LESSON 2:
THE CONSEQUENCES OF RECYCLING

This lesson builds on the ideas introduced in lesson 1 and looks at the environmental context for recycling. Students use examples of packaging to build up a picture of what happens to waste packaging when it is sent to landfill, or alternatively when it is recycled. They build on this to consider the consequences of these actions at local and global levels.

In the lesson, students explore the consequences of a decision to bin or recycle a waste item, including what happens to their waste, what this means for how we source and use natural resources, and some of the impacts this can create. discuss which outcomes they would rather contribute to - those related to recycling, or to "binning". The lesson includes extension task ideas for teachers who would like to research some of these consequences in more detail. You can also split this into two lessons if you prefer, starting the second lesson at 'What if we recycled instead?'

Learning outcomes

Recycling knowledge and understanding	Citizenship concepts and processes	Personal, Learning and Thinking Skills
• Disposal is the least effective way to deal with waste. • Materials take many years to break down in landfill sites and cannot be re-used. • Landfilling waste is not the best option for the environment. Greenhouse gases and a toxic liquid are produced when materials rot down under pressure in landfill sites. • Recycling provides a number of environmental and economic benefits. • Recycling allows materials to be used again, reducing the need for natural resource extraction and landfill	**1.1b** What is fair and unfair? **1.2a** Rights and obligations **1.2c** Balancing rights with obligations **1.3c** Consider interconnections between the UK and the rest of the world **2.2a** Expressing opinions **2.2b** Communicating an argument **2.2c** Justifying an argument and persuading others **2.3c** Impacts on communities and the wider world	**IE:** Analyse and evaluate information **IE:** Plan and carry out research **CT:** Question their own and others' assumptions **CT:** Connect ideas in inventive ways **RL:** communicate their learning in different ways **EP:** Discuss issues of concern

Resources

Printed:	For projection:
• Sequencing cards	• Video 2 • Slide presentation

Preparation

Read the *background information* below and review the student and teacher materials.

Suggested lesson plan

The core activities are highlighted in **bold**. Focus on these if amending the lesson plan or if time is limited to less than 60 minutes.

Starter

Activity	Delivery	Suggested time
What will we do with it?	Remind students of what they saw in Video 1. Today, they're going to make some decisions of their own. What will the consequences be? **Show the decisions slide and as a class, vote on whether students would be more likely to bin or recycle each item.** You could do this with a show of hands, or by getting students to move to one side of the room or the other. Selected students can explain their decision.	10 mins

Main activity

Activity	Delivery	Suggested time
What happens to our waste?	**Watch video 2, to explore what happens to our recycling.** **Give each table a set of sequencing cards for one material.** Ask students to identify the five cards that show what happens to the things you bin. Students should sort the photos into sequence. Gather students' ideas: project the flowchart slide, for landfill and discuss what might happen to each material once it has been buried in landfill. **Project the *landfill image slide*. Can students explain what is happening?**	15 mins
What happens in a landfill?	Key points to draw out: When biodegradable materials, e.g. paper, card and food rot down in the absence of oxygen in landfill sites, they produce methane – a greenhouse gas over 20 times more powerful than carbon dioxide and a toxic liquid called leachate. Other materials, e.g. glass and metal do not rot away at all and will still be in our landfill sites in 100s, or even 1000s of years time.	5 mins
How does binning our waste affect our demand on new raw materials?	Once in a landfill site, can materials be used again? **Elicit that landfill is the end of a one-way, one-off use of each material and that to make a new glass jar, plastic bottle and metal can, or piece of paper we need new raw materials. Where do these come from?** Explore the *natural resources map slides* as a class. Click to reveal where the raw materials used in the 5 packaging items come from, and how we get them.	5 mins
What are the impacts of landfill?	**Using what they discovered above, students suggest some local and global consequences of landfill. Summarise these on the board if you wish. Eg. Visual impact, noise, smells, use of land space, emissions, need for new raw materials.**	5 mins
What if we recycle, instead?	**Refer back to the decisions students made at the beginning of the lesson. Get students to arrange the remaining five photos for their material in sequence, to show what happens when it is recycled instead.** Elicit that recycling is a loop: the material is made ready to be used again and again, by reprocessors (see background) and is therefore more sustainable. **Show the *recycling flowchart slide*.** • **How does recycling change how we use natural resources?** **Get students, as a class or in small groups, to consider how the impacts of a decision to recycle might differ from the impacts of landfill. What difference does it make** • **Locally?** • **Globally?** Refer back to students ideas about the impacts of landfill. Capture ideas on the board if you wish.	10 mins

Plenary

Activity	Delivery	Suggested time
Why recycling makes a difference	**Summarise the differences between when we recycle and when we send to landfill by showing the final slide:** When we send materials to landfill, this increases the amount of greenhouse gases produced, uses space/ land and means we need to use more new raw materials to make new items. When we send things to be recycled, this reduces the amount of new natural resources we use and reduces the amount of waste we landfill. This has impacts both locally and globally. **Why does your choice make a difference? Tease out the idea that many small actions add up – this can be for something negative, like the need for a new mine or landfill site, or it can be for something positive, like reduced emissions.** Go back to students' original decisions, if appropriate. Have any now changed their minds? What are their reasons? Can students think of any problems that might be caused if they put something in a recycling bin that should not be there e.g. if glass goes into a paper bin or a nappy was put into a recycling box? Why does this matter?	10 mins

Differentiation

Easier	Harder
Bring the flowcharts to life by using them to tell the 'life story' of a piece of material. This can highlight the key difference, when students see that when recycled, a specific piece of material can be used over and over again. But when sent to landfill, it is useful only once.	Challenge more able students to explain the detail of the outcomes for both disposal and recycling. Consider energy use and emissions, demand for raw materials, and use the extension questions on page 5 to explore environmental and social impacts in more detail. Consider other items, including complex ones like a broken MP3 player. What is it made of? Can these be recycled? Students can research other ideas at www.recyclenow.com

Extension ideas

You may wish to explore some of the local and global consequences of waste in more detail. The information in the background notes below may be helpful.

Students could research or discuss some or all of the questions below:

Environmental impacts

- What substances are produced as waste rots down in landfill sites?
- How are they managed in modern landfill sites to reduce the risk of damaging the local and global environment?
- What are the impacts on the local and global environment from extracting different raw materials?
- What are the local and global impacts from the energy that is needed for mining and transporting raw materials?
- What are the environmental benefits of using recycled materials rather than virgin materials?

Economic impacts

- What economic benefits might natural resource extraction bring to a local community in a locality rich in raw materials?
- What effects might increased recycling rates have?

Social impacts

- Resource extraction can alter the patterns of where people live and work. How might the need for natural resources change a locality that is rich in raw materials?
- What might be the social impacts on these communities if the demand for natural resources goes up or down?

Create a display to show what students discover, to compare landfill and recycling, and their local and global consequences.

Background information for teachers

Correct sequences

	Landfill	Recycling
1	Binned	Recycled
2	Collected and taken to a landfill site	Collected and taken to a recycling facility
3	Emptied into a 'cell'	Melted or pulped
4	Compacted into the ground	Processed into new raw material
5	Covered with soil and clay	Molded into new items

About Landfill

The majority of non-recycled waste in the UK ends up in landfill sites. According to the Modernising Landfill Tax Regulation published by the Treasury in April 2009, the UK has just fewer than 800 active landfill sites (see www.hm-treasury.gov.uk/bud_bud09_landfilltax.htm).

Landfill sites are made up of a series of compartments where waste is burried, called cells. Once waste has been transported to a landfill site it is tipped into a cell and compacted. Active cells must be covered with inert material, e.g. soil, at the end of each day to prevent the waste being exposed to the weather or vermin.

As biodegradable materials, such as food waste, garden waste, paper and card break down anaerobically (in the absence of oxygen) in landfill sites, they produce greenhouse gases and toxic liquids which must be treated. Carbon dioxide and methane are the most significant greenhouse gases produced.

Modern landfill sites are managed to reduce the amount of methane released into the atmosphere, e.g. by using it to generate heat and power. Cells are also fully lined to reduce the risk of leachate, the toxic liquid produced as the waste degrades, being leaked into watercourses.

Consequences of landfill or recycling

When items are used once and then disposed of...	But when they are recycled instead...
New **raw materials** must be extracted, mined or harvested to produce new items. These processes can **damage habitats** (local) and **pollute** water supplies and the atmosphere (local and global). In the longer term, supplies of some raw materials may also be limited or finite (global). Mining and extraction, along with production, can all use large amounts of **energy**. This usually comes from fossil fuels which are **finite resources** and which release carbon dioxide, a greenhouse gas that contributes to **climate change** (global). Some waste is burned to supply energy. Most however goes to **landfill**. Burying waste in Landfill requires significant amounts of land. Landfill sites also produce large amounts of methane, a **greenhouse gas** more powerful than carbon dioxide (global).	Fewer raw materials are required, because recycling allows materials to be **used again and again** (global). This reduces our demand for new raw materials and the impacts extracting, mining, or harvesting these raw materials has on the environment (global). Recycling materials uses **less energy** than making products from new raw materials. This helps to **preserve stocks of fossil fuels** and **reduce greenhouse gas emissions to help tackle climate change** (global). Far less waste goes to landfill. **Less land is required** and landfill makes a **smaller contribution to climate change** (global).

About reprocessors

Material reprocessors turn *waste* materials into a *resource* that can be used by manufacturers. They form a vital link in the recycling process. Because they are able to do something useful with waste materials, they create an economic reason to recycle, which encourages councils and other collection organisations to provide recycling services. By creating demand for a product (the reprocessed raw materials) from manufacturers, reprocessors help to 'pull' recyclable materials through the system and encourage greater levels of recycling at the start of the process – in homes and businesses. In some instances the reprocessor and the manufacture may be the same.

Climate change

Global warming is an increase in the world's average surface air and water temperatures. Energy from the sun passes through the Earth's atmosphere. Some of this energy is retained as heat by gases in the atmosphere, acting like a blanket or duvet. The gases that do this are called greenhouse gases.

We need some of these gases in the atmosphere to keep the Earth warm. However, if there are too many of these gases in the atmosphere, more and more heat is retained. Many human activities such as burning fossil fuels release more greenhouse gases into the atmosphere, causing the atmosphere and oceans to warm.

This warming process is likely to cause major changes in climates across the globe, including:

- sea levels may rise and cause flooding in low-lying areas
- variable weather conditions and more extreme weather causing flooding or heat waves
- changes in weather and rainfall patterns
- changes in agriculture patterns and reduced crop yields
- increases in tropical disease-carrying organisms
- species extinctions and species movement
- loss of Arctic ice, glacier retreat and melting of permafrost

All of these consequences have economic and social impacts too, affecting billions of people worldwide.