Forty Minute Fieldwork: Noise Pollution

Key topic areas	Equipment and resources required
• Environmental quality • Pollution • Urban design • Health • Sustainability	Blank map of the school site Smart phone / device with decibel reader app installed* Ruler * There are a variety of free to download apps to choose from. The following come strongly recommended: Noise Detector, Sound Meter.

Context

Wherever humans engage with their environment or with others they are likely to do so by creating a degree of sound. Often we perceive too much sound (i.e. a sound that reaches high decibel levels) negatively, and with good reason. High decibel sound can not only damage human health physically, through injury to the delicate structures of the inner ear, but prolonged exposure to some sounds can lead to poor concentration levels in people and even affect their emotional and mental health.

Sounds can also impact upon the natural world. Sound (and its associated vibrations) can affect how different animals inhabit spaces, most notably bird and small mammal species. Long term high decibel levels of sound can even affect breeding cycles in some animals. It is little surprise therefore that geographers relabel unwanted sound as noise pollution.

While humans are usually the cause of noise pollution they too are part of the solution. Urban planners and architects now have the reduction or absorption of noise pollution as an idea that influences their decision making as they plan new districts, regenerate old ones or design brand new buildings. Understanding noise flow in relation to natural and human features has become an important part of environmental geography studies and the average school campus provides opportunities for students to investigate it on a small scale.

Classroom set up

An interesting way to introduce the idea of noise pollution to students is to set up paired discussions around the question of 'when does sound become noise pollution?'. Students can be presented with a list of sources of sound such as those below and students need to decide whether they are noise pollution or not. Many students will be able to recognise the need for particular contexts and understanding of nuance here: for some people the sound of seagulls calling is a lovely part of a seaside holiday, but for those who live on the coast the constant squawking might be viewed differently.

- Road works drilling
- Wind passing through leaves
- Rotating wind turbine blades
- Birdsong ('the dawn chorus')
- A motorway
- Seagulls calling
- Screams from a rollercoaster
- Crowds at a football stadium
- Electrical hum from overhead cables
- A school playground at breaktime

This brings in an opportunity to discuss and introduce or revise the concepts of subjectivity and objectivity, noting that many of the above examples of 'noise' are subjective while a decibel reading from a sound meter is objective and unable to identify how the sound might make someone feel or the impact it may have.

It can be interesting for students to appreciate what different decibel values actually mean. Showing a decibel scale allows them to contextualise it and it can be fun to test out the app itself to see how loud their classroom is. Likewise students

can guess what decibel level restrictions there might be. For example, the UK Health and Safety Executive regulates that employees working at a daily average of 85 decibels must be provided with hearing PPE.

Next, students should think about their own schools environment and which areas might be the sources of the most and least sound. Students can write hypothesis such as "Decibel levels will decrease when distance from [the canteen] increases".

In the field

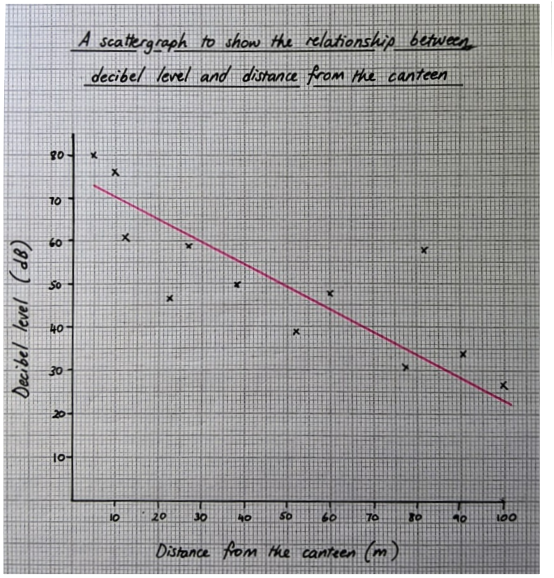
On a map of the school site, draw straight transect lines leading out in all directions from the part of the school site that students believe might be the source of the most noise (e.g. the school canteen), ending up with a map that looks like the spokes of a wheel with the canteen in the centre. Allocate a small groups of students to each transect line and ask them to mark three places along the line where it would be possible to measure decibel levels (outside the school buildings). These should be close to the canteen, furthest from the canteen, and at a place close to the mid point of the transect line.

Students then take decibel readings at each site using a sound reading app on their smart device. Using the map scale, and a ruler if necessary, students should also calculate and record the distance between each decibel recording site and the canteen, creating three pairs of data per transect.

Suggested data presentation

Assuming there at least four transect lines being used in the data collection phase, the class should be able to collect twelve pairs of data (decibel level paired with distance from the canteen). This means that students will be able to draw a scattergraph of their results, as both sets of data represent continuous data. This should be drawn with a line of best fit (by eye) if the data lends itself to one, reminding students of what the graph theoretically should look like as per their pre-written hypotheses.

Students can also complete a Spearman's Rank Correlation Coefficient statistical test using this data so that a value of the strength of any correlation between decibel level and distance from source can be found.



Key questions for reflection and analysis

- Is there a relationship between decibel level and distance from source?
- Did the decibel reader only pick up sound from the canteen? What impact did this have on the results?
- What does our Spearman's Rank Correlation Coefficient test result tell us about the strength of the correlation?
- What factors might cause decibel levels to be lower or higher than expected?
- Are there any outlier values in the scattergraph? How might we explain these?
- What impact might time of day or time of year make to the results?
- Why were transects a good method to use in this investigation?
- What other variables could have been measured in addition to decibels?

Taking it further

Students can look at the layout of buildings around the school site and note examples of design that may exacerbate noise or absorb it. With this in mind, students can think about where in the school might be the best place to site a new library or a music studio.