IMPACTS AND POLLUTION

Activity IP03

Theme
Class activity (CA). The students discuss the impacts of burning fossil fuels and investigates the effects of acid rain on soil and plants.

Objectives
Creating an understanding of what acid rain is, how it is formed and what its effects are, through experiments conducted by the students.

Curricular Strands
SESE, Science and Geography–Environmental awareness and care

SESE, Science–Science and the environment; Plant and animal life; Processes of life

SESE, Geography–Natural environments; Rocks and soils; Soils

SPHE–Myself and the wider world; Environmental care

Skills
Questioning, observing, predicting, recording and estimating

Time
20 minutes introduction; 30 minute investigation

Links to Green Schools
Impacts of fossil fuels on school surroundings

Up in smoke!

INVESTIGATING ACID RAIN

WHAT YOU NEED

- Four 1-litre plastic bottles (or 4 plastic trays of the kind used to package fruit or vegetables)
- Soil or potting compost
- Vinegar
- Water
- 0.75-litre glass bottle
- Cress seeds

WHAT YOU DO

1. Using the attached diagram, explain to the class how acid rain is formed.
2. Fossil fuels such as oil, coal and gas are used to fuel power stations. When these fuels are burned they release gases into the atmosphere. One of these gases is carbon dioxide, which is one of the main causes of climate change through the greenhouse effect (see Natural Resources pack). Sulphur dioxide also causes serious pollution but with more local and immediate effects than long-term climate change. When this gas mixes with water in the air it forms sulphuric acid, which falls as 'acid rain'.

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iMPACTS AND POLLUTiON

Activity IP03

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3 Acid rain can damage old historic buildings, causing the stone to crumble away. Acid rain has also been responsible for major damage to forests, lakes and rivers across Europe.

4 The class is going to investigate how acid rain affects soils and plants.

5 Cut the bottom off each of the one-litre plastic bottles to make four pots each about 6cm deep (this links to the Waste pack and the idea of creative re-use of waste materials).

6 Put 2–4cm of soil or compost in each pot. Label one pot 'Pot A: acid soil and normal rain' and another pot 'Pot B: normal soil and normal rain'.

7 Make up a dilute vinegar solution to simulate acid rain by putting 3 teaspoons (15ml) of vinegar into a clean 0.75-litre bottle (preferably a glass bottle) and filling it to the top with tap water. This is a different acid to that found in acid rain, but it will produce the same effects.

8 On a Thursday and Friday, water Pot A with the acid mixture and Pot B with tap water (this allows the pots to be left over the weekend without watering).

9 Label the remaining pots 'Pot C: normal soil and acid rain' and 'Pot D: normal soil and normal rain'.

10 On the following Monday, sprinkle about 20 cress seeds on top of the soil in each of the pots. Water Pots A, B, and D with tap water and Pot C with the acid solution.

11 Ask the class to predict what they think will happen and to record their predictions in the table below.

12 Continue to water Pots A, B, and D with tap water and Pot C with the acid solution over the next four days. One light watering a day is enough.

13 At the end of the week students can check their predictions and complete the table.

14 These results can be discussed and explanations filled in on the table.

Questions

1 What effect does the acid solution have on the cress seeds?

2 Do you think this is similar to what happens in our environment as a result of acid rain? Explain why.

Go further

1 As a follow-up, students could collect samples of rainwater and determine the pH of these samples using pH strips (available from school science suppliers). Is the rain in your area acidic?

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ACID RAIN DIAGRAM

Gases from power stations, factories, cars and houses rise up into the atmosphere

The gases mix with water in the air to form weak acid that falls as rain

When this rain falls it causes damage to trees, lakes and buildings. If washed into rivers it can harm fish and wildlife

Gases can be carried long distances by the wind, so the burning of fossil fuels in one country can cause acid rain in another

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INVESTIGATING ACID RAIN

Pots	Predictions	Results	Discussion – Why?
Pot A: acid soil and normal rain			
Pot B: normal soil and normal rain			
Pot C: normal soil and acid rain			
Pot D: normal soil and normal rain			