

LESSON 2

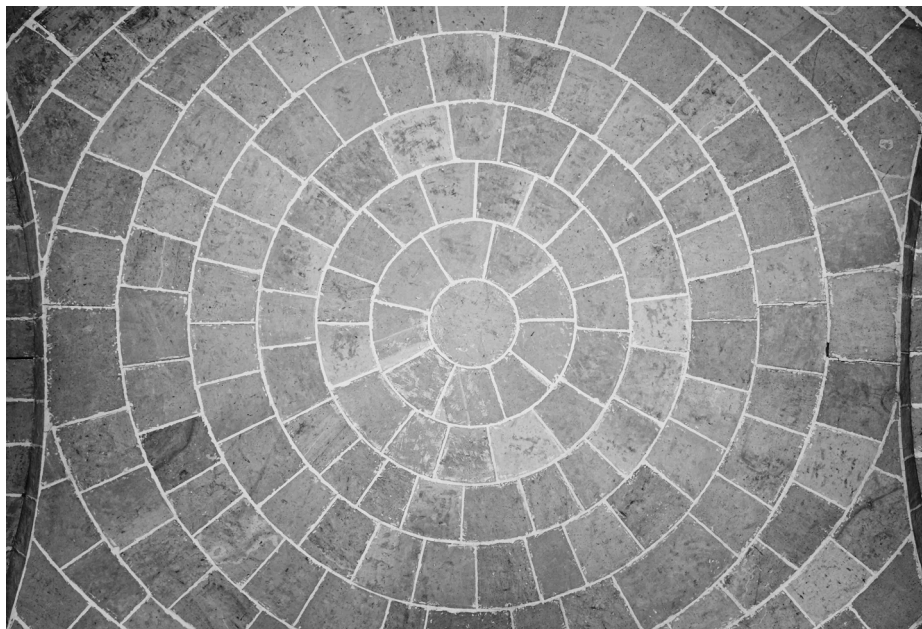
Exploring the circular economy



ELLEN
MACARTHUR
FOUNDATION

LESSON TWO:

Exploring the circular economy



This lesson is part of a series that introduces students to a different way of thinking about how our economy could work: a circular economy. The series builds up exactly how a circular economy is different from the status quo, and looks at the economic, environmental and social advantages of a new approach.

The series looks like this:

- (1/5) Challenging common conceptions
- **(2/5) Exploring the circular economy**
- (3/5) Understanding the challenge of 'finite' resources
- (4/5) Designing for a circular economy
- (5/5) The circular economy and modern agriculture

Subject: Economics, Geography, Environmental Systems, Biology, Sociology, Business, Citizenship, Design Technology

Age range: 12-19

Total time: 60 minutes

This is a group-based activity in which students will explore the basic characteristics of the linear and the circular economy.

Learning outcomes:

- to compare living systems with manmade systems
- to critique our materials economy
- to begin to investigate an alternative model: the circular economy

Preparation:

- Print off, cut out and sort the cards (attached pages 8-13 in this pdf)
 - one set per group, divide the cards into two groups: 'natural' items and man-made items (note: treated water belongs to the man-made group.)
 - Watch [this video](#) for a quick summary of this activity
- Sit the students in small groups
- Give each group an A3 sheet of paper should they need to take notes
- Load the PowerPoint, Exploring the circular economy and read presenter notes. The PowerPoint [can be downloaded](#) on the Schools & Colleges Teaching and Learning Materials site of the Ellen MacArthur Foundation.
- Preload the [YouTube video](#), Rethinking Progress (by the Ellen MacArthur Foundation)

Recommended classroom set-up:

This activity is best done with groups of 3 or 4 students, standing or sitting at a large table. Students will need to see the screen so you can help guide them in the early stages of the lesson. You will need audio for the video.

Teacher's Introduction:

In the last activity, your students were asked to challenge some common 'solutions' (such as 'reduce, reuse, recycle') to environmental problems. The argument is that all most problems are, in some way, connected, so solutions to environmental problems affect the economy, and so on. This **systems thinking** approach is fundamental to understanding how our economy could work, for economic, societal and environmental gain.

Systems thinking is the process of understanding how component parts of a system can best be understood in the context of relationships with each other and other systems, rather than in isolation. Systems thinking focuses on cyclical rather than linear cause and effect. There is more about systems thinking in other work produced by the Ellen MacArthur Foundation (see <http://www.ellenmacarthurfoundation.org/programmes/education>)

LEARNING ACTIVITY – 20 minutes

Hand out the man-made cards and ask them to arrange the cards to tell the story of the life of a plastic bottle. This is best done in groups of 3 or 4. Your students will need a wide table.

You may want to support them through the first few cards – the PowerPoint helps you to do that. You could ask, for example, where plastic comes from. When someone answers ‘oil’, show them the oil rig card and tell the class that that is their starting point. Then ask what happens next to the oil, which will likely lead into the oil being taken to a refinery, perhaps via a boat.

The activity tends to take 20 minutes. Most groups will end up showing a lengthy, wasteful linear process (as shown in slide 3). Ask them at the end of the activity to describe the system to you – look for words like ‘linear’ and ‘wasteful’. Ask why the waste card is depicted as a burning note.

Note: There are four power station cards, four factories and four treated water cards. These all go together. The treated water (at high energy cost) is used to cool the power station.

Students may ask whether a line should connect recycled plastic back into the loop. While this is certainly possible, and does take place, the effect is limited: most recycled material cannot be recycled indefinitely. This process is typically referred to as ‘downcycling’ – where the material quality is degraded. Is there another approach to this problem?

DISCUSSION

Doing this activity with a plastic bottle as the product to outline is relatively simple. Ask your students what this system would look like if the product were more complex, like, say, a mobile phone.

LEARNING ACTIVITY – 15 minutes

When the class has finished with the linear activity, give them the ‘biological’ cards and, as in the previous activity, ask them to arrange them in a manner that makes sense. They will realise there is a food chain at the heart of the system. Bacteria live off everything.

Help your students to the key conclusion that there is no waste in natural systems – one species’ waste is another species’ food. (Except for some waste in the form of lost heat!).

A crucial point is that with every cycle, the system is strengthened.

DISCUSSION

Ask the class to consider how we could design a system that is strengthened with every cycle, and which designs out waste.

LEARNING ACTIVITY - 20 minutes

Watch the Ellen MacArthur Foundation video, 'Rethinking Progress' (4 minutes):

<https://www.youtube.com/watch?v=zCRKvDyyHml>

Use the final slides to discuss the concepts introduced in the video, and to build up a bigger picture of the circular economy and work through the example of a washing machine.

CONCLUSION - 5 minutes

Conclude by asking students to define the circular economy, comparing this with the working definition on the final slide.

Exploring the circular economy

NOTES FROM THE POWERPOINT PRESENTATION

SLIDE NUMBER	NOTES
1	<p>This PowerPoint was produced to help you teach the linear/circular card activity.</p> <p>The activity is best done in groups of 3 or 4 students</p> <p>This PowerPoint should have come with corresponding cards to print off. If you don't have them, visit www.ellenmacarthurfoundation.org to download your free set.</p> <p>Watch this video from the lesson plan preparation section for a quick summary of this activity: http://tinyurl.com/jj82l62</p>
2	<p>Refer to the lesson plans for advice on running this activity.</p> <p>Basic instruction:</p> <p>Ask the students to use the cards to describe the process of producing a plastic bottle.</p>
3 - 4	<p>Slide 3 shows a lengthy, wasteful linear process of plastic production.</p> <p>More instructions in the PowerPoint slide notes and lesson plan</p> <p>Slide 4 shows the food web connections we find in ecological systems.</p>
5	<p>We recommend you first view Rethinking Progress (available on YouTube – URL: https://www.youtube.com/watch?v=zCRKvDyyHml)</p>
6	<p>Q: How might that work?</p> <p>Q: Are there any examples of this working already?</p>
7	<p>This image is a simplified graphic demonstrating the circular economy: an industrial system that is restorative by design or intention.</p> <p>Ask the audience what they see.</p> <p>Note two cycles of materials:</p> <p>Biological materials are made from things that grow and which ultimately can go back into the soils (perhaps by composting, or through anaerobic digestion) and improve it. They are natural materials that can be safely disposed of in a manner which allows the soil to regenerate; thus they must not contain any toxins.</p> <p>Technical materials are metals, polymers, etc. They are materials designed to continually flow at high quality in closed industrial cycles.</p>

8	<p>How might the circular economy work?</p> <p>Take washing machines as an example.</p> <p>What if you never actually owned the machine, but paid a subscription for its use?</p> <p>If that were the case, the manufacturer would have a vested interest in ensuring the machine worked long-term. (i.e. durable design – design for repair)</p> <p>When the customer was finished with the machine – perhaps ready to upgrade – the manufacturer reclaims the machine, remanufactures the parts and puts it back out on the market.</p> <p>Q: what are the advantages of this approach to (a) the manufacturer? (b) the customer?</p> <p>Q: do you know of examples where this already happens?</p> <p>Remember, resource prices and energy prices are volatile, creating uncertainty for businesses...</p>
9	<p>These two simplified graphics show the difference between a linear economy and a circular economy.</p> <p>Ask the students to note the differences between the two systems</p>
10	<p>Listen to feedback, challenge undefined terms, come to a class definition.</p>
11	<p>This is a definition we use.</p> <p>Q: How does your definition differ?</p> <p>Q: Which phrases have you used that are missing from this statement?</p> <p>Q: Do you prefer this statement, or yours? Why?</p>

This lesson was produced by the Ellen MacArthur Foundation. The Ellen MacArthur Foundation works with business, government and academia to build a framework for an economy that is restorative and regenerative by design.

We have produced a number of educational resources which are free to download from www.ellenmacarthurfoundation.org

If you have any suggestions, questions or feedback about these lesson plans, or just want to get in touch with the Schools and Colleges team, please email info@ellenmacarthurfoundation.org. You can also sign up to the Schools & Colleges Programme Newsletter to [join our community](#) and stay in touch

SHIP



CAR



PLANE



TRAIN



TRAIN



LORRY



LORRY



LORRY



LORRY



LORRY



TREATED WATER



TREATED WATER



TREATED WATER



TREATED WATER



TREATED WATER



www.ellenmacarthurfoundation.org

FOREST



CONSUMER



www.ellenmacarthurfoundation.org

SHOP



www.ellenmacarthurfoundation.org

WAREHOUSE



www.ellenmacarthurfoundation.org

WAREHOUSE



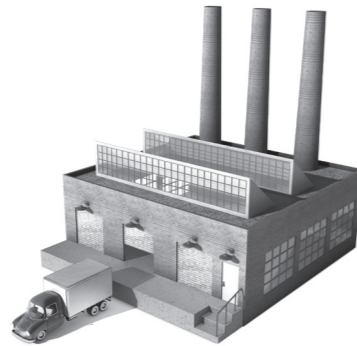
www.ellenmacarthurfoundation.org

www.ellenmacarthurfoundation.org

MINE

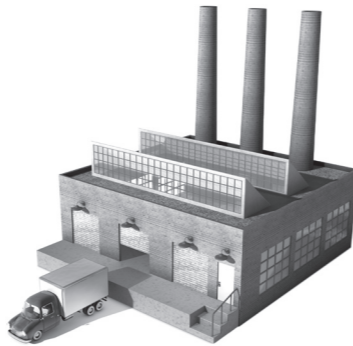


FACTORY



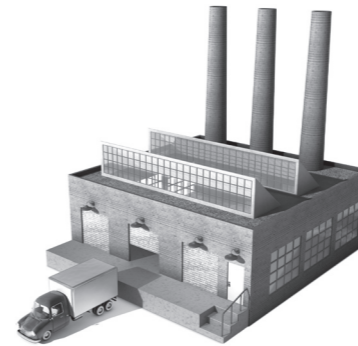
www.ellenmacarthurfoundation.org

FACTORY



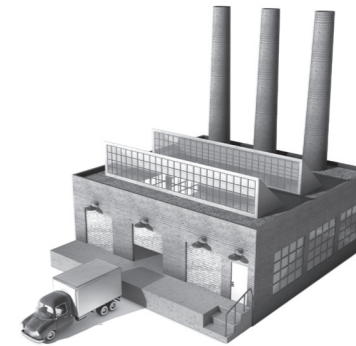
www.ellenmacarthurfoundation.org

FACTORY



www.ellenmacarthurfoundation.org

FACTORY



www.ellenmacarthurfoundation.org

www.ellenmacarthurfoundation.org

www.ellenmacarthurfoundation.org

www.ellenmacarthurfoundation.org

www.ellenmacarthurfoundation.org

www.ellenmacarthurfoundation.org

POWER STATION



POWER STATION



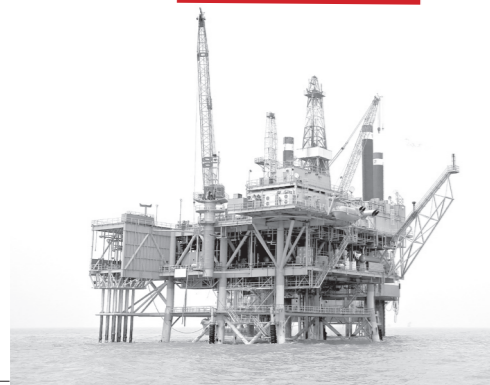
POWER STATION



POWER STATION



OIL RIG



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



LANDFILL



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



WASTE



TOADSTOOL



SOIL



SUN



CATERPILLAR



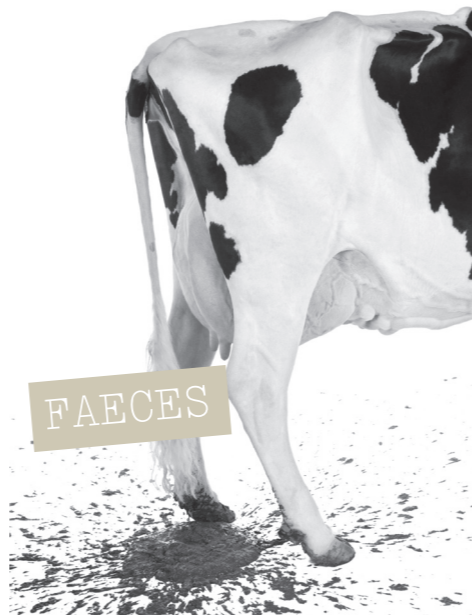
GREAT TIT



LEAF



FAECES



HAWK



WATER



ATMOSPHERE



BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org

BACTERIA



www.ellenmacarthurfoundation.org