

5.3 Lean production and quality management (HL)

Cradle-to-cradle design and manufacturing

Cradle-to-cradle design and manufacturing is a model of designing and creating products in a way that minimises waste and negative effects on the environment and on all stakeholders. It is a model that focuses on sustainability. This could include making products durable so they do not have to be replaced, using recyclable materials or choosing production methods that reduce pollution. **Figure 1** illustrates two of the fundamental ideas that underpin cradle-to-cradle design. These ideas are now being used by thousands of businesses around the world.

In the biological cycle, biodegradable raw materials are used. These products or materials are broken down (turned back into raw materials) naturally by biological agents such as bacteria and fungi. Biodegradable soaps, dishwasher detergents and laundry detergents are now widely available (the non-biodegradable forms of which are considered major sources of underground water pollution). Other examples of products that are available in biodegradable form are glass, multipurpose cleaners, nappies, pet waste bags, rubbish bags and eating utensils.

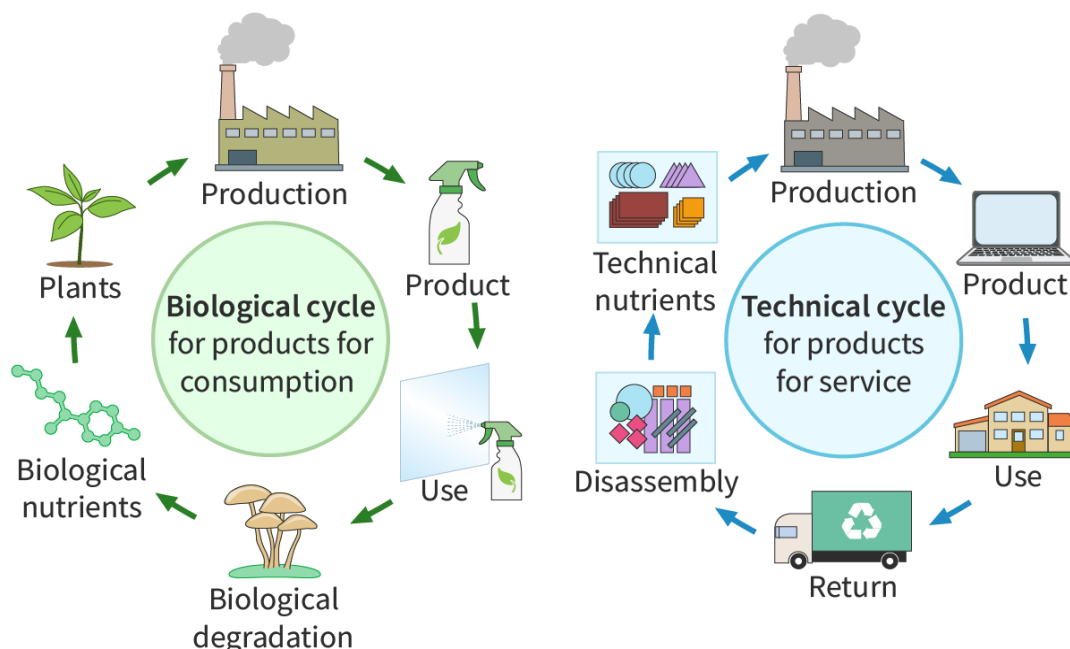


Figure 1. Cradle-to-cradle design and manufacturing aims to reduce waste.

The technical cycle focuses on the ideas of reuse and recycling. Products are made using sustainable materials, which can then be disassembled and reused once the original product is no longer needed. Using glass instead of plastic to design drinks bottles is a good example of the technical cycle in action. Plastic drinks bottles are a major source of waste, whereas glass bottles can be recycled or reused, minimising environmental impact.

Video 1 outlines Taiwan's experience with improving technical cycles to better manage waste in its economy. The video emphasises, however, that cradle-to-cradle, or circular, strategies alone will not fix the waste problem. We have to design out waste in the first instance if we want to improve sustainability.

Cash from trash: could it clean up the world?



Video 1. Changes in waste management in Taiwan allow for the capture of more resources for recycling.

Case study

Zero-waste fashion

Watch **Video 2**, which tells the story of fashion brand Tonlé, a company using the cradle-to-cradle design philosophy.

Tonlé zero waste



Video 2. Cradle-to-cradle manufacturing at Tonlé.

Tonlé, a fashion label based in Cambodia, has developed a production system that generates zero waste. The process begins with Tonlé employees scavenging local rag markets looking for fabrics that have been discarded by other clothing manufacturers. These scraps are delivered to the factory where new clothes are made from them. The process is so efficient that the small amount of waste cloth that cannot be used is collected and turned into paper! Tonlé ensures its workers are paid a living wage and provides other benefits, such as health care and long-term contracts of employment.

Questions

1. Define cradle-to-cradle production. [2 marks]
2. Explain how Tonlé's cradle-to-cradle production strategies improve both environmental and social sustainability. Use either the Doughnut Economics model or the SDGs in your response. [4 marks]

The Cradle to Cradle Products Innovation Institute (<https://www.c2ccertified.org>) is an independent non-profit organisation that provides certification of companies that operate within the cradle-to-cradle principles. It has identified five areas where companies can apply the cradle-to-cradle ethos. In Section 1.3.7 ([/study/app/y12-business-management-a-hl-may-2024/sid-351-cid-174702/book/terminology-exercise-id-36522](https://app.kognity.com/study/app/y12-business-management-a-hl-may-2024/sid-351-cid-174702/book/terminology-exercise-id-36522)), you also learned about the Ellen MacArthur Foundation (<https://ellenmacarthurfoundation.org>), which does similar work with businesses to help them move to a circular economy and meet their ethical obligations to people and the planet.

Concept

Creativity, Sustainability and Ethics

Moving from a take-make-waste linear economic system to a more sustainable and ethical production system – based on cradle-to-cradle or circular principles – requires that designers and manufacturers think creatively. From the moment they have an idea about meeting a human need or solving a problem, they need to consider how to embed circularity into choices of materials, manufacturing process and the product's end of life.

This requires moving away from current materials and processes and reimagining or inventing new materials, manufacturing and recovery. New business models need to be used, requiring flexible thinking across traditional disciplines. You learned about circular business models in [Section 1.3.7 \(/study/app/y12-business-management-a-hl-may-2024/sid-351-cid-174702/book/terminology-exercise-id-36522\)](https://study/app/y12-business-management-a-hl-may-2024/sid-351-cid-174702/book/terminology-exercise-id-36522). These circular business models help businesses move to cradle-to-cradle production, which is essentially the same idea as the circularity concept you have already learned about.

Exam tip

Using cradle-to-cradle strategies may increase costs of production for a business in the short term. However, businesses can see reduced costs in the long term if they do not have to buy as many resources to produce their products, or if they already have production processes that future environmental laws will likely require.

It is also important to realise that, though some businesses may see higher costs, these are not new costs. They are costs that the broader society and environment have been experiencing through waste and pollution from business activity. So, moving to cradle-to-cradle or circular strategies makes businesses more responsible for the full costs of the waste they produce.

The business may also see an increase in revenues, as conscientious consumers move more and more to purchasing ethical products, designed with a circular strategy. This can be a unique selling point (USP) for a business.

When discussing cradle-to-cradle production or circular business strategies, make sure you are aware of these different ways to discuss costs and revenues related to the practices.