

Lesson One: How does air quality vary across London and how might we manage it?

Starter Activities:

Teachers can show the *Presentation: Comparing pollution images*. This asks students to compare the image of the 1952 Great Smog in London with the regular hazes that formed on still, mild days across the capital in 2011, 2012 and 2014. Teachers can either ask the students to come up with their own questions about the image, (which can perhaps be generated via individual white boards and subsequently shown to the class), or students can discuss their own perceptions of what is going on in the images via some guided questions which can be displayed separately:

- When were the images taken?
- Which image shows the greater danger to human health?
- Why does the air look like that?
- What caused the pollution?
- What impacts (other than health implications) might there be?
- How long might the impacts last?
- What might be done to manage the pollution?

Teachers should then discuss the nature of the pollution itself, with the help of *Presentation: The big five of air pollution* if needed. Comparing the size of particulates to a human hair, as well as the composition of polluted air chemically, the problem of breathing in very fine particulates and chemical compounds can be discussed and students should think about the sections of workers whom are most vulnerable to the health hazards associated with breathing in polluted air.

Main Teaching:

Teachers might like to discuss with their class what they would expect a pollution map for London to look like. Using an interactive white board and *Presentation: Imagining London's pollution*, students can draw their ideas to the class. Depending on the ability of the group, teachers may wish to give hints and tips and provide contradictory statements to make the students expand or re-express their ideas.

Using ArcGIS or a similar Geographical Information System package and by importing data from *Data: London PM10*, students can plot the PM₁₀ particulate levels for London. Teachers should encourage the students to explore more complex forms of data presentation rather than, for example, simple pinpoint colour coding. If computer access is limited, students can use a base copy of a London map and plot the data manually using *Handout: London PM10 data*.

Students should then look to describe what they see and explain the patterns and anomalies present. Some guided questions could include:

- Why are there higher particulate levels in the centre of London compared to the outer suburbs?
- Why do some areas of Greater London, for example Romford, record higher than average particulate levels?
- What could account for the band of high readings in the north west of Inner London?
- What problems are there with the data? Has it been recorded fairly and without bias?
- How would you improve the collection and recording of data such as this?

If there is an opportunity for fieldwork, teachers can research through their local authority website where the nearest air quality measuring station is and this can be highlighted to students. It may be possible to borrow handheld air quality monitors

from a nearby university geography department and real data for nitrogen oxide levels at different sites could be collected and then presented in creative manners using GIS or paper based maps of the local area.

Teachers can show students *Presentation: Urban design problems* and discuss with them the way that London's built design and geographical position could be contributing to its poor air quality. Comparisons can be made with Los Angeles and students from within the London area may be able to identify specific parts of London that follow the examples given. At the end of the discussion, students should be split into groups, with a piece of sugar paper and a chunky pen given out to each. Students can then be asked to list the top five priorities for urban design if relief from air pollution is a new city's focus. These ideas can then be discussed around the class and groups can adjust and add to their list of points as they hear those points coming from other groups.

Plenary Activities:

Students should be shown *James Thornton's video* in which he discusses the work of ClientEarth. Then teachers could pose the following question:

If the law is upheld and the UK government is held accountable, what measures might the new Mayor of London take to reduce particulate pollution?

Students should be given the chance to come up with one reasonable solution to the problem of particulate pollution as if they are London Mayor. A handful of students (maybe around five, each with different ideas) should 'nominate' themselves as mayoral candidates and give a thirty second speech about why people should vote for them to be in power to improve London's air quality. Each student should be given two sticky notes, ideally one coloured green and one coloured pink. Choosing the policy they think sounds best for London's air quality, students should write why that policy is most likely to work on the green sticky note and stick it onto the correct mayoral candidate. For the policy they think is most likely to fail to improve London's air quality, they write a reason on the pink sticky note and stick it onto the appropriate candidate. The candidate with the most green sticky notes and the fewest pink sticky notes is declared the mayor.

Teachers can then look at the arguments for and against the losing and winning candidates respectively and summarise the idea that for a policy to be successful it must address not only the city's environmental needs but also satisfy the needs of the city economically and socially.

Extension / Homework Activities:

Is there a link between the different types of pollution or are they produced (and do they act) independently? Research the role nitrogen oxides play in many different types of pollution. By studying the causes of the different parts of modern pollution, one might be able to create future models to predict patterns of pollution levels over cities like London as different industries and transport systems change.
