or an opinion

- justify and provide reasoned arguments for their choices

- understand the need to gather evidence to support opinions

- consider bias.

STEP 1

1. Ask pupils to read this article looking at a pilot scheme to reduce traffic outside of schools in Birmingham. What is it about? What do you think about the idea? Could something similar happen near your school?

2. Hold a silent debate. Place the below statements around the room and ask the pupils to, in silence, independently annotate their thoughts, with a focus on reasoning, on the sheet around each statement.

   - All roads next to schools should be pedestrianised.
   - The government should make all road vehicles electric by 2025.
   - Every town/city in the UK should have wind turbines nearby to generate their electricity.

   - Flights should be limited to one per person, every two years.
   - No wood or coal should be used to heat or cook anywhere on Earth.
   - People should be encouraged to use less electricity, for example, by switching off lights and turning off sleep mode on electrical devices.
   - Electric cars are the only solution worth implementing.
   - Schools should be encouraged to start 'walking buses' to get pupils to school safely.
   - No vehicles, including buses and delivery trucks, should be allowed on the school grounds.
   - City centres should have car bans in place to stop traffic and, therefore, pollution.
   - All public transport should be free to everyone and run on electricity.

3. Divide the class into groups, and ask each group to have a focused discussion about one or two sheets, before reporting back their reflections to the class. To 'sell' a point of view or opinion, it needs to be supported by facts.

Ideas for collaborating with your partner school

Share responses to the different statements with your partner school, so when groups carry out the second part of the activity – to reflect and feedback on one or two statements – they can draw on what has been recorded across different schools.

It might also be possible for pupils at one school to design a set of silent debate statements for their partner school to enact. These could be themed around a related environmental issue, such as waste management, global warming or habitat destruction.

Zoleka Mandela, ambassador for the Child Health Initiative, with youth advocates (FIA Foundation)

Lessons 11 and 12

What can we do to help?

Pupils will:

- think about how the actions they take as individuals or as part of a group or community can make a difference on a global scale

- find out how one young girl is determined to make a difference through her individual actions, and how this has influenced others to do the same

- reflect upon their own transportation/fuel use on a daily basis

- learn about the key ways in which all individuals can take action within their own lives

- identify specific ways in which they can take immediate action, and commit to making the small changes necessary.

STEP 1

1. Have a go at this quiz.

2. Ask pupils which ideas they thought were unusual, and which could easily be done at school?

3. Read the statement: 'scientists say too many parents are causing a pollution problem when they drop off and pick up their kids at school. They say it's because they leave their engine running while waiting near the school gates and they are worried it is bad for people's health.' (www.bbc.co.uk/newsround/40458735)

4. If you can, also watch this video. Ask pupils how this notion makes them feel.

5. Ask pupils to work in groups to research what actions have been taken worldwide to decrease air pollution. Are there any that are achievable at school?

6. Ask them what will they do.

STEP 2

1. Implement the community awareness event that was planned as part of Lessons 3 and 4.

   - There should be scope for the pupils' learning and messages to be showcased and celebrated, whilst providing a powerful platform for them to inform and inspire a wider community of adults and peers about the causes, effects and possible actions to help ease the clean air problem.

   - The event will reinforce the 'communication' aspect of the enquiry cycle, and should facilitate the pupils' creative approaches to deliver their messages, ranging from posters and informative displays, to multimedia presentations, songs, skits and dances.

   - Special guests such as local dignitaries and celebrities should be invited.

   - A number of actions can be launched, or, if initiatives are already in place, the event can be used to further awareness and participation.

2. Set pupils the challenge to find out what actions have been taken around the world at an individual, community and organisational (school) level to help lessen air pollution. What sort of actions could your school take? These Clean Air Day resources may help you get started. You can find more resources at www.childhealthinitiative.org/toolkit/connecting-classrooms

Ideas for collaborating with your partner school

There is a fantastic opportunity to jointly plan the schools' community events and to even establish a live link between your schools during the events. Alternatively, you can record and share some key elements of your own event, such as an interview with a local dignitary.

Your partner school may want to provide a different opportunity to the community awareness event – perhaps one where pupils are asked to think about the key messages they would want to be heard at a global scale. These could then be shared across the schools.

Zoleka Mandela speaks at an event to raise awareness about safe and healthy streets (FIA Foundation)

Taking it further ...

Are your pupils now champions for change? Do they want to find out and do more?

Learning all about an issue is just the beginning. The real value comes from using that learning to make informed choices and empowered actions.

Hopefully, the result of your hard work to increase the flow of information across the local community, including key community leaders, will have a galvanising effect in not only facilitating elements of Clean Air Day, but engaging in authentic initiatives such as the This is My Street campaign.

You and your pupils may well be inspired to investigate what else you could be a part of on a personal or local level. You could create school 'champions' for air quality or the environment. You may want to focus purely on air pollution, or, like the United Nations' Global Goals on Sustainable

Development (www.globalgoals.org), your actions may be rooted in developing a broader sense of active citizenship.

Here are some further resources to help get you started:

- an overview of London's experience around clean air
- some practical approaches to making London a healthier place to live
- the global Child Health Initiative toolkit for inspiration about what cities around the world are doing to make streets safer and healthier
- the Youth and Road Safety Action Kit for more information about ways that young people can get involved with campaigning around making roads safer.

BRITISH COUNCIL

This resource was developed through the Connecting Classrooms through Global Learning programme, which ran between 2018–2022 and was co-funded by the British Council from our grant-in-aid, and the Foreign, Commonwealth and Development Office (FCDO) using UK aid.

Find a partner school or browse more resources at **www.britishcouncil.org/school-resources**